MEETING BRIEFS

Evolutionists Take the Long View on Sex and Violence

More than 230 evolutionary biologists, psychologists, philosophers, computer scientists, and anthropologists attended the Fifth Annual Meeting of the Human Behavior and Evolution Society, held 4-8 August at Binghamton University in New York. Sociobiological explanations for human behavior were on prominent display at the meeting, as researchers explored evolutionary influences on such areas as family killings and war.

Really Wicked Stepparents

Exceptional cruelty of stepparents towards stepchildren is one of the staples of fairy tales. But, say two McMaster University psychologists, those fabulous themes may come from some nasty human evolutionary realities. Statistics show that stepparents are particularly prone to murder their stepchildren, Martin Daly and Margo Wilson reported at the human behavior and evolution meeting. The motives for these tragic killings, the researchers argue, come less from the Grimm brothers than from Charles Darwin, as retold by sociobiology.

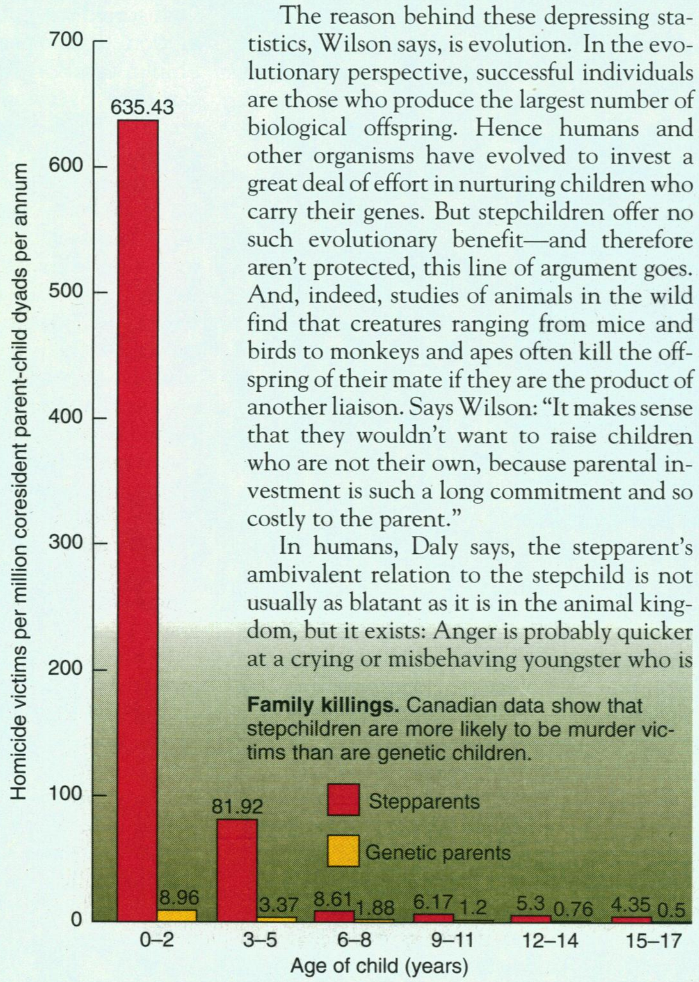
Specifically, the two researchers found that in Great Britain and Canada, the risk of a stepchild's being abused or murdered by a stepparent is much higher than the risk for a child living with its birth parents. After examining almost two decades worth of Canadian police statistics, the husband-and-wife team found that stepchildren age 2 or under were 60 to 70 times more likely to be killed by their stepparents than were children living with their natural parents. The murder rate went down as the ages of the children increased, but at every age more stepchildren were killed than were genetic children. The effect held up even though the researchers took into account possible confounding factors such as poverty, which could be more likely to affect stepfamilies and contribute to a higher murder rate. The study used only data on children living in two-parent homes, and stepchildren in general are distributed among the same socioeconomic groups that biological children are.

The studies in Great Britain show that in England and Wales, stepchildren age 4 and under were 15 to 20 times more likely to be killed by a parent than are genetic children. The new data add to earlier studies by the pair that showed stepchildren in the United States and Canada were at higher risk for child abuse. "Living with a stepparent is the single most powerful risk factor for child abuse that has been yet identified," says Wilson.

The reason behind these depressing statistics, Wilson says, is evolution. In the evolutionary perspective, successful individuals are those who produce the largest number of biological offspring. Hence humans and other organisms have evolved to invest a great deal of effort in nurturing children who carry their genes. But stepchildren offer no such evolutionary benefit—and therefore aren't protected, this line of argument goes. And, indeed, studies of animals in the wild find that creatures ranging from mice and birds to monkeys and apes often kill the offspring of their mate if they are the product of another liaison. Says Wilson: "It makes sense that they wouldn't want to raise children who are not their own, because parental investment is such a long commitment and so costly to the parent."

