



READY TO **POUNCE**

After years of favoring dogs, researchers are finally probing the secrets of the feline mind

By **David Grimm**, in *Corvallis, Oregon*; Photography by **Holly Andres**

Carl the cat was born to beat the odds. Abandoned on the side of the road in a Rubbermaid container, the scrawny black kitten—with white paws, white chest, and a white, skunklike stripe down his nose—was rescued by Kristyn Vitale, a postdoc at Oregon State University here who just happens

to study the feline mind. Now, Vitale hopes Carl will pull off another coup, by performing a feat of social smarts researchers once thought was impossible.

In a stark white laboratory room, Vitale sits against the back wall, flanked by two overturned cardboard bowls. An undergraduate research assistant kneels a couple of meters away, holding Carl firmly.

“Carl!” Vitale calls, and then points to one of the bowls. The assistant lets go.

Toddlers pass this test easily. They know that when we point at something, we’re telling them to look at it—an insight into the intentions of others that will become essential as children learn to interact with people around them. Most other animals, including our closest living relative, chim-

Strange and noisy objects like a fan with streamers often frighten cats. But they can calm down by picking up on humans' emotional cues, as Kitty does with a smiling Kristyn Vitale (opposite page).

panzees, fail the experiment. But about 20 years ago, researchers discovered something surprising: Dogs pass the test with flying colors. The finding shook the scientific community and led to an explosion of studies into the canine mind.

Cats like Carl were supposed to be a contrast. Like dogs, cats have lived with us in close quarters for thousands of years. But unlike our canine pals, cats descend from anti-social ancestors, and humans have spent far less time aggressively molding them into companions. So researchers thought cats couldn't possibly share our brain waves the way dogs do.

Yet, as cats are apt to do, Carl defies the best-laid plans of *Homo sapiens*. He trots right over to the bowl Vitale is pointing at, passing the test as easily as his canine rivals. "Good boy!" Vitale coos.

Carl isn't alone. After years when scientists largely ignored social intelligence in cats, labs studying feline social cognition have popped up around the globe, and a small but growing number of studies is showing that cats match dogs in many tests of social smarts. The work could transform the widespread image of cats as aloof or untamed. It also may eventually offer insight into how domestication transformed wild animals into our best friends, and even hint at how the human mind itself changed over the course of evolution.

That is, if the cats themselves deign to participate.

CARL'S CANINE PREDECESSOR was a black Labrador retriever named Oreo. In the spring of 1996, Brian Hare, then an undergrad at Emory University in Atlanta, was studying how toddlers pass the pointing test. "I turned to my adviser," says Hare, now an evolutionary anthropologist at Duke University in Durham, North Carolina, "and said, 'I think my dog can do that.'"

In 1998, Hare and Ádám Miklósi, a cognitive ethologist at Eötvös Loránd University in Budapest, independently published studies showing dogs could understand human pointing. Until then, social cognition researchers had paid little attention to dogs, thinking their minds had been "corrupted"

by thousands of years of domestication.

Hare's and Miklósi's finding sparked a canine cognition revolution (*Science*, 28 August 2009, p. 1062), helping confirm that domesticated animals such as dogs were worthy of study. More than a dozen labs around the world have since churned out hundreds of papers on the canine mind. Researchers have learned that dogs can recognize emotion in people's faces, understand components of human speech, and may even have a sense of fairness and ethics. Those abilities probably helped turn canines into loyal, trusted companions and



Few species understand what human pointing means, but Lyla aces the test.

enabled them to perform socially complex tasks, as varied as guiding the blind and serving with military units.

As dogs nuzzled their way up the cognitive tree, however, cats were left clawing at the roots. By 2004, researchers had published more than two dozen papers on canine social cognition—and none on felines. And yet, aside from dogs, no other animal is as prevalent or cherished in the human home. "The scientific output doesn't match the popularity of cats," Miklósi says. "We know more about how wolves think."

Miklósi himself tried to change that in 2005. In the first study to directly compare how cats and dogs communicate with people, he and colleagues conducted the pointing test at pet owners' homes. The cats performed as well as the dogs. But, foreshadowing a headache that would plague the field of feline social cognition, several cats "dropped out" of the study, according to the research paper. Some stopped paying attention. Others simply walked away from the testing site.

