



▶ Impatient Chimp Bananas Over Zoo PC

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Lincoln Park gives apes computer access--and now they're hooked Keo, a 47-year-old male chimpanzee at Lincoln Park Zoo, paced the floor of his non-public living quarters one recent afternoon, clearly annoyed with his keepers. In his rolling gait, he would stride up to a glass wall, stop and glare at the humans on the other side. He was supposed to have been at work on his computer at 1:30 p.m., but now it was 1:40 p.m. and the door to a small adjoining room with the computer was locked so he couldn't enter.

Behind the glass, Steve Ross, the zoo's supervisor of behavioral and cognitive research, was a little annoyed too. He was waiting for two visitors, 15 minutes late, who were coming to see how he has been training Keo and other apes this year to use a touch-screen computer in order to measure their cognitive abilities. The work Ross and his colleagues are doing is part of a movement in American zoos to hire their own scientists and allow others to use zoo animals for sophisticated studies that used to be done almost exclusively in university settings.

Among the experiments being conducted at Lincoln Park is long-term research on using computers to talk to the animals. The idea is to get the apes to learn to use computer programs to communicate preferences on food, activity and living space. More broadly, Ross said, the work should add to the scientific literature on how and to what extent apes are able to think and perceive the world. Keo's annoyance at being delayed suggests he is keenly aware of time, even though he can't read a clock, said Ross. He and other apes judge the time of day with uncanny accuracy and are able to anticipate their scheduled activities, such as feeding and training sessions. "Keo seems to gauge the time of day starting from the time keepers arrive every morning," said Ross.

Obvious intelligence

That kind of obvious intelligence is driving zoos to develop projects like the computer study. When Lincoln Park opened its \$25.7 million Regenstein Center for African Apes in 2004, it was designed to handle such research. Besides housing the apes in natural habitats for public viewing, the building houses the Lester E. Fisher Center for the Study and Conservation of Apes, a zoo-funded research component that employs Ross. Some of its experiments are conducted in public view, like an artificial termite mound where visitors can sometimes watch as chimps and gorillas use sticks (or try to use them) as tools to retrieve favorite snacks.

To avoid distractions, the computer experiment is conducted in non-public areas like Keo's quarters and the basement holding areas the apes go to in the morning while keepers clean their living spaces.

Keo was the first ape to be trained to use the screen, in January. Now every Monday through Friday at 1:30 p.m., he and another chimp in his troop, 20-year-old Vicky, wait anxiously for the researchers to arrive. Usually Keo does the first session, then Vicky. Currently Keo is doing a task Ross calls "match to sample." Keo squats in front of a 42-inch computer screen that places a 2-inch-high photo icon--the face of a chimp he has never met-- somewhere on the screen. If he touches it, little edible balls called Primatreats (in pina colada and banana flavors) roll out of a slot at the bottom of the screen as a reward. Moments later, two chimp-face icons flash on the screen: the one he just touched and one of another chimp Keo has never met. If he touches the image of the first chimp, he gets a reward. If he touches the second image, he gets nothing.

"In each session Keo has 30 opportunities--called trials--to win a reward for touching the right face," said Ross. "He has 10 minutes to get through each trial; then we cut the experiment off for that day.

"Keo has gotten so good at it, he usually does all 30 in 2 1/2 minutes."

The exercise with the faces is just for training, getting Keo used to the idea that the icons mean something, that there are right and wrong answers.

"In the next three to four years, as more of our apes become accustomed to the screen, we can devise programs for them that we can use to ask them questions about their world and how they perceive it," Ross said. In a fashion, it might give them a way to talk to us." He said he and colleagues hope to devise preference tests so apes can say what foods they like most, which areas in the ape house they most enjoy living in and how they react to individual keepers or visitors.



Teaching apes to use computers is not new. Research literature has made a few apes famous for what they have accomplished on computers with their trainers, including Sue Savage-Rumbaugh's chimp Kanzi, Penny Patterson's gorilla Koko and Roger Fouts' chimp Washoe. Those experiments, however, were aimed at seeing if apes could learn and use language. Ross and his zoo colleagues are more interested in the cognitive research Tetsuro Matsuzawa has done with chimps for more than 20 years.

At the Primate Research Institute in Japan's Kyoto University, Matsuzawa studies only chimps, delving into how they think and what they think about. Chimps are closer genetically to humans than horses are to zebras, and he hopes that studying chimp cognitive abilities will yield clues to the evolution of human intellect.

Matsuzawa wrote in an e-mail interview this week that he is enthusiastic about Ross' research. "I really want to see the future progress of the Chicago apes," he wrote.

Decision-making skills

The wild chimps Matsuzawa studies in West Africa naturally demonstrate decision-making and memory traits while spending up to 40 percent of their day working to find and eat food, he said. The apes eat about 200 of 600 plant species growing in their forest, know in what seasons they will find properly ripened fruits and vegetation, and choose stages of ripeness for the tastiest morsels.

In captivity, where apes normally spend only about 5 percent of their day eating, Matsuzawa and Ross said research exercises are enriching tools for the animals, challenging them intellectually and allowing them to spend more time looking for tasty tidbits.

"The most important point is [that] in the computer-controlled experiment, the apes come to the booth based on their free will," said Matsuzawa, likening the behavior to wild ape foraging. "You work, and then you get a reward. It is a matter of effort, fairness and joy." In most ape research facilities, the animals are brought to labs that are equipped to do the experiments. Lincoln Park designed its off-viewing habitats in the back and basement so the experiments could be brought to the animals, giving them a more comfortable, familiar setting for the work.

Keo's off-viewing living quarters and the basement holding spaces have ports to attach the mobile computer. The computer screen sits behind 1 1/2 inches of extremely strong glass and is framed by a device that throws a web of invisible laser beams across the screen's surface. The screen is not touch sensitive, but the laser web acts as a vertical laser mouse, so when the ape touches an icon, it breaks the laser web, and the computer sees the hit. So far, nine apes have been introduced to the screen, but just three have stuck with it: Keo, Vicky and a 9-year-old female gorilla, Rollie.

"It is totally voluntary on their part," Ross said.

Introduction to numbers

Vicky and Rollie are learning a different exercise from the one Keo is learning. They see two colored squares that contain the numeral 1 or the numeral 2. If they touch 1 first, they get a reward; if they touch 2 first, they get nothing, and the screen momentarily goes red. When the apes master that task, the researchers will add a third square with the numeral 3. The plan is to train the apes to touch numbers in sequence all the way to 9. "At some point we hope all 25 of the apes living in this building will be doing computer tasks," said Ross.

"In most cases of zoo research like this, you have the idea of setting up the experiment, doing it for a year, then taking it down while you write the results up for publication," he said. "This is a very different thing. This could go on for several years to get to productive scientific output."

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