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For Human Eyes Only

By MICHAEL TOMASELLO

COL. WILLIAM PRESCOTT is said to have prepared his troops for a charge from the British Army at the Battle of Bunker Hill by telling his men, "Don't one of you fire until you see the whites of their eyes."

If the opposing army had not been British men but rather a horde of charging chimpanzees, the American troops would have been summarily overrun. Why? Because neither chimpanzees nor any of the other 220 species of nonhuman primates have whites of the eyes, at least not that can be easily seen. This means that if their eyes are looking in a direction other than the one in which their heads are pointing, we can easily be fooled about what they are looking at.

Why should humans be so different? And yet we are. We can't fool anyone. The whites of our eyes are several times larger than those of other primates, which makes it much easier to see where the eyes, as opposed to the head, are pointed. Trying to explain this trait leads us into one of the deepest and most controversial topics in the modern study of human evolution: the evolution of cooperation.

The idea is simple. Knowing what another person is looking at provides valuable information about what she is thinking and feeling, and what she might do next. Even young children know that when a person is looking at one toy and not another, she most likely prefers that toy and may reach for it. Professional poker players are often so worried about others reading their minds by reading their eyes that they wear sunglasses.

Evolutionarily, it is easy to see why it is to your advantage to be able to tell with maximum certainty where I am looking. You may use this information to detect food you wouldn't otherwise have seen, or to detect the dominant male approaching in a fighting mood.

But evolution cannot select the color of my eyes based on advantages to you. Evolutionary theory tells us that, in general, the only individuals who are around today are those whose ancestors did things that were beneficial to their own survival and reproduction. If I have eyes whose direction is especially easy to follow, it must be of some advantage to me.

If I am, in effect, advertising the direction of my eyes, I must be in a social environment full of others who are not often inclined to take advantage of this to my detriment -- by, say, beating me to the food or escaping aggression before me. Indeed, I must be in a cooperative social environment in which others following the direction of my eyes somehow benefits me.

Of course, it's possible that having large whites of the eyes serves some other purpose, like enabling me to advertise my good health to potential mates. But such an advantage would apply to other primates as well. Cooperation, on the other hand, singles out humans, as humans coordinate activities to do such things as construct buildings, create social institutions and even, paradoxically, organize armies for war.

In a recent experiment, our research team has shown that even infants -- at around their first birthdays, before language acquisition has begun -- tend to follow the direction of another person's eyes, not their heads. Thus, when an adult looked to the ceiling with her eyes only, head remaining straight ahead, infants looked to the ceiling in turn. However, when the adult closed her eyes and pointed her head to the ceiling, infants did not very often follow.

Our nearest primate relatives, the African great apes (chimpanzees, bonobos and gorillas) showed precisely the opposite pattern of gaze following. When the human pointed her eyes only to the ceiling (head remaining straight ahead), they followed only rarely. But when she pointed her head only (eyes closed) to the ceiling, they followed much more often.

It has been repeatedly demonstrated that all great apes, including humans, follow the gaze direction of others. But in previous studies the head and eyes were always pointed in the same direction. Only when we made the head and eyes point in different directions did we find a species difference: humans are sensitive to the direction of the eyes specifically in a way that our nearest primate relatives are not. This is the first demonstration of an actual behavioral function for humans' uniquely visible eyes.

Why might it have been advantageous for some early humans to advertise their eye direction in a way that enabled others to determine what they were looking at more easily? One possible answer, what we have called the cooperative eye hypothesis, is that especially visible eyes made it easier to coordinate close-range collaborative activities in which discerning where the other was looking and perhaps what she was planning, benefited both participants.

If we are gathering berries to share, with one of us pulling down a branch and the other harvesting the fruit, it would be useful -- especially before language evolved -- for us to coordinate our activities and communicate our plans, using our eyes and perhaps other visually based gestures.

Infant research, too, suggests that coordinating visual attention may have provided the foundation for the evolution of human language. Babies begin to acquire language through joint activities with others, in which both parties are focused on the same object or task. That's the best time for an infant to learn the word for the object or activity in question.

We are still a long way from figuring out why humans evolved to do so many complicated things together -- from building houses to creating universities to fighting wars. But the simple fact that we have evolved highly visible eyes, to which infants attune even before language, supplies at least one small piece of the puzzle of how.

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