What should have been the beginning of a revolution in feline social cognition turned out to be a dead end. No one followed up on Miklósi's study, including

Miklósi himself, who vowed never to work with cats again. "I think everybody tried, and almost everybody gave up," he says, laughing. It would be nearly a decade before almost anyone tried again.

BACK AT OREGON STATE, a heavy-set calico named Lyla has entered the white lab room along with her owner, Clara. As we watch on a video feed, Lyla slinks low to the ground and suddenly freezes—eyes dilated—when a door slams in the adjoining hallway. Then things get worse: Clara leaves. Lyla begins to circle, seemingly in a panic, and then creeps toward the door where Clara exited. Then Lyla meows. And meows. And meows.

"Our record is 61 cries in 2 minutes," says Vitale, who runs the cat research program here. After 2 minutes, Clara returns to the room and sits cross-legged on the floor. Lyla immediately walks over and rubs against her owner's legs and face while Clara strokes her. Then, calmer than she's been since she arrived, Lyla walks away from Clara and begins to explore the room, sniffing its corners and batting a feather toy.

"People think that's a sign the cat doesn't care about the

owner," Vitale says. "But it's actually the opposite." Lyla, she says, is showing that she trusts Clara so much that she feels comfortable going off on her own as long as Clara is around. In essence, Clara is her security blanket.

Vitale grew up with cats and, like Miklósi, wondered why no one had bothered to study their social mind. "There was a void in the research world I was drawn to," she says. "I saw the projects that could be done." She came to Oregon State as a graduate student in 2014 to work with Monique Udell, an animal behaviorist who had published studies on dogs, wolves, and even bats.

Vitale was well prepared to add cats to the lab's repertoire. She has four at home, and at Oregon State she began to run kitten classes for the community, teaching cats to socialize with strangers and other felines and even walk on a leash. That experience came in handy for acclimating the animals to the alien environment of the laboratory. (Vitale's tricks include coaxing cats into the experimental room by leading them with a feather dangling from a plastic rod, and she wears a fanny pack loaded with five kinds of treats.)

In 2017, Vitale and Udell showed that cats preferred interacting with people over food and toys. This year, the team reported that cats spend more time with humans who pay attention to them—such as by clicking at them and calling their name. Similar behavior in dogs has been used to argue that canines are tuned in to our “attentional state,” allowing them to pick up on our gestures, commands, and other social cues. Vitale is also exploring whether cats that have “passed” her kitten class are more attached to their owners or more sensitive to human emotions—a skill Lyla is about to demonstrate.

Vitale enters the white lab room and places a fan taped with black and white streamers on the floor. Then, she turns it on and leaves. As the streamers shoot out from the fan and crackle against each other, Lyla crawls back to Clara and circles her, as though looking for reassurance. Then, as previously instructed by Vitale, Clara begins to make friends with the fan. “What a nice fan,” she murmurs soothingly to the object. And then, to Lyla, “Don’t you want to see the fan?” Remarkably, Lyla approaches the fan and lies down next to it. “She’s picking up on Clara’s positive state of mind,” Vitale says.

Similar work, published by Italian researchers in 2015, was the first to show that cats, like dogs, can shape their behavior to human emotions—something many pet owners may have suspected but that hadn’t been scientifically demonstrated. The Italian group also found that most of the cats looked back and forth between the fan and

their owner, as though trying to suss out how they should respond to the object.

Meanwhile, ethologist Péter Pongrácz, a colleague of Miklósi’s at Eötvös Loránd, has taken the pointing test to the next level. Instead of using fingers, members of his team simply gazed at an object, sometimes just for a split second. Cats followed the gaze 70% of the time, the group reported late last year, similar to the performance of dogs.

Most animals rarely gaze at each other, and when they do it’s often a sign of hostility, Pongrácz says. To see cats use gaze

“There’s a very widespread belief that cats are stupid and selfish. The new results are pushing back on that.”
 Péter Pongrácz, Eötvös Loránd University

the way people do—to share information—is “really surprising,” he says. “The findings provide stronger proof that cats have evolved to be capable of complex communication with humans.”

