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Pet Projects

Tim Obermiller
Illinois Wesleyan University, iwumag@iwu.edu

Kim Hill
Illinois Wesleyan University, iwumag@iwu.edu

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In IWU's Dog Cognition Lab, Professor Ellen Furlong and her students seek to better understand humans' best friend.

Story by TIM OBERMILLER and KIM HILL

As a college intern working at a zoo, Ellen Furlong was asked to sweep up straw outside the orangutan cage. She started in, then hesitated, concerned that if she got too close to the cage, one of the apes might snatch away her broom through the bars. That's when an orangutan reached under the cage and began to sweep some straw with its hand. Was it simple imitation, or was it perhaps an invitation for Furlong to just relax and do her job? She wondered, "What is going on here?"

Now an assistant professor of psychology at Illinois Wesleyan, Furlong has invited students to join her in discovering how and why animals think and act the way they do.

As an undergraduate at Transylvania University, a liberal arts college in Kentucky, Furlong first realized that her fascination with animals could blossom into an academic career. She earned a master's and Ph.D. in developmental psychology from The Ohio State University. She then became a post-graduate fellow at Yale University, where she worked with Laurie Santos, a prominent cognitive scientist. With Santos, Furlong studied both humans and non-human primates — including a population of free-ranging rhesus monkeys on Cayo Santiago, a small island off the coast of Puerto Rico.

Santos and Furlong later opened Yale's Canine Cognition Center. Their tests showed that dogs, on the whole, are "incredibly sophisticated … really good at math and overall just very intelligent," says Furlong. "And they outshine many other species in terms of social skills."

It's also easier and safer to work with dogs compared to simians, where misunderstandings — such as a human smile of greeting that's mistaken as a "smile of threat" — can more easily occur. To illustrate, Furlong recounts an experiment she ran on Cayo Santiago for which she constructed a tower made of fake limes (rhesus monkeys love limes). Hearing shouts of warning from her student intern, Furlong looked up and saw about 35 monkeys sitting in a horseshoe shape around her, staring at the lime tower and then at her as she slowly backed away.

Instead of glares, you are far more likely to see wagging tails in Furlong's Dog Cognition Lab — a tidy, comfortable space located on the lower level of Stevenson Hall. Along with computers and video cameras, there are baby gates and squeaky toys. A faint aroma of dog treats wafts in the air. Hanging on one of the lab's white walls is a large color photo of Furlong's dog Cleo, an 11-year-old Australian shepherd mix who is described by her owner as smart, loud, playful and occasionally weird (for example, Furlong marvels at her pet's willingness to swallow bees).

Kate Ford '15 and Furlong examine video frame by frame to measure dogs' reactions to tests.

Cleo is always the first dog to try out the cognitive, noninvasive tests designed in the lab by Furlong and her students. From watching puppet shows to selecting treats to identifying shapes on a computer touch-screen, Cleo enjoys the attention as much as the tests — where the only requirement to pass is to be a dog.

After Cleo helps work out the kinks of an experiment's design, the test is deemed ready for canines that are brought to the lab by their owners, many of whom are IWU faculty and staff. A comment Furlong commonly hears from those owners is: "You probably don't want my dog; he's not very smart."

Her response: "First, we are interested in learning about the average dog. Some dogs are smarter than others, but we want to get all the variation we can in our studies. Second, I'll bet you're wrong. Some of our best dog scientists in the past have been dogs whose owners said they weren't smart. Sometimes it's just a matter of finding your dog's particular skill set."

For dogs, the lab's experiments may feel more like fun and games. For Furlong and her students, it means the chance to better understand the world's oldest domesticated animals and how their cognitive abilities have been uniquely shaped over the course of their bond with humans, which new genetic science dates as far back as 32,000 years.

An estimated 78 million dogs live in American households. "They're a huge part of our lives, and yet we know very little about them," says Furlong. Do dogs have self-control? What do they understand about human intentions and human goals? It turns out we have a lot more questions than answers."

