

ANIMAL COGNITION

## 'Killjoys' Challenge Claims Of Clever Animals

Despite recent claims of advanced intelligence in animals, researchers still debate how to test whether their abilities reflect humanlike cognition

**LONDON AND CHICHELEY**—It seems that hardly a week goes by without a new report about animals performing marvelous feats we once thought only humans could do: Crows make tools, chimpanzees seem to mourn their dead, and rats supposedly empathize with one another's pain.

Charles Darwin, were he alive today, might approve this trend. "The difference in mind between man and the higher animals," he wrote in *The Descent of Man*, "... is one of degree and not kind." For many researchers, the new evidence represents a welcome shift from behaviorist paradigms often associated with psychologist B. F. Skinner, which denied nonhuman species anything approaching advanced cognition (*Science*, 25 January 2008, p. 404). Yet recently, some researchers have been pushing back against attributing humanlike qualities to other animals without considering cognitively simpler explanations.

This more skeptical contingent was present in force at two recent back-to-back meetings\* sponsored by the Royal Society in London and Chicheley. At both, researchers explored what animals are really doing when they engage in seemingly complex behaviors, rather than reported still more

\*"Animal minds: from computation to evolution," London, 16–17 January, and "Theories of minds: the theoretical bases of comparative cognition," Chicheley, 18–19 January.

discoveries of their impressive abilities. "There's an arms race to identify the most clever animals," Lars Chittka, an animal psychologist at Queen Mary, University of London, said at the London meeting. "But what are we trying to demonstrate?"

Attempts to measure the gap between human and nonhuman minds have become like a "party game," said experimental psychologist Cecilia Heyes of the University of Oxford in the United Kingdom. Some researchers blamed the news media, and even some scientists, for exaggerated interpretations of animal behavior. "People in the field often gravitate into two camps," Daniel Dennett, a philosopher at Tufts University in Medford, Massachusetts, told *Science*. "There are the romantics," those who are quick to see humanlike traits in animals, "and the killjoys," who prefer more behaviorist explanations. "I think the truth is almost always in the middle."

### Crinkly bananas

In a talk at the London meeting titled "Simple Minds," Heyes argued that many researchers discount associative learning—the expectation that two events, for example, a stimulus and reward, are connected. Heyes argued that this type of learning is ubiquitous among both animals and humans and remains a "contender" when interpreting animal experiments. As a case study, Heyes critiqued a

**Sharing the wealth.** Chimps aren't quick to help each other but may do so under some conditions.

paper on chimp altruism published last year in the *Proceedings of the National Academy of Sciences*. Researchers have been hard put to show that chimps have much desire to help each other out; unlike humans, they seem to do so only when pressured or pleaded with rather than spontaneously.

In the study, led by primatologists Victoria Horner and Frans de Waal of Emory University in Atlanta, chimps were given a choice between two different colored tokens. One color prompted the human experimenter to give a banana to both the subject chimp and another chimp in an adjacent enclosure whereas the other

color resulted in food for the first chimp only. Chimps showed a significant preference for the token that led to a banana for both themselves and their partners. The team concluded that chimps are more altruistic than usually given credit for.

But Heyes pointed out that the bananas were wrapped in crinkly paper, so chimps could both hear and see when the partner got a reward. She suggested that the chimps may have begun to like the sound of the crinkly paper, "just as Pavlov's dogs got to like the sound of a bell." Thus they might have opted for the color choice that yielded a double shot of the noise.

Psychologist Sara Shettleworth of the University of Toronto in Canada says she "totally agrees" with Heyes's reservations, and even Horner calls the arguments "thought-provoking." But Horner argues that the chimps got only one reward no matter "how many rustling papers they heard." Had associative learning been the primary mechanism operating, she says, the chimps would not have preferred one token color over another.

Although researchers still debate what's behind the behavior of close human relatives such as chimpanzees, there was wide agreement with points made at the Chicheley meeting by cognitive scientist Derek Penn of the University of California, Los Angeles. His talk, titled "Animals Aren't People," included a blistering critique of a 9 December 2011 *Science* paper (p. 1427) that claimed that rats are capable

of empathy—or, as *Science*'s online news coverage headlined the story, “Rats Feel Each Other’s Pain.”

