

Born to fight, evolved for peace

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Not only is warfare as old as humanity itself, it may even be the driver behind cooperative behaviour

IT'S a question at the heart of what it is to be human: why do we go to war? The cost to human society is enormous, yet for all our intellectual development, we continue to wage war well into the 21st century.

Now a new theory is emerging that challenges the prevailing view that warfare is a product of human culture and thus a relatively recent phenomenon. For the first time, anthropologists, archaeologists, primatologists, psychologists and political scientists are approaching a consensus. Not only is war as ancient as humankind, they say, but it has played an integral role in our evolution.

The theory helps explain the evolution of familiar aspects of warlike behaviour such as gang warfare. And even suggests the cooperative skills we've had to develop to be effective warriors have turned into the modern ability to work towards a common goal.

These ideas emerged at a conference last month on the evolutionary origins of war at the University of Oregon in Eugene. "The picture that was painted was quite consistent," says Mark Van Vugt, an evolutionary psychologist at the University of Kent, UK. "Warfare has been with us for at least several tens, if not hundreds, of thousands of years." He thinks it was already there in the common ancestor we share with chimps. "It has been a significant selection pressure on the human species," he says. In fact several fossils of early humans have wounds consistent with warfare.

Studies suggest that warfare accounts for 10 per cent or more of all male deaths in present-day hunter-gatherers. "That's enough to get your attention," says Stephen LeBlanc, an archaeologist at Harvard University's Peabody Museum in Boston.

Primatologists have known for some time that organised, lethal violence is common between groups of chimpanzees, our closest relatives. Whether between chimps or hunter-gatherers, however, intergroup violence is nothing like modern pitched battles. Instead, it tends to take the form of brief raids using overwhelming force, so that the aggressors run little risk of injury. "It's not like the Somme," says Richard Wrangham, a primatologist at Harvard University. "You go off, you make a hit, you come back again." This opportunistic violence helps the aggressors weaken rival groups and thus expand their territorial holdings.

Such raids are possible because humans and chimps, unlike most social mammals, often wander away from the main group to forage singly or in smaller groups, says Wrangham. Bonobos - which are as closely related to humans as chimps are - have little or no intergroup violence because they tend to live in habitats where food is easier to come by, so that they need not stray from the group.

If group violence has been around for a long time in human society then we ought to have evolved psychological adaptations to a warlike lifestyle. Several participants presented the strongest evidence yet that males - whose larger and more muscular bodies make them better suited for fighting - have evolved a tendency towards aggression outside the group but cooperation within it. "There is something ineluctably male about coalitional aggression - men bonding with men to engage in aggression against other men," says Rose McDermott, a political scientist at Stanford University in California.

Aggression in women, she notes, tends to take the form of verbal rather than physical violence, and is mostly one on one. Gang instincts may have evolved in women too, but to a much lesser extent, says John Tooby, an evolutionary psychologist at the University of California at Santa Barbara. This is partly because of our evolutionary history, in which men are often much stronger than women and therefore better suited for physical violence. This could explain why female gangs only tend to form in same-sex environments such as prison or high school. But women also have more to lose from aggression, Tooby points out, since they bear most of the effort of child-rearing.

Not surprisingly, McDermott, Van Vugt and their colleagues found that men are more aggressive than women when playing the leader of a fictitious country in a role-playing game. But Van Vugt's team observed more subtle responses in group bonding. For example, male undergraduates were more willing than women to contribute money towards a group effort - but only when competing against rival universities. If told instead that the experiment was to test their individual responses to group cooperation, men coughed up less cash than women did. In other words, men's cooperative behaviour only emerged in the context of intergroup competition (*Psychological Science*, vol 18, p 19).

Some of this behaviour could arguably be attributed to conscious mental strategies, but anthropologist Mark Flinn of the University of Missouri at Columbia has found that group-oriented responses occur on the hormonal level, too. He found that cricket players on the Caribbean island of Dominica experience a testosterone surge after winning against another village. But this hormonal surge, and presumably the dominant behaviour it prompts, was absent when the men beat a team from their own village, Flinn told the conference. "You're sort of sending the signal that it's play. You're not asserting dominance over them," he says. Similarly, the testosterone surge a man often has in the

presence of a potential mate is muted if the woman is in a relationship with his friend. Again, the effect is to reduce competition within the group, says Flinn. "We really are different from chimpanzees in our relative amount of respect for other males' mating relationships."

The net effect of all this is that groups of males take on their own special dynamic. Think soldiers in a platoon, or football fans out on the town: cohesive, confident, aggressive - just the traits a group of warriors needs.

Chimpanzees don't go to war in the way we do because they lack the abstract thought required to see themselves as part of a collective that expands beyond their immediate associates, says Wrangham. However, "the real story of our evolutionary past is not simply that warfare drove the evolution of social behaviour," says Samuel Bowles, an economist at the Santa Fe Institute in New Mexico and the University of Siena, Italy. The real driver, he says, was "some interplay between warfare and the alternative benefits of peace".

Though women seem to help broker harmony within groups, says Van Vugt, men may be better at peacekeeping between groups.