In humans, Daly says, the stepparent's ambivalent relation to the stepchild is not usually as blatant as it is in the animal kingdom, but it exists: Anger is probably quicker at a crying or misbehaving youngster who is not a biological child. Sometimes, however, the stepparents' behavior is blatant. Anthropologists have reported on stepfathers in two tribes in the jungles of South America—the Yanomamo of Venezuela and the Ache of Paraguay. Men in those tribes who married women with dependent children from previous unions either demanded that those children be put to death or simply refused to provide enough food.

There are, to be sure, other explanations for the high murder rate in stepfamilies. Although social psychologist Richard Gelles of the University of Rhode Island says that, "I would never quibble with the homicide data," he notes that psychodynamic theorists have pointed out that stepparents form less of an attachment bond with the new children, that the role of the stepparent isn't clearly defined, and that stepfamilies tend to be in more emotional and financial difficulties than genetic families. All of this can raise the stress level within a household, perhaps to the breaking point. Despite Daly and Wilson's work, the entire social science community is not yet ready to picture stepparents as birds shoving rivals' eggs to the ground.



Family killings. Canadian data show that stepchildren are more likely to be murder victims than are genetic children.

SOURCE: MARGO WILSON/MARTIN DALY

Warring Over Women

When Leda Cosmides, a cognitive psychologist from the University of California, Santa Barbara, began her talk in Binghamton she posed a question: "Why would anyone be so stupid as to initiate a war?" Her answer: "To get women."

That's not an answer that would surprise anyone who's heard of Helen of Troy, but Cosmides is thinking of even earlier developments in human history. The idea is part of a new theory on the evolution of warfare, holding that aggressive male alliances were the products of natural selection because they increased men's access to women, permitting them to have more children. But this idea contradicts a long-established view that the first wars erupted among tribes fighting for scarce but decidedly nonhuman resources such as food, land, and water holes.

Coordinated campaigns of aggression are rare among animals, but among humans, many have argued that groups go to war when survival is threatened and they need scarce resources held by another group. But recent observations among the Yanomamo (an Amazonian tribe) of organized aggression to capture females have prompted some scientists to wonder whether the notion of scarce resources should be extended to females. This may be true among animals as well: Dolphin males form aggressive coalitions to kidnap females from other dolphin groups, and Yanomamo men in one village seem to organize raids to take women away from other villages.

Cosmides and her husband, biological anthropologist John Tooby, also at Santa Barbara, propose that human wars began over women in the Pleistocene, hundreds of thousands of years ago. And once a few early hunter-gatherer groups started battling over women, the researchers say, the victors would produce more offspring. That would lead to the selection of certain complex cognitive mechanisms in later generations, such as the ever-improving ability to form groups and go forth in battle.

The reason Tooby and Cosmides think that the first warriors battled over women instead of food is that it isn't worth the risk to die for fruit or land. If food was scarce and a group of men went after another group's food stocks, they were taking a big chance: Their own offspring, already malnourished, could starve if the men were killed in the fighting and didn't return to help scratch out a living.

But women, the researchers argue, are worth dying for. A group of men would benefit from initiating a battle to claim new women if they were flush with food and other resources. Then they would know their existing mates and offspring could survive without them. In evolutionary terms, they don't lose much by going to war for women—even if many were to die, their offspring would survive to pass on their genes. And if the group won and gained new mates, the male coalition would bear more young on average, even if a few men lost their lives in the effort.

Similar theories about the influence of sexual competition on the evolution of male behavior have been put forth by anthropologists Richard Alexander of the University of Michigan and Richard Wrangham of Harvard University. Moving from theory to ethnographic observation, University of California anthropologist Napoleon Chagnon has suggested that the Yanomamo he studies are fighting to capture new women. Chagnon's proposal has been vigorously criticized by University of Florida anthropologist Marvin Harris and Rutgers University anthropologist Brian Ferguson, who argue that scarce food and land are more immediate—and more powerful—incentives for warfare than are women. With the new work from Tooby and Cosmides, however, Chagnon feels that more of his colleagues are beginning to see his point of view. "Why fight over bananas," he asks, "when you can fight over women?"