In the study, neurobiologist Peggy Mason of the University of Chicago in Illinois and her colleagues trapped one rat in a small plastic restrainer that could be opened only from the outside; trapped rats gave alarm calls roughly 20% of the time. A second, free rat was placed nearby, and it soon learned to free its compatriot by opening the door. Free rats did not open the door when the trap was empty. The authors concluded that the helping rat reacted empathically to the distress of its fellow.

But Penn argued that the team hadn’t shown that either rat was truly in distress. The team didn’t perform at least one other important control, he said: using trapped rats that were not distressed. Playing videos of the experiments to the meeting, he pointed out that once the door was open, the free rat entered the trap and explored it with the trapped rat, suggesting that being in the trap was not that stressful.

Mason, who was not at the meeting, counters that once the trap was open, it became “an object to be explored, and in fact rats might prefer it to staying out in the open.” As for the lack of an unstressed control rat, Mason says the team now has an experiment under way suggesting that the more anxious the trapped rat, the more helping behavior is evoked. She agrees that rats probably are not aware of one another’s mental states, as humans are, but says the behavior her team observed is the “rodent homolog of empathy.”

Nevertheless, Penn argued that this and many other recent papers suffer from what is called “folk psychology”: interpreting ani-

mal and human behavior in “commonsense” rather than strictly scientific terms. Folk psychology, Penn said, gives animals humanlike reasons for what they do, such as “the rats helped free their cagemates because the caged rats were feeling scared.”

Penn’s talk evoked murmurs of agreement in the meeting room. “Our folk psychological labels carry a lot of specifically human baggage,” Dennett says, “which can be gradually jettisoned as we come to understand other ways of accomplishing many of the same basic cognitive tasks.”

### Do birds have theory of mind?

Are there alternative ways of explaining remarkable animal feats? A talk in Chicheley by cognitive scientist Rineke Verbrugge of the University of Groningen in the Netherlands explored that question in the case of birds such as rooks and jays. Recent findings suggest that these birds can make tools and understand the mental states of others, often called “theory of mind”—behavior once reserved for humans.

Research suggests that the western scrub jay is no “birdbrain” cognitively, for example. In work by Nicola Clayton of the University of Cambridge in the United Kingdom and colleagues, the jays appear to plan for the future by caching food where it is most likely to be needed later. And in an elegant 2006 *Science* paper (16 June, p. 1662), Clayton’s team showed that these birds might even have theory of mind. The team found that the jays alter their caching behavior—for example, moving food, called recaching—if other birds are watching. Because jays routinely steal one another’s caches, this raises the possibility that the birds are aware of one another’s mental state.

In her talk, Verbrugge described computational modeling work carried out by graduate student



**Feeling his pain?** A study concluding that rats have empathy for one another came under fire at the meeting.

Elske van der Vaart, which was published online this week in *PLoS ONE*. Van der Vaart created “virtual scrub jays” whose behavior was governed by simple behavioral rules. In the model, the birds recached more when they were stressed, for example, by the presence of another bird, especially one more dominant in the pecking order. The model also took into account the scrub jays’ superb memories.

Van der Vaart’s simulations closely duplicated the behavior of real scrub jays. “Their model fits some of the data really well,” says psychologist Amanda Seed of the University of St. Andrews in the United Kingdom. “Even better, it provides some testable predictions,” such as that boosting birds’ stress levels should spark more recaching.

Clayton agrees that the model “provides a powerful explanation for some of the studies,” but she argues that it leaves some data unexplained, a point Heyes also makes. For example, Clayton’s team showed that “it takes a thief to know a thief”: Jays that have previously pilfered others’ caches are more likely to recache themselves. Van der Vaart’s model does not explain that result, but theory of mind could. Further experiments are needed, Clayton says, and she and the Groningen team are now discussing collaborating on them.

Van der Vaart and colleagues emphasize that they haven’t proved that scrub jays don’t have theory of mind, only that theory of mind is not necessary to produce the findings. Indeed, meeting attendees discussed at length where the burden of proof should lie: on those who claim animals have more advanced, or less advanced, cognition. “Part of me hopes they will prove the model wrong,” Van der Vaart says. “But I think it’s important to exclude as many simpler explanations as possible.”

—MICHAEL BALTER



**Cache as catch can.** Scrub jays hide food more often if they are aware that another bird has been watching them.

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