BEHAVIOR

Who Are More Helpful, Humans or Chimpanzees?

Humans, including infants, are more willing than closely-related chimpanzees to cooperate and behave altruistically and cooperatively, probably in part accounting for their evolutionary success.

Joan B. Silk

Do you hold the door for shoppers laden with packages? If you received two copies of the latest issue of *Science* in the mail, would you give the extra one to a colleague or throw it in the recycling bin? Do you make donations to charity, serve on departmental committees, recycle bottles, or donate blood? If you are like most people, you help in these sorts of situations and are motivated by empathy and concern for the welfare of others (*1*). Two reports by Melis *et al*. on page 1297 (*2*) and Warneken and Tomasello on page 1301 (*3*) of this week's issue contribute to understanding how we came to be such caring and cooperative creatures.

Evolutionary theory predicts that altruistic interactions, which are costly to the actor and beneficial to the recipient, will be limited to kin or reciprocating partners. This precludes anonymous acts of altruism on behalf of strangers, such as giving blood, or large-scale cooperation, such as serving on committees. Cooperation is equally perplexing to economists whose theorems are based on the principle of maximizing profit and self-interest, not concern for the welfare of others. Evolutionary theory and economic models provide a comfortable fit for the behavior of other animals (*4*, *5*), including other highly social and intelligent members of the primate order (*6*), but humans stand out as a puzzling anomaly (*1*).

This raises two questions: Why do humans cooperate so much? And what limits the extent of cooperation in other animals? While evolutionary social scientists struggle with the first question, primatologists are beginning to tackle the second. Much of this work focuses on chimpanzees. Chimpanzees participate in a variety of collective activities in the wild, but we can't say much about the motives underlying cooperation or the factors that prevent them from cooperating more in the wild. So researchers have headed into the laboratory to probe the capacity and motivation for cooperation.

To cooperate effectively, individuals must know what needs to be done and be willing to do it. Experimental efforts to induce nonhuman primates (capuchins, tamarins, and chimpanzees) to work together in joint tasks have met with mixed success. But it is not clear whether collaborative failures occurred because animals didn't understand how to solve the tasks (*7*) or because they were inhibited by the presence of competitors who monopolized the apparatus and appropriated rewards (*8*–*10*).

Work with me. A female chimpanzee fishes for termites while her infant sits on her shoulders. Tolerance during feeding enhances the effectiveness for cooperation in joint tasks involving food rewards.

Two sets of experiments conducted by researchers at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany (*2*, *11*) provide compelling evidence that chimpanzees collaborate effectively under appropriate conditions. In one set of experiments (*11*), bowls of food were attached to a platform outside the testing room. A rope was threaded through the platform so that it could be pulled forward only if two chimpanzees pulled on the ends of the rope at the same time. Pairs of chimpanzees that got along well in other settings quickly learned to solve this task together, but chimpanzees paired with less preferred partners were much less successful. The same apparatus was used in another set of experiments (*2*), but with one chimpanzee placed in the testing room and the other in an adjoining room. The chimpanzee in the testing room could admit the other by removing a key that locked the door between the two rooms. First, Melis and her colleagues manipulated the need for collaboration by varying the distance between the ends of the rope threaded through the platform. A chimp was more likely to recruit an assistant when the rope ends were too far apart to be pulled at the same time by one individual. Second, the chimps were allowed to choose between two potential collaborators who differed in their effectiveness in the task. Initially, the chimpanzees did not discriminate between the two assistants, but they came to show a strong preference for the more effective helper.

Both of these experiments indicate that chimpanzees can work together effectively when they profit directly. But humans also provide help when they don't benefit themselves. Warneken and Tomasello suggest that human helpfulness emerges at infancy. The authors presented 18-month-old children with situations in which an adult was trying to perform an everyday task (e.g., reaching for a marker or stacking books). In control trials, no help was needed by the adult. On the majority of tasks, children were more likely to perform the appropriate act (respond to others' needs) when help was needed than in the control condition, and they did so without prompting. These data complement findings that by 15 months of age, infants have some understanding of others' mental states (*12*) and respond to others' distress (*13*).

Warneken and Tomasello also presented three 3- to 4.5-year-old human-reared chimpanzee infants with similar tasks and scenarios. The chimpanzees regularly responded when tasks required reaching, but not in tasks that required other types of assistance, perhaps because they more readily grasped the intended goal in the reaching task than in the other tasks.