Our warlike past may have given us other gifts, as well. "The interesting thing about war is we're focused on the harm it does," says Tooby. "But it requires a super-high level of cooperation." And that seems to be a heritage worth hanging on to.

The mindset for modern warfare

Bob Holmes

Modern warfare with its complex strategies, and advanced, long-distance weapons bears little resemblance to the hand-to-hand skirmishes of our ancestors. This may mean we're left with battle instincts unsuited to our time, suggested several participants at the Oregon conference.

Overconfidence in the strength of numbers is one example, says Dominic Johnson of the University of Edinburgh, UK. He found that in a simulated war game, men tended to overestimate their chance of winning, making them more likely to attack (Proceedings of the Royal Society B, vol 273, p 2513). Thus, a dictator surveying his soldiers on parade may vastly overrate his military strength. "In the Pleistocene, nobody would have been able to beat that," says John Tooby at the University of California at Santa Barbara.

Soldiers going into battle today don't make the decisions, says Richard Wrangham of Harvard University, which may make them more fearful fighters. "In primitive warfare, men were fighting because they wanted to."

How war spread like the plague

Bob Holmes

The threat of disease could have driven the evolution of war - at least within a nation.

This controversial idea is the brainchild of Randy Thornhill, an evolutionary biologist at the University of New Mexico in Albuquerque. He argues that cultures become more insular and xenophobic where diseases and parasites are common, preferring to drive away strangers who may carry new diseases. In contrast, cultures with a low risk of disease are more open to outsiders. Thornhill thinks these attitudes to outsiders colour each culture's propensity for war.

Sure enough, when Thornhill and his colleagues gathered data from 125 civil wars, they found that such wars were far more common in nations with higher rates of infectious disease, such as Indonesia and Somalia.

Participants at the conference at the University of Oregon in Eugene greeted Thornhill's theory with interested scepticism. It is "a very different way of thinking that has to be taken seriously", says primatologist Francis White who works at the university. John Orbell, a political scientist also at the university, says the idea is "pretty persuasive".

Thornhill admits his ideas are hard to test, because countries with high disease levels are often poor, multi-ethnic and authoritarian, all of which can drive civil unrest. However, he says, when infectious disease fell in western nations in the 20th century thanks to antibiotics and sanitation, those same societies also became less xenophobic.

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By Bob Holmes

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## **THE EVOLUTION OF AGGRESSION**

Humans are primates, and like our cousins we use violence and cooperation in complex ways

At Gombe National Park in Tanzania, a patrol of seven chimpanzees stealthily roved deeper and deeper into enemy territory. Suddenly, they heard the call of an infant chimpanzee nearby. Instantly rushing toward the sound, the chimps fell upon a hapless mother who was desperately trying to escape with her child. Over the next 15 minutes the chimps hit, bit and stamped on their victim and dragged her infant through the underbrush until the mother finally broke free. Bleeding profusely, she scooped up her wailing offspring and fled.

Lethal group-against-group violence was once thought to be a uniquely human behavior. But primatologist Jane Goodall's recounting of "warfare" among neighboring groups of chimpanzees several years ago suggested for the first time that when it comes to aggression, the dividing line between humans and the rest of the animal kingdom is not clearly drawn. Goodall watched in horror as a band of chimpanzees she had been observing for years systematically hunted down individuals from a neighboring group and murdered them one by one, eventually wiping out the entire community.

Scientists have long used monkeys and apes as stand-ins for humans in testing food and drugs and researching basic human biology, but today they are turning more and more to primates for clues to human behavior as well. They have been especially interested in what primate aggression can say about human acts of violence. Their findings are providing a compelling counterargument to the age-old notion that human violence is either the consequence of innate biological drives or aberrant behavior caused solely by social pressures such as overcrowding and poverty. Instead, the new research suggests that aggressive behavior is a complex, inseparable mixture of both. What's more, aggression appears to be a vital component in maintaining cooperative relations among members of a society.

Not everyone is enthusiastic about the new findings. Even though the seminal work of Charles Darwin is now a century and a half old, many people are still uncomfortable with the idea that humans share traits and ancestry with apes and monkeys, in spite of the fact that humans and apes have nearly identical DNA. Indeed, the U.S. government's top-ranked behavioral scientist recently resigned amid criticism of his controversial remarks suggesting that research on monkeys might yield clues to the problem of violence in inner cities -- a suggestion that two prominent senators labeled "preposterous."

**Clues from cousins.** Despite such sentiments, primatologists have found that while studies of monkeys and apes may not provide specific prescriptions for solving human social problems such as gang violence, they can serve as an important window on certain human characteristics. "Although chimps are not simply little people in furry suits," observes Irwin Bernstein of the University of Georgia, "the basic building blocks of human behavior are present in their behavior."

One of the most surprising findings from recent animal research is that group violence and social cohesion are intimately linked. According to primate researchers Joseph Manson of the University of Michigan and Richard Wrangham of Harvard University, male chimpanzees who are best able to form alliances are also the most successful in

competing for access to females and resources such as food and water, which are attractive to females. Cooperation, they say, appears to be a prerequisite for their successful aggression. A comparison of 42 foraging societies by Manson and Wrangham revealed the same dynamic at work: Males mount attacks -- over females and vital resources -- only when they have pieced together a coalition that outnumbers the outsiders, so there is little risk to the attackers.

