OBSERVATORY

The Elephant in the Mirror

By HENRY FOUNTAIN
Published: October 31, 2006

SIGN IN TO E-MAIL THIS
PRINT
REPRINTS
SAVE

For those who study the development of intelligence in the animal kingdom, self-awareness is an important measurement. An animal that is aware of itself has a high level of cognitive ability.

Enlarge This Image

Chris Gash

Awareness can be tested by studying whether the animal recognizes itself in a mirror. Many animals fail this exercise miserably, paying scant attention to the reflected image. Only humans, apes and, more recently, dolphins, have been shown to recognize that the image in the mirror is of themselves.

Now another animal has joined the club. In The Proceedings of the National Academy of Sciences, researchers report that an Asian elephant has passed the mirror self-recognition test.

"We thought that elephants were the next important candidate," said Diana Reiss of the Wildlife Conservation Society, an author of the study with Joshua M. Plotnik and Frans B. M. de Waal of Emory University. With their large, complex brains, empathetic and altruistic behavior and elaborate social organization, Dr. Reiss said, elephants "seemed like cognitive cousins to apes and dolphins."

The researchers tested Happy, Maxine and Patty, three females at the Bronx Zoo, where the conservation society is based. They put an eight-foot-square mirror on a wall of the animals' play area (out of view of zoo visitors) and recorded what happened with video cameras, including one embedded in the mirror.

The elephants exhibited behavior typical of other self-aware animals. They checked out the mirror, in some cases using their trunks to explore what was behind it, and used it to examine parts of their bodies.

Of the three, Happy then passed the critical test, in which a visible mark was painted on one side of her face. She could only tell the mark was there by looking in the mirror, and she used the mirror to touch the mark with her trunk.

Dr. Reiss said it was not unusual that only one of the three elephants passed this test; with other self-aware species, large numbers of individuals don't pass the test either.

But the result with Happy, she said, is a "beautiful case of cognitive convergence" with other self-aware animals. "We knew elephants were intelligent, but now we can talk about their intelligence in a more specific way."

Multimedia

Video
Mirror, Mirror

Related

More Observatory Columns »

Web Links

Self-recognition In an Asian Elephant (PNAS)

Rare Earth Nanoparticles Prevent Retinal Degeneration Induced by Intracellular Peroxides (Nature Nanotechnology)

Comparing the Rheology of Native Spider and Silkworm Spinning Dope (Nature Material)

A Lamprey From the Devonian Period of South Africa (Nature)

The Trouble With Photons

Photoreceptor cells in the retina are bombarded with photons — their job, after all, is to convert light to signals that the brain can understand.

But this constant rain of photons causes problems, too. Photoreceptor cells are highly oxygenated, and the combination of high oxidation and all those photons produces peroxides and other reactive

Next Article in Science (4 of 6) »

MOST POPULAR

E-MAILED | BLOGGED | SEARCHED

1. One for the Ages: A Prescription That May Extend Life
2. Translating Virgil's Epic Poem of Empire
3. What Do Women Want? Just Ask
4. Books on Science: An Evolutionary Theory of Right and Wrong
5. The Media Equation: American Tragedies, to Sell Trucks
6. In Boulder, Runners Gather in Guarded Isolation
7. The Energy Challenge: Budgets Falling in Race to Fight Global Warming
8. For a World of Woes, We Blame Cookie Monsters
9. Trained by Inmates, New Best Friends for Disabled Veterans
10. U.S. Drops Bid Over Royalties From Chevron

Go to Complete List »

oxygen intermediates, or R.O.I.'s, which can cause the cells to die. These intermediate compounds have been suspected in certain eye diseases, including macular degeneration.

What if there was a substance that could be put into the eye to consume these R.O.I.'s? Junping Chen of the University of Oklahoma and colleagues have found a candidate, from the automotive and jewelry industries.

The substance, they report in the journal Nature Nanotechnology, is cerium oxide, tiny particles of which are made from the rare-earth element cerium. Known as nanoceria particles, they are currently used in the catalytic converters that are part of automobile exhaust systems and in jewelry polishing.

The researchers incubated rat retinal cells with the particles and found that they prevented increased production of R.O.I.'s. They also injected the particles into the retinas of albino rats with damaged photoreceptors and found that they helped prevent loss of vision.

The researchers say that they are not sure exactly why nanoceria particles scavenge R.O.I.'s but that with more research they may prove useful in treating eye diseases involving photoreceptor damage. And since R.O.I.'s are thought to be partly responsible for other degenerative diseases including diabetes, the researchers suggest that nanoceria particles should be investigated for use in treating those diseases as well.

The Nature of Silk

While chemists and other researchers have made plenty of synthetic fibers over the last 150 years, they've never been able to replicate spider silk, among the toughest fibers around.

A spider makes its silk by extruding the raw material, or feedstock, a process that separates out the water, orients the proteins and other molecules, and binds the whole thing together into a thread. To truly replicate silk, scientists would have to replicate this process, and it is not fully understood.

Work by Fritz Vollrath of Oxford and colleagues may help with the understanding. In a study in the journal Nature Materials, they report on the flow characteristics of spider silk feedstock.

The researchers actually studied both the raw material that spiders use to make their draglines and the raw material that silkworms spin to make their cocoons. They found that characteristics of the feedstocks relating to viscosity, elasticity and shearing forces were very similar for both types of silk.

That alone is remarkable, since production of spider silk and silkworm silk evolved independently, hundreds of millions of years apart.

But from the standpoint of replicating silk, the most important finding is that these silk feedstocks behave in ways that are very similar to "polymer melts," which are used to make synthetic fibers and resins. "This observation," the researchers say, "opens the door to using polymer theory to clarify our general understanding of natural silks."

The Earliest Known Lamprey

Scientists have found by far the earliest fossil of a lamprey, showing that the jawless fish's basic parasitic approach — using its teeth to attach itself to another fish for feeding — has existed for hundreds of millions of years.

The fossil, of a lamprey less than two inches long, was found in South Africa and is described in the journal Nature by Robert W. Gess of the University of Witwatersrand in Johannesburg and colleagues. It dates from the Late Devonian period, some 360 million years ago.

Very few fossil lampreys have been found, and this one is the first in which teeth have been discovered. Those teeth and a large oral disc are indications that back then the lamprey had already developed specialized features that have been passed down to the present day.

Next Article in Science (4 of 6) »