

The Evolution of Jealousy

Did men and women, facing different selective pressures, evolve different “brands” of jealousy? Recent evidence suggests not

Christine R. Harris

Love wasn't the only thing in the air on Valentine's Day 2003. A Texas jury had just found C. Harris guilty of killing her husband in a “sudden passion.” After encountering him at a hotel with a mistress, she had driven the car over his body again and again. As others were exchanging tokens of love, the “Mercedes murderer” was sentenced to spend 20 years in jail.

Clara Harris was hardly the first woman to stand accused of murdering in a jealous rage. In various studies, jealousy is often ranked among the top three motives for nonaccidental homicides where motive is known—along with rage arising from a quarrel and murder during the commission of a crime. Across the ages the confounding power of sexual jealousy has inspired poetry, novels, drama, art and opera. It has also captured the attention of psychologists, who have used a variety of theoretical approaches in their pursuit of scientific understanding.

Early work focused on Freudian interpretations, the influence of which can still be seen in the psychiatric literature. As in other domains of psychology, however, recent research has followed a rather different direction. For some years now, a small but persistent group of investigators has attempted to uncover the nature and origin of this painful and dangerous counterpart of romantic love.

Most of us know jealousy from experience as a deeply negative emotion that arises when an important relationship is threatened by a rival. Given the inherent intricacies of social relationships, a simple theory that adequately captures the complexity of jealousy is unlikely. Hence research has focused on the interplay between social and cognitive factors in the incidence and expression of this emotion. Some psychologists have explored cultural differences and have found that jealousy is more pronounced in cultures that attach social importance to marriage and sanction sexual grat-

ification only in the marriage bed and in cultures that place a premium on personal property. Others have tried to account for why some individuals show strong jealousy at the slightest provocation and others seem less susceptible. (Factors examined in these studies range from personality and parental-attachment styles to who has the better “deal” in a relationship.)

One relatively straightforward idea about jealousy in romantic relationships is at the center of a hot debate among psychologists. During the 1990s, as evolutionary psychologists began applying Darwin's theories to human behavior in novel ways, a new theory of the origins of jealousy developed. Jealousy, it was suggested, might have given a fitness advantage to men and women in our ancestral environment. But the selective pressures on males and females struggling to survive and reproduce in this environment were asymmetrical. Thus jealousy, like many of the emotions associated with mating, came to have a different character in men and women. The notion that jealousy evolved into an “innate module”—a wired-in brain circuit that has different primary triggers in men and women—is one of the most celebrated applications of an evolutionary approach to psychology.

Debate over this hypothesis continues. In fact, newer evidence raises questions about whether there is a fundamental difference between the male and the female experience of jealousy in romantic relationships. After reviewing the evidence in light of other theories, I believe an evolutionary explanation for this emotion may turn out to be more subtle and complex than the recent view suggests. Jealousy could certainly be an innate and adaptive emotion, but its form may be better explained by social-cognitive approaches, as well as developmental theory, than by theories based on proposed sex differences in our ancestors' mating strategies.

Christine R. Harris received her Ph.D. in psychology in 1998 at the University of California, San Diego, where she is currently assistant professor of psychology. Her primary research interests are in human emotion, including the effects of emotion on cognitive processes, social influences on emotional reactivity and specific emotions—particularly jealousy, embarrassment and humor. Address: Department of Psychology-0109, UCSD, La Jolla, CA 92093-0109. Internet: charris@ucsd.edu

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Figure 1. Long a popular theme in literature, art, music and drama, jealousy is today the subject of debate among psychologists. An archetype of female jealousy is the mythological character of Hera, wife of Zeus. After Semele was impregnated by the philandering Zeus, Hera set in motion a series of events leading to Semele's death by fire. As his mother was consumed by the flames, Dionysus (Bacchus) was born. Hera is shown observing the unfolding scene from above in the engraving *The Birth of Bacchus*, made around the beginning of the 19th century by Jean-Baptiste Patas, after a 16th-century painting by Jules Romain (Guilio Romanus). Evolutionary psychologists have proposed that female jealousy is triggered by a mate's emotional infidelity, whereas male jealousy is triggered by sexual infidelity. The author finds the evidence supporting this view to be equivocal at best.

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The Specific Innate Module Theory

As I mentioned above, evolutionary psychologists seek to explain the peculiarities of human psychology in terms of the selective pressures that operated on our ancestors in the Pleistocene Epoch—the pressures that determined whose progeny survived and whose did not. The wired-in emotions we have now, these writers maintain, are not necessarily ones that increase our inclusive evolutionary fitness (the survival of our genes) today. But they tended to provide a payoff in the very different environment of our forebears. This framework has been used in attempts to understand such diverse features of human nature as pregnancy sickness and depression.

According to David Buss at the University of Texas at Austin and several other evolutionary psychologists, a specific set of brain circuits guides our emotional reaction to threats in the context of sexual relationships. This emotional-cognitive module, they argue, makes men innately predisposed to jealousy over a mate's *sexual* infidelity. It makes women innately predisposed to jealousy over a mate's *emotional* infidelity.