Manson and Wrangham are careful to point out that their work does not mean that chimp and human aggression are identical; humans are far more sophisticated in their cooperation, technology and the kinds of resources they fight over. But the evidence that apes weigh risks and form coalitions suggests that all primate aggression, including human aggression, is more complex than a simple bubbling up of some atavistic animal instinct or a mere reaction to stress. It is instead, the research suggests, an ancient evolutionary strategy more closely tied to coalition building and harmony than to murderousness and wanton violence. Nor is aggression a trait found just among male primates: Studies show that in many ape and monkey societies, the females, not males, band together to fight aggressively over resources.

In contrast to the causes of group-against-group conflicts, aggression within a single primate community appears to serve as a tool for maintaining the group's social stability. Research by the University of Georgia's Bernstein and Tom Gordon of Emory University's Yerkes Primate Center demonstrates that in rhesus monkeys, for instance, most aggressive encounters take place when a newcomer attempts to join an established group. Rhesus monkeys live in a strict pecking order, and newcomers must nudge and jostle their way into the hierarchy. Once the monkey is established in the group, however, the level of aggression drops dramatically, as each individual generally defers to those higher on the societal ladder. Gordon points out that deferential encounters occur three times more often than do encounters involving overt acts of aggression.

A monkey's ability to establish itself in the social hierarchy depends far less on its physical strength, aggressiveness or fighting ability than on its ability to make friends. Older males, for instance, often maintain their social position by craftily allying themselves with other influential monkeys in the group. "During a power struggle, males will try to get support of females by playing with their infants," says Yerkes primatologist Frans de Waal. "Presidential candidates do the same thing."

Monkeys will also band together to topple a higher-up. In one experiment, a high-ranking female was removed from her allies and placed among a group of low-ranking females, who quickly formed an alliance against her and reversed the hierarchy. Again, it was cooperation rather than untempered aggression that guaranteed success.

Ultimately, social cohesion among primates requires that allies play straight with one another, and aggression appears sometimes to have a key role in discouraging cheating. In one instance, a chimp that had formerly come to the aid of another chimp during a fight came under attack himself. When he extended his hand toward his partner in an apparent plea for help and was ignored, he turned and attacked his betrayer. Another

study by de Waal found that when a bundle of food was placed among a group of chimpanzees, the greatest amount of aggression was used not to fight for a fair share but to exclude those chimps who had refused to share their food on a previous occasion.

Mothers, too, use aggressive punishment to teach social lessons that will ultimately smooth their offspring's passage in the group. Indeed, experiments have shown that rhesus monkeys who are taken from their mothers as infants and raised in isolation become social misfits who are unable to make allies when they are later put into a group.

Primatologist Stephen Soumi of the National Institute of Mental Health has found that the genes of the father can also influence how a monkey gets along in a group. In a typical group of rhesus monkeys, there is usually a small percentage of males who do not get along with anyone. Like the monkeys who are raised in isolation, these monkeys disregard the group's social structure, frequently engage in aggressive acts without provocation and sometimes are expelled from the group. These monkeys are often the offspring of fathers who display similar traits, says Soumi.

**Brain chemistry.** Analyzing the spinal fluid of these antisocial monkeys, Soumi has found that they have low levels of a particular byproduct of a brain hormone called serotonin. In contrast, monkeys higher up in the social hierarchy have higher levels of the same brain chemical. Intriguingly, low levels of the same brain hormone have been discovered in Marines discharged from the corps for excessive violence, and a study of criminals in Finland who committed acts of wanton violence also found they had low levels of this brain chemical.

There is no evidence yet that low levels of serotonin directly cause violent behavior, Soumi emphasizes. While hormones can certainly produce behavioral changes, he says, social circumstances can also cause changes in brain chemistry. Poor nurturing, for instance, is known to lower a monkey's serotonin level, while good nurturing can raise it. "The whole debate over nature versus nurture is meaningless," says Soumi. "It's not either/or, it's and."

Ultimately, the same could be said for the supposed distinction between aggression and peaceful coexistence. Rather than being polar opposites, these behaviors in fact are woven together in the complex interactions through which humans -- and many other primates -- maintain balance in their social relations. Indeed, as much as nonhuman primates might reveal about aggression, they tell far more about how close-living individuals can resolve their inevitable conflicts of interest peacefully, says Yerkes's de Waal, who has observed many instances of chimpanzees reconciling after an aggressive encounter. Like other primates, humans must continually work to control harmful aggression within their societies. Understanding the biological and cultural roles that aggression plays in human life will ultimately be more constructive than moralistic efforts to ban this fundamental primate behavior.

Picture: Top primate.

Ritualistic aggression on the stump (WLS-TV, Chicago); Cruel to be kind. New research suggests that with chimpanzees as with humans, acts of aggression can help maintain peace in the community. (Frans de Waal -- Yerkes Primate Center)

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By William F. Allman

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