ScienceWatch – Planning Ahead

In the last 500 years science has drastically changed our view of ourselves and the universe. It's been humbling. The Copernican heliocentric theory, backed later by Galileo's observations, deflated our ego by showing us that the earth (and by extension, humans) was not the center of the universe. Darwin's theory of evolution through natural selection told us we were not specially created, while Freud showed us that often we are not even conscious of what drives us to act in certain ways.

Nevertheless, at college we were taught humans were still special in other ways. We use tools. We have language and culture. We are self-aware, empathetic and altruistic. But one by one our presumed monopoly on these traits has been shattered by finding them in other species. For example, birds and apes use tools, dolphins have language, monkeys have culture, apes are self-aware, and elephants are empathetic. Even the lowly ant is altruistic. What's left for us to call our own?

Taking the car keys or umbrella when we leave home is a complex behavior, requiring forethought, and sociologists tell us it is exclusive to humans. While other species may appear to plan for future needs, e.g., caching food or building nests, these activities are unlearned, instinctive acts with strong genetic determinants within all members of the species and do not require foresight. However, a recent study has provided another pinprick to deflate our overblown sense of uniqueness by demonstrating that great apes have the foresight to plan ahead.

Writing in the May 19, 2006 issue of the journal *Science*, Nicholas Mulcahy and Josep Call at the Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany, show that apes can save tools for future use. The researchers designed an experiment to see whether apes would do what is akin to taking the car keys when leaving home. First they allowed five bonobos and five orangutans to learn how to use a tool to get a reward (grapes) from an apparatus in a "test room". Later each ape was led back to the test room where the baited apparatus was now blocked by clear plexiglass, and several suitable and unsuitable tools were strewn on the floor. After allowing the ape five minutes to assess the situation, it was led from the test room to an adjacent "waiting room" and all the tools in the test room were removed while the ape watched through a window. One hour later, the ape was led back into the test room with the apparatus now accessible but absent tools. If it had taken the right tool with it, it could obtain the reward. Thus, to solve the problem, the ape had to carry a suitable tool from the test room into the waiting room, wait one hour, and bring it back into the test room.

Of the three apes of each species tested, all got it right by the seventh trial, and three figured it out on the first trial. All in all the six apes left the test room with a tool 70% of the time, and in three-quarters of those instances it was a suitable tool.

The next experiment was the same as the first, but the waiting period was extended to overnight (14 hours), and the apes slept in the waiting room. One ape of each species was tested. Neither got it right the first time, but the orangutan took a suitable tool in all

11 of the remaining trials and used it to get the reward in seven of those. The bonobo took a suitable tool in eight of the remaining 11 trials and always brought it back to obtain the reward in the testing room, yielding an overall success rate of 63%.

Lastly, an experiment was performed to test whether apes took tools specifically for future use or simply because tools were associated with food. In this case two bonobos and two orangutans learned to use a tool (hook) to get a reward (juice bottle) in the test room. Later they were presented with the hook and several unsuitable tools but in the absence of the juice bottle. They were then taken to the waiting room and after an hour were ushered back into the test room. Now the test room contained no juice, but if the ape brought the hook back it got a reward. Tool saving was now much less prevalent. Only two apes were successful. They brought the hook back in seven of 64 trials or only 11% of the time.

These experiments show that the apes preferentially selected and saved a tool when it was needed for future use, a clear demonstration of foresight. Moreover, both bonobos and orangutans were equally successful. The latter diverged from our hominid ancestors about 2 million years ago, the former 14 million years ago, which is early on in the divergence of the great ape species. This suggests that foresight ought to be a trait shared by all hominids and perhaps even other branches of the evolutionary tree if we search for it.

Meanwhile, if the forecast is for rain tomorrow, remember to take that umbrella!

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