The discovery also impresses Christian Nawroth, a behavioral biologist who studies social cognition in livestock at the Leibniz Institute for Farm Animal Biology in Dummerstorf, Germany. He has shown that pigs can follow pointing, but only with

lots of training, and that they struggle to follow gaze. “The performance rates of cats really surprised me,” he says. “We haven’t seen that with farm animals.”

It’s true that many cats won’t pass social intelligence tests as well as dogs, Miklósi says. But that’s likely because they’re in an unfamiliar environment or with unfamiliar people, which can stress them out. What’s important, he says, is that some cats can pass the tests, suggesting these abilities are inherent to the species. “If you take a well-socialized, calm cat, I think it’s going to perform similarly to a dog.”

Additional studies on cats are happening in labs from Mexico to Japan. Researchers are showing that cats perceive some optical illusions the same way we do and that they can distinguish their owners’ voices from those of strangers. “The field is definitely expanding,” Vitale says. “Cats are finally getting their due.”

But when it comes to catching up with dogs, cats may turn out to be their own worst enemy.

A FEW YEARS BACK, Pongrácz brought a cat into his lab for a study. “In less than a minute, it escaped and got into an air duct,” he says. “We were terrified. We had to wait an hour for it to come out.”

Things didn’t go much better with his gaze experiments. Pongrácz’s team did the work in cats’ homes, thinking they would be better behaved there, but some felines either didn’t cooperate or dived under the sofa. Other cats—frustrated by being

How socially smart is your cat?

To find out whether your cat can pass some common tests of social intelligence, try these simplified experiments at home. Make sure your cat is calm and relaxed before you start.

EXPERIMENT	HOW TO TEST	WHAT IT MEANS	THE LESSON FOR OWNERS
Does your cat know its name?	When your cat is calm, perhaps relaxing in the sun, say four words of about the same length and inflection as its name, waiting 15 seconds between words. Then, say its name.	If your cat gradually reacts less to each random word, but responds to its name by turning its head toward you, rotating its ears, or moving its tail, it probably “knows” its name.	It may be easier to train a cat that knows its name, for example when using verbal commands like, “Sit!”
Is your cat tuned in to your emotions?	Take your cat into a room with an object it has never seen before, ideally something that moves and makes noise, like a robot vacuum. Sit calmly on the floor with your cat, then make friends with the object, saying “what a nice vacuum” in a calm, friendly voice. Approach the object and touch it.	If your cat is initially freaked out but calms down—and even approaches the object—after you make friends with it, your cat likely can pick up on your emotional cues and alter its behavior in kind.	Your mood can influence your cat’s mood. So, if you’re calm and chipper at the vet’s office, it may stay calm as well.
How independent is your cat?	Take your cat into a room in your home and sit with it on the floor. Proceed to ignore it, sitting quietly or paying attention to a book or phone, for 2 minutes. Then, try to interact with your cat—call it to you. If it comes, pet and talk to it.	Highly social cats immediately come to you when you begin to pay attention to them, whereas more independent cats keep their distance.	If your cat tends to be antisocial, try spending more time with it. Like humans, cats can become more friendly if we make extra effort.
Does your cat prefer you—or food?	Pick a few items you think your cat may enjoy, such as treats and toys. Set them on the ground, sit nearby, and see where your cat lingers.	The items—or person—your cat spends the most time with are the ones it prefers. But sometimes it may just be hungry. Repeat the experiment in varied circumstances to be sure of its preferences.	If your cat prefers you to toys or treats, the best incentive when training or rewarding it may be your presence.

held when they knew the researchers had treats—scratched and wriggled their way out of their owners' arms. "It's like suddenly the cat has 10 legs," Pongrácz says.

The team started with 99 cats but got usable data on only 41. In other labs, cats have leapt out of mazes topped with nets designed to keep them inside, leaving the whole setup in disarray. And some researchers have had to deprive cats of food for up to 8 hours just to motivate them to crave a treat. "If you want results on one cat," Miklósi says, "you have to test three."