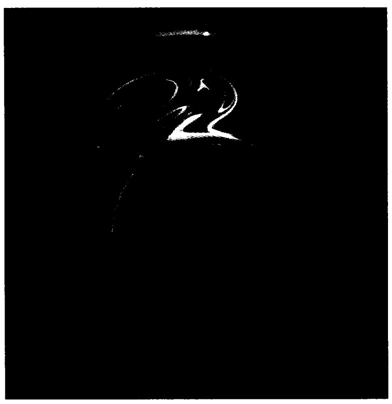
–Ann Gibbons

CHAOS THEORY

How Islands Survive in a Chaotic Sea

When you stir cream and sugar into a cup of coffee, little pockets sometimes remain stubbornly unmixed, no matter how vigorously you stir. Much the same thing happens in the giant mixing vats of the chemical industry and even on Jupiter, where the Great Red Spot marks a colorful storm that somehow stays intact amid the planet's whirling atmosphere. In recent years, so-called chaos theory has sharpened researchers' understanding of mixing, but the puzzle of these coherent islands in a sea of disorder has only deepened. Now Troy Shinbrot and Julio Ottino of Northwestern University have proposed a way to make sense of them.

The islands posed a mystery because, according to chaos theory, any two points that start off close together in a chaotic fluid should end up unpredictably far apart as the mixing proceeds. But in last week's *Physical Review Letters* Shinbrot and Ottino offer theoretical studies to show how the very processes that mix a fluid can sometimes preserve small eyes in the storm. They've also backed up their analysis with practical demonstrations, which they have yet to publish. "This is a nice stepping stone towards a better understanding of coherence," says Steve Wiggins, an authority on nonlinear dynamics at the California Institute of Technology.


LEO BRESLER

Little red spot. Like the famous red spot of Jupiter, a patch of red dye remains intact in a swirl of chaotic mixing.

Shinbrot and Ottino's theoretical analysis starts with the description of any mixing process that was devised at the turn of the century. As any mixture is stirred, each parcel of fluid "can either stretch like a rubber band or it can fold over," says Shinbrot, yielding a horseshoe shape. With each successive stretch and fold, the distance between any two particles along the legs of the horseshoe will randomly increase by anywhere from two to 100 times, ensuring relatively complete mixing. Such unpredictable divergence is the hallmark of chaos, theorists realized in the 1960s, implying that any fluid mixing process is inherently chaotic.

You might expect chaotic mixing to require random stirring forces, such as those generated by turbulence. If so, Shinbrot and Ottino would have had a harder time analyzing it, because the math needed to describe turbulent mixing is only just being developed, according to Wiggins. As Ottino was one of the first to show, however, a chaotic system can be achieved without turbulence. A smoothly mixed fluid still undergoes the stretching and folding that produces horseshoes. So Shinbrot and Ottino tackled coherence by examining one of these simpler systems.

In their paper, the pair shows that the horseshoes, the very hallmarks of chaos, actually help preserve coherent structures. They examined what happens right at the vertex of a horseshoe, where the stretched fluid parcel folds in half. One way to think about the process is to imagine a piece of taffy with a blue stripe down its middle. If you stretch the taffy perpendicular to the stripe, then fold it in half, down the center of the stripe, the stripe will be displaced—moved to the top of the candy—but it will stay together. If, during repeated cycles of stretching and folding, which correspond mathematically to the mixing cycles, the fold always stays in the blue patch, the blue dye will never mix with the rest of the taffy.

Much the same thing can happen in a fluid stirred with a periodic motion, even a motion that appears impossibly complex, Shinbrot and Ottino's analysis showed. Folds can recur over and over in the same area, preserving coherent structures. And that's exactly what they saw when they followed their theoretical recipe in the lab. They filled the space between two cylinders, one inside the other, with blue glycerine, then added a spot of red and mixed the system by twisting the cylinders back and forth in opposite directions. The rotations stretched and folded the entire fluid, but when they were controlled to keep a fold within the red glycerine on every mixing cycle, the two dyes stayed separate after numerous mixings.

Knowing how islands can be preserved within a chaotic flow could suggest the converse—ways to eliminate them by avoiding periodic stirring. And that could be valuable to the chemical industry, helping it to guard against incomplete mixing, which can degrade products. "Ideally, you would like to have recipes where you can get rid of these unmixed regions," says Ottino.

But the theory leaves some larger challenges unanswered, says Wiggins—it can't fully explain such grand examples of coherent structure as Jupiter's red spot. Jupiter's atmosphere is truly turbulent, while Shinbrot and Ottino looked only at coherence in a periodically mixed system. Still, says Ottino, "it's always exciting to find order within the mess."

–Karen Fox