# For the first time, monkeys recognize themselves in the mirror, indicating self-awareness (w/ Video)

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In the lab of Luis Populin, University of Wisconsin-Madison professor of anatomy, a rhesus macaque monkey stares at himself in a mirror, as the first demonstration that any monkey has a degree of self-awareness. Photo: courtesy Luis Populin

Typically, monkeys don't know what to make of a mirror. They may ignore it or interpret their reflection as another, invading monkey, but they don't recognize the reflection as their own image. Chimpanzees and people pass this "mark" test — they obviously recognize their own reflection and make funny faces, look at a temporary mark that the scientists have placed on their face or wonder how they got so old and grey.

For 40 years, scientists have concluded from this type of behavior that a few species are self-aware — they recognize the boundaries between themselves and the physical world.

Because chimps, our closest relatives, pass the test, while almost all other primate species fail it, scientists began to discuss a "cognitive divide" between the highest primates and the rest.

But a study published today (Sept. 29) by Luis Populin, a professor of anatomy at the University of Wisconsin-Madison, shows that under specific conditions, a rhesus macaque monkey that normally would fail the mark test can still recognize itself in the mirror and perform actions that scientists would expect from animals that are self-aware.

The finding casts doubt on both the relevance of the mark test and on the existence of a definitive cognitive divide between higher and lower primates.

Populin, who studies the neural basis of perception and behavior, had placed head implants on two rhesus macaque monkeys, while preparing to study attention deficit disorder. Then Abigail Rajala, an experienced animal technician who is in the university's Neuroscience Training Program, mentioned that one of the monkeys could recognize himself in a small mirror. "I told her the scientific literature says they can't do this," says Populin, "so we decided to do a simple study."

Much to his delight, it turned out that the graduate student was right.

In the standard mark test, a harmless mark is put on the animal's face, where it can only be seen in a mirror. If the animal stares at the mirror and touches the mark, it is said to be self-aware: It knows that the mirror shows its own reflection, not that of another animal. (Animals that lack self-awareness may, for example, search for the "invading" animal

behind the mirror.)

Rhesus macaques, a mainstay of medical and psychological research, have long failed the mark test.

But in Populin's lab, the monkeys that got the implants were clearly looking in the mirror while examining and grooming their foreheads, near the implant. Tellingly, they were also examining areas on their body, particularly the genitals, that they had never seen before. In some cases, the monkeys even turned themselves upside down during these examinations. In other cases, they grasped and adjusted the mirror to get a better view of themselves.

When the researchers covered the mirror glass with black plastic, these behaviors disappeared, and the monkeys ignored what had been a subject of fascination.

Furthermore, although a macaque will often interpret its reflection as representing an intruding monkey and adopt either an aggressive or submissive response, the implanted monkeys showed dramatically fewer of those "social" behaviors compared to the behaviors, such as exploring hidden body parts, that indicate self-awareness, Populin says.

"This report makes a unique contribution to our views about primate self-awareness because the 'mirror test' has been the traditional gold standard for determining if a person and/or animal met a criterion for having a sense of self," says Christopher Coe, a primatologist and professor of psychology at UW-Madison. "If a young child, brain-damaged adult or animal was able to recognize and appreciate that the image in the reflection was really them, then it was interpreted as proof of being aware."

Thus, Coe says, "If we follow that logic through with the belief that

mirror recognition is proof of a sense of self, then we need to extend that attribute at least to rhesus monkeys."

Scientists who have used the mark test to explore self-awareness have found the quality in one species of bird, in one individual elephant, and in dolphins and orangutans. And so instead of asking how self-awareness evolved only among primates, they face the larger question of how it evolved multiple times in distantly related species.

The study may refine how the mark test is used, Populin says. "We clearly have data showing that these animals recognize themselves in the mirror, but fail the mark test."

The mounting data on self-awareness has undermined the concept of a cognitive divide in the primate lineage, Populin says. "There is another idea in primatology, and Charles Snowdon of UW-Madison has contributed to this, that instead of a divide, self-awareness has evolved along a continuum, so we will find it in different forms in different locations on the tree of evolution. I think the mark test may not be sensitive enough to detect self-awareness in the lower species; they may have it, but in a different form, and it may show up in different situations, using different tests."

**More information:** The study, with several videos of the monkeys, appears in today's *PLoS One*, at dx.plos.org/10.1371/journal.pone.0012865

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https://phys.org/news/2010-09-monkeys-mirror-indicating-self-awareness-video.html