Those stats concern Alex Taylor, a comparative psychologist at the University of Auckland in New Zealand who has studied cognition in crows, dogs, and other animals. "There's a lot of solid science going on in these cat studies, but it's taking a lot of resources to produce the data," he says. "It would give me pause about working with cats."

Research money is also scarce. Pongrácz funded the gaze study out of his own pocket. And Atsuko Saito, a psychologist at Sophia University in Tokyo who just last month showed that cats seem to know their names even when a stranger says them, says she can't get grants either.

Even Vitale is struggling. Her postdoc funding ends in October, and though she has grant applications out, she's worried that the work, lacking direct applications to people, won't win support from funding agencies such as the National Institutes of Health. "If I leave," she says, "pretty much everything I do would leave with me."

Yet even the limited work on cats so far could help unravel some of the mysteries of how we bonded so closely with our pets. Dogs and cats traveled different roads to the human home: Dogs evolved from the social, cooperative gray wolf and are the product of thousands of years of intensive breeding and selection by humans. Cats, by contrast, descend from the fiercely antisocial and territorial Near Eastern wildcat, and they largely domesticated themselves, as the tameest cats began to hang out and hunt rodents in early farming villages. Both species seem to have evolved the same skills to live alongside us, however, suggesting those skills are crucial to domestication.

Reading complex human cues such as gaze may have allowed cats and dogs to communicate with people in a way other

animals can't. And puppies and kittens seem to pick up those skills right away, whereas animals such as wolves can take months to understand something even simpler, such as pointing.

Still, Nawroth and Taylor say it's too early to tell whether the social intelligence of cats and dogs is more advanced than that of other domesticated animals. If we shared our beds with pigs, they might be just as good at following the human gaze. And Hare argues that to truly understand what has changed in the feline mind through evolution, researchers will



Kristyn Vitale with her cat Carl. New research suggests cats are more socially bonded to humans than many people had suspected.

need to compare cats with their direct ancestors—for example, by exploring how the wildcat responds to social cues from humans and other cats.

Such work could give us a fresh insight into another domesticated species: humans. Like cats, our ancestors may have self-domesticated, becoming less aggressive and more cooperative over evolutionary time. "It would be interesting to see if the things that changed in cats also changed in us," Nawroth says.

Udell wonders whether one such trait was our ability to live alongside other species, the way cats and dogs have evolved

to live alongside us. "Maybe it's not just cats and dogs that have become more socially flexible," she says. "Perhaps we have as well."

AS VITALE FINISHES her work with Lyla, a research assistant brings in her own cat, a gray and brown striped tabby named Moody. His name turns out to be appropriate. In the lab, he first encounters a person who plays with him and then one who ignores him. He quickly learns to approach the friendly person and avoid the indifferent one. Then Vitale enters the room. Will she play with him or brush him off? Moody apparently assumes the latter, keeping his distance. "That's a sign of pessimism," she says.

Vitale herself is cautiously optimistic. She recognizes the challenges of working with cats, but she hopes scientists see the potential, too. "Cats are now where dogs were a couple of decades ago," she says. "I hope researchers give them a chance to show what they can do."

Despite his reservations about working with cats, Taylor thinks the field will grow. Having owners bring pets into a lab is much easier than housing other species yourself, he says. "We're moving from the rat and pigeon phase of comparative psychology to the dog and cat phase."

Vitale hopes the new findings will help workers make shelter cats more adoptable—they often lack the social skills of their house cat counterparts—and lead to improved ways to calm separation anxiety and other social disorders in felines.

And both she and Pongrácz think the research will help dispel negative percep-

tions about cats. When it comes to social skills, "There's a very widespread belief that cats are stupid and selfish," Pongrácz says. "The new results are pushing back on that."

Meanwhile, Miklósi has returned to the feline fold. For example, he's considering using touch screens to see whether cats can categorize objects such as landscapes and animals, as dogs can. "I've been working with dogs for 25 years. It's getting harder and harder to find something new and exciting to do with them," he says. "Cats are still exciting. Maybe it's the time of the cat." ■

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Ready to pounce

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