Answering those questions could lead to better trained working and service dogs that assist the military and police, that sniff for cancers or bombs or that help people with a variety of disabilities and illnesses.

What Furlong and her students have already learned could also help save millions of dogs given up to shelters or euthanized each year because of perceived behavioral problems. "If we can learn more about dogs, we can keep that from happening," Furlong says. "The idea of improving dogs' lives is one of the most exciting things about this research."

The canine connection

An attentive Piper watches a puppet show assisted by Connor Hughes '15. Piper belongs to Michael Gorman '10, one of many IWU staff and faculty who volunteer their pets for the lab's noninvasive studies.

Illinois Wesleyan students sense the excitement. There are usually more applications for student researchers than spaces available in Furlong's lab each semester. She welcomes students of any class year, major or academic interest. "Our research is very interdisciplinary," she says.

In the lab, students divide into teams of up to four students on one project per semester. "The project head is usually a more senior student or someone who has been around the lab a while," says Furlong. Students come up with research ideas, design and run studies, analyze data, and write up the results for possible publication.

You also need to "know how to act around dogs," Furlong tells her student researchers. "Even the nicest dog can bite if provoked." Still, you don't need to be a dog lover to work in the lab, "but you do need to love the knowledge you can gain from them," Furlong says. Most students — like anthropology/psychology double major KiriLi Stauch '15 — love both.

Back in grade school, Stauch tried to figure out her family dog's behavior, like why he barked at certain people and "play-bowed" to others. As an IWU junior, she brought that same curiosity to Furlong's office, where she asked about possibly designing a research project for the Dog Cognition Lab.

Furlong suggested further readings and helped her develop specific research goals, a process Stauch continued in Furlong's "Research Methods in Psychology" course and one-on-one meetings with her professor.

Collaborating with Furlong and with other students, Stauch adapted methods from earlier studies that tested apes' ability to read social cues revealing human goals and intentions. A stipend awarded to Stauch through the Eckley Summer Scholars and Artists Endowment program allowed her to continue her research on campus over the summer of 2014.

For one lab test, a person sits inside a dog playpen and gives one treat, then another, to a dog standing outside the pen. On the third try, the person either a) 'accidently' drops the treat and cannot retrieve it, or b) offers and then deliberately withholds the treat.

Students designed an apparatus (shown above) that Stephanie AuBuchon '16 used to test self-control as a foundation for helping dogs find forever homes.

"When it looks like an accident, the dogs will move in really close, standing with their nose right up against the cage," says Stauch. "It's like they're saying, You can do it, come on, give it another try! But when it looks like you're not giving them the treat on purpose, they get really mad — they move away from the cage, and also whine or bark."

This and another study by Stauch confirmed that domestic dogs understand humans' intentional actions at least as well as non-human primates performing similar tests. Stauch, Furlong and psychology major Stephanie AuBuchon '16 shared their results with animal researchers from around the world at an academic conference held last March at Eastern Kentucky University.

After helping Stauch with her project, AuBuchon applied for and received her own Eckley scholarship to pursue research this past summer. Her goal was to develop a study that tests dogs' ability to exercise self-control.

KiriLi Stauch '15 offers Wendell a treat in a trial testing dogs' recognition of human intentions. As an Eckley Scholar, Stauch designed the experiment with Furlong's help.

"When I learned I was going to receive the Eckley award, I felt so proud of my hard work to get this huge opportunity," says AuBuchon, who also majors in women's and gender studies and plans to become a school psychologist. "I texted Dr. Furlong, called my mom and ran around my sorority house telling all my friends how excited I was."

An inspiration for AuBuchon's research was a famous test performed in the early 1970s at Stanford University by psychologist Walter Mischel. Children age 4 or 6 were told they could eat a marshmallow now, or wait 15 minutes and be rewarded with a second marshmallow. In follow-up studies, Mischel found that children who waited had better life outcomes, as determined by SAT scores, educational attainment, health and other measures.