Although it is tempting to conclude that the responses of human and chimpanzee infants in these experiments were motivated by empathy, other experiments suggest that chimpanzees are not consistently motivated by concern for the welfare of others. In experiments conducted by two independent research groups at three different research facilities, adult chimpanzees were offered the opportunity to provide rewards to others at no cost to themselves (*14*, *15*). One chimpanzee (the actor) was offered a choice between two options: One option (A) delivered a food reward only to the actor, and the other (B) delivered a reward to the actor, as well as to a familiar group member. Experimenters also included a control condition in which the actor was offered the same options when no other chimpanzee was present. If chimpanzees were concerned about the welfare of others, they would prefer option A. If chimpanzees were indifferent about the welfare of others, they would choose between the two options at random. In both studies, actors were just as likely to

The author is in the Department of Anthropology, University of California, Los Angeles, CA 90095, USA. E-mail: jsilk@anthro.ucla.edu

choose option B when they were alone as they were when another chimpanzee was present.

The chimpanzees' responses in these two sets of experiments were equivalent to flipping a coin to decide whether to toss out that extra copy of *Science*. Human children behave quite differently. When 3- to 5-year-olds were offered a choice between a sticker for themselves and a sticker for the experimenter, or just one sticker for themselves, they overwhelmingly chose the prosocial option (*16*).

It's not clear why chimpanzee infants were helpful to humans, but older chimpanzees did not help other chimpanzees obtain food rewards even when there was no cost in doing so. These studies will no doubt fuel debate about which best captures the essence of chimpanzee cooperation. We can hope that the creative approach of the Leipzig research teams will inspire new experiments to address the arguments.

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ANTHROPOLOGY

An Example of Preclassic Mayan Writing?

Archaeological discoveries at San Bartolo, Guatemala, have provided a rich trove of information about Maya culture. Painted hieroglyphs in an early temple at this site suggest that Mayan writing had developed by 200 to 300 B.C.

Stephen D. Houston

San Bartolo, in remote northeastern Guatemala, has been the site of several stunning discoveries from ancient Maya civilization. The news agency Notimex (*1*), however, insists that the finds represent a modest discovery, a product of media "diffusion and financial support" from "foreign money." Most scholars would politely disagree. With the San Bartolo murals, and the text now reported by Saturno *et al.* on page 1281 of this issue (*2*), Maya archaeology of Mexico and northern Central America enters a period of renewed focus on the mental and religious life of the late Preclassic period, a time from ~300 B.C. to 100 A.D. As a scientific discipline, the field will be marked by a time before the discovery of these paintings in the jungle of Guatemala, and a time thereafter.

For much of the 20th century scholars have known that the Preclassic was a time of monumental construction, immense stucco masks, and fragmentary remains of wall paintings. But, to quote Winston Churchill in another circumstance, the period offered a riddle wrapped in a mystery inside an enigma. The historical and dynastic detail of the later, Classic period, from ~250 to 850 A.D., seemed undetectable, with the courtly life of the Classic invisible or inferred at best. This has not changed. The shimmer of kings and their doings remains hazy for much of the Preclassic period. What the San Bartolo paintings do is to highlight as never before the inventory of godly narrative from a remote time (see the figure). They confirm the resilience of those ideas over more than a millennium.

The excavation of a small text, in deposits securely dated to 200 to 300 B.C., thrusts San Bartolo into another kind of prominence. As pointed out by Saturno and his coauthors (*2*), the painted block with 10 hieroglyphs forms part of a longer sequence, perhaps in pieces still waiting in this layer behind the mural room. Their content is, as with many Preclassic texts in Mesoamerica, hard to discern. There may be a glyph for "lord," another for "scribe," with a human hand clutching a brush, even a "split sky" sign that resembles later dynastic titles for the kingdoms of El Zotz, Guatemala, and Yaxchilan, Mexico. Yet these are speculative identifications. The authors are correct to stress the opaque nature of early Maya writing and the San Bartolo block. In fact, the opacity itself poses a question: Why is Preclassic script so discontinuous with later, more legible inscriptions? One answer might be that collapse of Preclassic society in the second century A.D. ruptured scribal training along with other features of ancient society. A growing theme in research is the perception that the Maya writing experienced multiple shifts, to the extent that it is best viewed as a writing tradition or a set of historical practices. Maya script is not a unitary system of writing that remains fixed from earliest times.

As a result, the text from San Bartolo commands attention less because of what it records, than because of its striking date and sophistication. The glyphs are hardly the work of a neophyte or an inventive genius from antiquity. The sure execution and balancing of brush width indicate several centuries of prior development, suggesting a set of evidence that awaits discov-

Maya murals. Reproduction of accession scene, West Wall, San Bartolo Mural Building. The standing figure to the left offers a crown and headdress to a seated lord on a painted, wooden scaffold. The undeciphered glyphs at the center may refer to this act.

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The author is in the Department of Anthropology, Brown University, Providence, RI 02912, USA. E-mail: stephen_houston@brown.edu