What makes human culture unique from culture of other animals?

Philip Guelpa
26 December 2024

Human beings are animals, evolved from ancestral great apes. We are part of nature and yet unique in many ways.

It was once thought that humans were the only animals with culture: the learned rather than genetically determined behavior that is passed on from one generation to the next and is subject to modification. Many decades of research have revealed, however, that a number of other species of animals also have culture, notably other primates and corvids (crows). Nevertheless, human culture is clearly qualitatively distinct from all others. We rely on highly complex cultural inheritance for our very survival. What accounts for this difference? Is it merely a matter of degree or is there something unique about human culture?

Researchers Thomas J. H. Morgan, Arizona State University, and Marcus W. Feldman, Stanford University, have addressed this issue and proposed a new hypothesis, presented in a paper published in the journal *Nature Human Behavior*, titled, "Human culture is uniquely open-ended rather than uniquely cumulative" (November 7, 2024).

Chimpanzees learn to use tools. For example, they strip leaves from small twigs and then insert them into termite mounds to extract and eat the clinging insects. This behavior is not instinctive (i.e., genetically determined) but learned by observing the actions of other chimps. Monkeys and chimps have been observed to use hammer and anvil techniques to crack open nuts. Young carnivores are taught to hunt by their parents, etc.

These and many other behaviors of a variety of animal species are learned by observing other members of that species carrying out the given activity. The ability to learn is genetically inherited, but not the specific behaviors. However, these behaviors are of a limited nature. Change occurs slowly and not intentionally.

The authors of the new study first identify and evaluate two existing hypotheses regarding the distinct nature of human culture. The first is that human culture is cumulative, knowledge is built upon from one generation to the next and, thereby, increases in complexity. Non-human animals' cultural knowledge is relatively stagnant.

The second hypothesis "identifies our capacity for stable, high-fidelity transmission as the enabling cognitive factor behind cumulative cultural change." This is based on "imitation, teaching and language." Other animals have transmission limited to imitation and teaching, resulting in a much lower level of fidelity (i.e., accuracy), or to extend the metaphor, too much "noise." Intentional teaching through the use of language greatly increases both the accuracy and complexity of the information being conveyed. However, the authors contend that this is insufficient to explain the unique characteristics of human culture.

They then review seven other explanations that may underlie the distinctive character of human culture that are found in a variety of animal species, even in some invertebrates. These include: the inheritance of acquired characteristics, the pathways of inheritance, the non-random generation of variation, the scope of heritable variation, effects on organism fitness, effects on genetic fitness and effects on evolutionary dynamics. But after study, none of these are found to be unique to humans.

Instead, the authors of the present study propose that human culture is distinctive for its "open-endedness." In contrast to all other animals, humans have the ability to learn and execute complex sequences of steps to

accomplish an ultimate goal. These steps or subgoals are “modular” in the sense that they can be employed individually to accomplish a number of different tasks. Furthermore, they can be creatively recombined in novel sequences to meet new needs.

This is evident, for example, with respect to language, which can be employed very fluidly to accommodate and adapt to a wide range of factors. Though the authors do not specifically refer to this, the basis of this flexibility lies in the nature of language itself, that is, the mechanism of thought by which actions and phenomena in the external world are abstracted into mental symbols or ideas. This allows ideas to be manipulated and applied in new ways to situations distinct from those from which they were originally derived, in the same way as words can be combined to make new sentences which in turn can be combined into novel paragraphs, and so to express things that did not previously exist.

Behaviors such as using sticks to fish termites out of their mounds by chimpanzees are highly specific, involving only a very limited number of individual actions (selecting a suitable stick, stripping off any leaves, and inserting it into the mound), and are evidently not transferable to other uses. Attempts to teach chimps and gorillas more complex sequences of tool manufacture or human language have met with limited success. By contrast, humans have the ability to conceive of behavioral modules as abstractions which can be mentally manipulated and recombined almost without limit, enabling them to address new phenomena and novel situations. This is what the authors term open-endedness. Of course, the efficacy of these mental constructs is subject to a dialectical process of interaction. They have to be tested and refined or discarded in real-world applications.

The development of such behavioral complexity can be traced archaeologically in the evolution of stone tool technology from the simplest Oldowan (2.9 to 1.7 million years ago) and beyond. At each stage, the number and variety of manufacturing steps and production techniques to produce increasingly specialized tools grew, with greater flexibility and innovation in the process.

In addition, because of the ability to use language, human culture is subject to a high degree of horizontal transmission. In other words, not only can it be passed from one generation to the next (i.e., from parent to child or vertical transmission) but shared contemporaneously with other members of the group, horizontal transmission. This expands the number of individuals who can come up with novel combinations of behaviors and thus increases the potential to solve new problems.

An even more recently published study amplifies and adds complexity to the Morgan and Feldman study. In “Nonadjacent dependencies and sequential structure of chimpanzee action during a natural tool-use task” (*PeerJ*, December 5, 2024), Elliot Howard-Spink and colleagues utilized data from a decades-long database of video footage depicting wild chimpanzees in the Bossou forest, Guinea, where chimps were recorded cracking hard-shelled nuts using a hammer and anvil stones. The researchers observed a total of 8 chimpanzees ranging in age from 6 to 60 years encompassing 3,882 nut-cracking attempts. These involved multiple individual actions. Among these were “grab,” “pour,” “turn,” and “spill.”

They found that in about half the cases involving adult chimpanzees, the task involved multiple actions arranged in an extended hierarchy, sometimes separated in time, similar to the types of organization employed by humans. They observed that this complex level of behavior occurred only among half of the observed individuals. That this difference did not improve with time suggests that the cognitive ability for hierarchical structuring of labor tasks is not an essential aspect of chimpanzee adaptation.

It is not surprising that that our closest evolutionary relatives—chimpanzees—possess at least the beginnings of the mental capacity that underlies human cultural uniqueness. This ability, at least at a rudimentary level, would appear to have existed in the last common ancestor of humans and chimps. Evolution usually works on existing “raw material.” It rarely starts from scratch. The next big question is how did the capacity for open-endedness expand so tremendously among humans but remain at a low level among chimpanzees?