Similar self-control tests were later run with monkeys as the subjects. To build a test for dogs, AuBuchon used a spinning-wheel apparatus built by students in Furlong's lab. The wheel spins and brings a treat to an open window. One treat, a humdrum piece of kibble, arrives first and the dog can either eat it or wait for the wheel to keep spinning to bring the farther treat — a yummy chunk of jerky — to the window.

"So if they let the kibble pass by, they get the better-tasting jerky," AuBuchon explains. "So it's conceptually similar to the marshmallow test, in that you have to wait for a better reward."

The test showed that "some of the more hyper dogs show amazing self-control, while some of the shy ones don't have any self-control. Like any personality trait, self-control varies by dog, and it doesn't matter if the animal is young, old, calm, hyper, shy or social."

Each year, 6 to 8 million pet dogs enter shelters. Six in 10 of those dogs are ultimately euthanized. Many of those pets had been given up by owners due to behavioral problems: aggression, destructive behavior or separation anxiety. If owners could be forewarned about a dog's personality quirks, it's possible many of those deaths could be prevented, says AuBuchon.

She sees potential to develop a self-control test that could quickly be done in animal shelters or veterinary offices. Such a test could help prospective owners "choose a dog that fits their ability to deal with different levels of self-control," AuBuchon says. "So a vet can say, 'This dog has a great amount of self-control,' or 'This dog does not have the best self-control, so you might have to give them a little extra attention, a little more exercise, so they don't have those negative behaviors.'

"Overall, this study is the foundation for helping dogs find forever homes and not be turned over to shelters," says AuBuchon, who will continue her work this academic year as part of her senior thesis.

Gorillas in the mix

As research continues in Illinois Wesleyan's Dog Cognition Lab, Furlong is finding opportunities for her students to investigate the animal mind in other venues and with other species.

This past spring she led a May Term class that offered students the chance to directly observe animals at both the Louisville Zoo and the Primate Rescue Center in nearby Nicholasville, Ky. Their assignment: to design, build and assess the effectiveness of enrichment items used to support the physical, social and psychological well-being of confined primates.

Students in Furlong's May Term course traveled to the Primate Rescue Center near Louisville, Ky.

Biology major Jessica Kraut '16 was surprised to learn that even experienced zookeepers tended to underestimate the cognitive abilities of primates in their care. While building one of their enrichment items for the gorillas at the Louisville Zoo, Kraut recalls the caretakers were adamant that just one of the gorillas would be able to use sticks found in their enclosures as tools in order to obtain a food reward within the enrichment puzzle.

"It turned out almost all the gorillas used tools to get the food reward," says Kraut. "The keepers realized that they had been underestimating gorilla intelligence and that the gorillas were much more capable than they thought."

Students in Furlong's May Term course also designed and built cognitively appropriate enrichment items for apes at the Louisville Zoo

Though it was her love of animals that attracted Kraut to Furlong's May Term course, she says she did not expect to become so emotionally attached to the primates. Observing them for hours at a time, Kraut began to discern their different personalities "and how each one is an individual."

In addition to dogs and primates, Furlong's students have studied wallabies and wallaroos in observation projects at Bloomington's Miller Park Zoo.

One potential species not on Furlong's list is the domesticated feline. "As soon as you can figure out how to motivate a cat to do anything, we will bring them in," she says, laughing.

With or without cats, the potential for discovery in Furlong's lab seems boundless. Using the tools of psychology, she and her students will continue their quest to better understand the thoughts, behaviors and reasoning of animals — including humans.

"Dogs can give us insight into our own thinking and decision-making," insists Furlong. "We are similar in a lot of important ways, and different in many ways too. What can these similarities and differences tell us about human cognition? I believe the answers will continue to surprise us."

- **Read about how dogs may benefit from touch-screen computers**
- **Visit Ellen Furlong's IWU Dog Scientists page.**
- **Visit the Psychology Department website.**
- **Watch a video about an experiment in the Dog Cognition Lab.**