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## Wolves Demonstrate Self-Awareness in Sniff Test

Grey wolves pass an olfactory version of the mirror test for self-recognition.

Grey wolf.

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Since the 1970s, scientists have employed the mirror test as an assay of self-awareness. If an animal or child recognizes themselves in a mirror — for instance, touching a mark placed on their body by the experimenter while inspecting their reflection — they are said to possess self-awareness.

The evidence from great apes is the most compelling, though elephants, dolphins, certain species of birds, and even some fish have showed some signs of self-recognition in the mirror test. However, it is still unclear if failure to recognize oneself in a mirror confirms that an animal lacks self-awareness. The mirror test is biased toward those species that use vision as their primary sense and possess limbs capable of pointing to parts of their bodies. How could other species demonstrate that they know the difference between self and other?

Several years ago, a [new experimental approach](#) proved effective with dogs. In an [olfactory](#) version of the mirror test, [Roberto Cazzolla Gatti](#), a biologist at Tomsk State University in Russia, tested whether dogs could distinguish their own odor from that of others. Dubbed the Sniff-Test for Self-Recognition (STSR), the task involved measuring the time an animal spends investigating canisters containing their own urine versus those containing urine from another individual.

“Dogs spend less time sniffing their own sample than samples from others, but this does not prove that they are self-aware,” says Cazzolla Gatti. “It could be more that they have a sense of ‘mine-ness’ than a sense of self.”

### The Nose Knows

Cazzolla Gatti made improvements to the STSR, including additional controls, in a recent [experiment with wolves](#). The subjects were four captive grey wolves living in male-female couples in two different enclosures at the Wolf Park in Indiana.

The researchers carried out five trials of the STSR. For each trial, the wolf was presented with a randomly ordered array of three canisters, each containing an odor sample. In some trials, the experimenters “marked” a urine sample with a foreign odor (analogous to how experimenters place a mark on the body of an animal in the mirror test). The olfactory mark consisted of anise oil, an odor the wolves had probably never encountered before.

The researchers tested combinations of marked and unmarked samples from the test wolf, a familiar wolf, an unfamiliar wolf, and an unfamiliar dog, as well as the mark by itself.



Source: Jean Beaufort, via Wikimedia Commons.

In the first trial, wolves spent much more time sniffing their marked odor than their unmarked odor and showed little interest in the mark by itself. In the second trial, wolves showed the same high level of interest toward marked urine from their familiar partner wolf as they did toward their own marked urine. In the third trial, all wolves spent more time smelling the unknown samples than the known samples, with or without the mark.

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The fourth trial confirmed that wolves can distinguish their own odor from that of an unfamiliar wolf; the wolves spent less time sniffing their own odor than odors from unfamiliar wolves, still showing a higher interest in “other” odors over “self.”

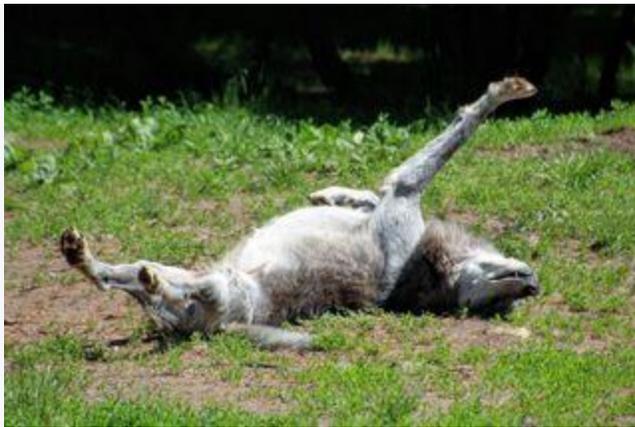
Finally, results from the fifth trial showed that even though wolves may have become familiar with the mark in the previous trials, they were still more interested in smelling the marked odors from their familiar partner than unmarked odors from themselves or their partner. Cazzolla Gatti says this shows that it is the ability to recognize self versus other, more than familiarity, that directs the wolves' sniffing behavior.

"They did not spend much time investigating the mark by itself but they spent a lot of their time sniffing the marked urine from a familiar wolf and the samples from unfamiliar animals," he says. "This means they are not just interested in something that is new to them.

"We suppose they are interested in understanding what has happened to their partner's odor. It is not only a sense of 'mine-ness;' it could be awareness of what is me and what is you."

### On a Roll

In addition to the time spent sniffing samples, Cazzolla Gatti and colleagues also measured a common post-sniffing behavior among the wolves: scent-rolling. Importantly, wolves never scent-rolled on their own unmarked urine samples; this behavior was always directed toward "other" smells.



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In the first trial, most of the wolves scent-rolled over their marked sample but never on their unmarked sample. Cazzolla Gatti suggests that this behavior may be considered analogous to mark-directed behaviors in the mirror test.

"Wolves show this behavior on smells that are not their own," he says. "If you mark their own smell, they roll on the sample."

Although its meaning is still unclear, scent-rolling over an odor seems to be a means to collect “other” smells, possibly to bring the odors back to the pack. This could explain why the wolves in this study never rolled on their own urine or their familiar partner’s urine unless it was marked with anise oil.

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Together, the results of these trials show that wolves demonstrate an awareness of differences between “me” and “you,” differentiating what is “mine” from what is “yours” and between what is “familiar” and “unfamiliar.”

When it comes to probing the capacity for self-awareness in other animals, Cazzolla Gatti says the focus on visual self-recognition is interesting but not enough, as its use is limited to certain species. He says he hopes these preliminary results will encourage other scientists to design and conduct tests in different ways, with an eye towards the sensory and behavioral strengths of the species being tested.

“If we want to understand more about the cognitive world of animals, we need to change our own minds,” he says. “We need to be more open-minded, stop thinking as humans applying our tests to other animals, and instead think about how the animals would design tests for themselves.”

#### References

Roberto Cazzolla Gatti, Alena Velichevskaya, Benjamin Gottesman & Karen Davis (2020) Grey wolf may show signs of self-awareness with the sniff test of self-recognition, *Ethology Ecology & Evolution*, DOI: 10.1080/03949370.2020.1846628.