Wolves show signs of self-cognition with innovative sniff test

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Self-awareness has been a central theme in philosophical and biological research since ancient times. In the temple of Apollo at Delphi, the exhortation "Know yourself" is inscribed in Greek, an invitation to men to understand their own finitude, to understand their limits. In "Latin in his Discourse on the Method," René Descarte wrote, "Ego cogito, ergo sum, sive existo" (I think, therefore I am, or I exist) to underline the fact that existence derives from our awareness as thinking beings capable of reflecting on ourselves.

Self-recognition (i.e., the ability to recognize oneself) has been scientifically examined by studying the behavior of animals and children in response to their reflection in the mirror, a test developed by Gordon Gallup in 1970. The basis of the test is that the subject who understands the concepts of "self" and "other" is able to distinguish between the two entities and, therefore, to recognize himself in the reflection. The most interesting result deriving from the confirmation of self-awareness is that, on the basis of this capacity for self-awareness, other behavioral traits can be deduced such as empathy, for example.

In fact, the ability to differentiate from others is often considered a fundamental prerequisite for understanding that the other can be happy or sad despite the fact that the observer is not. However, the idea behind this test, which is that understanding the concepts of "self" and "other" is proof of self-awareness, has been contested several times. According to Carl Safina, for example, it is still unclear whether animals that do not recognize their reflection in the mirror are not truly self-aware. On the other hand, the ability to recognize one's own image is ascertained, in the test proposed by Gallup, only when the individual touches a marked part of his body (for example, a red mark on the forehead) and is, therefore, limited to those species that use vision as their main sensory approach and possess limbs capable of touching specific parts of their body.

Thus, until now, only great apes (including, of course, humans) have shown extremely compelling evidence of self-recognition in the mirror, even though at least one elephant and two dolphins have spontaneously used the mirror to touch or inspect the sign on their body. Nonetheless, some species of birds, fish and ants have provided signals, although not definitive, of self-recognition in the mirror test.

Dogs and wolves show a high level of behavioral and cognitive complexity, as well as primates, dolphins and elephants. Yet, during the numerous mirror tests carried out to date, dogs have shown no interest in the reflected image, and usually prefer to smell or urinate around the mirror as if it were any random element present in the environment. Yet, as early as 2001, the well-known ethologist Marc Bekoff observed that there were hints of self-recognition in species that are evolutionarily distant from primates such as dogs.

In a 2016 scientific paper, Prof. Roberto Cazzolla Gatti of the Tomsk State University in Russia proposed a new experimental approach and a new
olfactory test (the Sniff-Test for Self-Recognition, STSR), which shed light on different ways to test animal self-consciousness and reopened the discussion on self-awareness. The article was published in the journal *Ethology, Ecology and Evolution* with a title borrowed from the famous novel by Lewis Carroll: "Self-consciousness: beyond the looking-glass and what dogs found there." ([Ethology Ecology & Evolution, 28[2], 232-240, 2016](https://doi.org/10.1111/1365-2524.12232)).

Then, prof. Cazzolla Gatti, in collaboration with American and Russian colleagues of the Tomsk State University, Purdue University and Konrad Lorenz Institute for Evolution and Cognition Research, applied this sniff test to a group of four captive grey wolves living in male-female couples in two enclosures at the Wolf Park in Indiana, U.S. In this preliminary study, wolves showed some signs of the ability to recognize themselves through the "olfactory mirror" and exhibited some clues of mark-directed responses, particularly scent-rolling, which may shed more light on this still unclear behavior and represent a sort of olfactory equivalent to passing the original mirror test. ([The results of this new research have just been published in the scientific journal Ethology Ecology & Evolution.](https://doi.org/10.1111/1365-2524.12232))

The team of biologists, Roberto Cazzolla Gatti, Alena Velichevskaya, Benjamin Gottesman and Karen Davis, carried out a five-trial sniff test for the self-recognition with wolves. The study's authors recorded the increased time spent investigating urine samples of other wolves instead of their own, confirming the evidence of self-awareness provided by dogs, and the greater interest in the smells of wolves and other canids not belonging to their social group or pair. ([Videos are available here.](https://doi.org/10.1111/1365-2524.12232))

Moreover, they also documented an omnipresent behavior in wolves: scent rolling behavior on unmarked "other" smells, just like the behavior shown by dogs rolling on a dead pigeon in a park, for instance, or on the excrement left by other animals, which disgusts even the most "ethological" of human companions. This behavior appears to be a relevant sign that the animals tested (wolves, in this case) have self-awareness.

In fact, if the odoriferous marker (the anise oil used in the experiment) had been the only element to attract the interest of the wolves, they would not have had to roll over the urine of a dog or of the unmarked non-partner wolves. Furthermore, the wolves in the experiment have never shown rolling behavior on samples containing their own urine during testing, showing that they are well aware of their own smells and of that of "others" they want to collect (or cover) in their environment.

Prof. Roberto Cazzolla Gatti says, "It seems reasonable to think that in an olfactory test, this behavior may represent an action analogous to the touch of the colored sign after observation in the mirror in which a 'hands-free' animal, after having smelled the containers, manifest awareness in discerning between itself and others."

Scent-rolling is still unclear behavior. However, there is a suspicion that wolves and other predators are depositing their own scent rather than picking up some of it by scent-rolling and that this is a way of bringing information about where they have been to the rest of the pack. This seems to suggest a social function for odor rolling and could explain why the wolves tested in the study never rolled on their own or their partner's urine unless it was modified with the marker odor of anise oil. The authors write, "The fact that, in our study, wolves not only rolled on marked urine but also rolled on unmarked odors of non-partner wolves or other canids, could be confirmation that this behavior does have multiple functions: mimetic, social and identity ones."

In any case, wolves seem perfectly capable of recognizing something that is "not themselves, unfamiliar and not belonging to their social group"—in other words, they demonstrate that they are aware of a distinction between "I" and "you," as well as differentiating what is "mine" from what is "yours" and between what is "familiar" from what is "unfamiliar." In other words, they can think about themselves and use their own experience to reason about comparable experiences made by others.

"The innovative approach to test self-awareness with a smell test highlights the need to shift the paradigm of the anthropocentric idea of consciousness into a specific perspective for each
species," says Prof. Cazzolla Gatti. "After self-awareness that we previously documented in dogs and these new signs showed by wolves, we now have even stronger empirical evidence to suggest that species that are different and evolutionarily distant from primates can be tested using chemical or auditory perception. These new self-recognition tests have already provided significant evidence of self-awareness in some canids and should be applied to other species, because they can play a key role in demonstrating that this cognitive ability is quite widespread among animals."


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