This difference in the sexes' response to specific triggers is present now, according to these theorists, because people once faced different inclusive fitness risks during the Pleistocene. According to the theory of natural selection, mutations that increase fitness are favored and survive, because future generations inherit these mutations from successful individuals.

Ancestral man purportedly faced a grave Darwinian threat from cuckoldry—a result of the fact that eggs are fertilized internally and paternity is always somewhat uncertain.

Should a man's mate be impregnated by another man, he might easily expend his scarce resources on genetically unrelated children, thus making his own Darwinian fitness plunge. Hence, natural selection shaped the male brain to respond specifically to sexual infidelity with intense jealousy—an emotion that would motivate actions to defend against cuckoldry.

Ancestral woman, knowing that she was the mother of her children, faced no such risk, and thus was not under the same selection pressure to respond to sexual infidelity. Rather, she faced the threat that a philandering mate might divert his resources to another woman and her children. Because human children require years of care, these resources were supposedly critical to her inclusive fitness. Therefore, according to the theory, women developed an innate psychological module that is particularly sensitive to emotional infidelity (the assumption here being that men expend resources on the women they love).

This evolutionary theory of jealousy has received a great deal of general media attention in the past few years. However, as this article will show, there are other accounts that would be entirely consistent with evolution by natural selection.

Self-Report Studies

The innate-module theory has come to have a strong following among psychologists largely because of an outpouring of research that relies on self-reports of college students. Subjects are asked to imagine a romantic relationship in which their partner is either having sex with someone else or is falling in love with someone

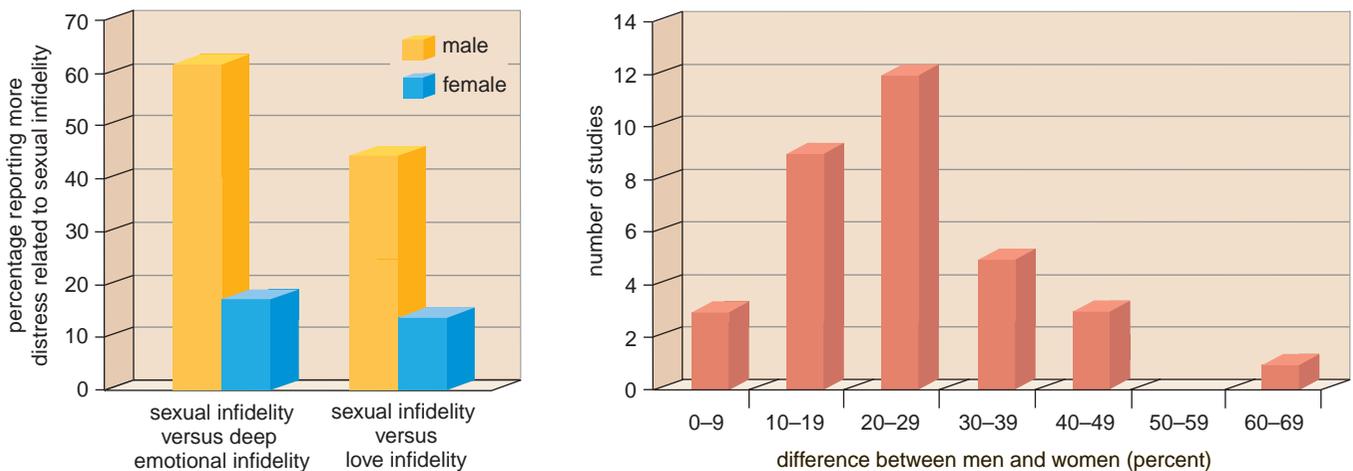


Figure 2. Jealousy's nature has been examined through forced-choice studies in which subjects describe their responses to imaginary scenarios involving a mate's infidelity. Imagined sexual infidelity might be expected to trigger jealousy in men because jealousy provided a payoff to ancestral man, whose inclusive fitness was threatened by cuckoldry. In contrast, ancestral woman might have responded more strongly to emotional infidelity because it implied a threat to the resources needed for the care of her children. When David Buss and his colleagues asked 202 college students for their reactions to infidelity scenarios involving sex, "deep emotional attachment" and "falling in love," their responses fit the predicted pattern (*left*). Since that 1992 study, more than two dozen similar studies have been published. The difference between the proportions of heterosexual men and women choosing sexual infidelity as the stronger trigger has ranged in these studies from 8 percent, in a study of Austrian adults, to 69 percent, in a United States college-student sample (*right*). Only one study found a reverse effect: Sexual infidelity was of greater concern to Dutch lesbians than

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else, and then are required to choose which of the two types of infidelity would be more upsetting to them.

This forced-choice method was first designed by Buss and his colleagues in 1992 and has since been used in more than two dozen studies. In the United States, the method almost invariably produces a significant sex difference: Most women (usually 70 percent or more) indicate that emotional infidelity would be more disturbing, whereas more men (usually between 40 and 60 percent) report that sexual infidelity would be worse.

Recently I conducted an integrative review (or “meta-analysis”) surveying these data. I found that the sex effect is robust and moderate in size but tends to be smaller among older subjects or in samples that include homosexuals. A sex effect has also been found in samples from other countries. However, in comparison to their counterparts in the U.S., far fewer European or Asian men seem to choose sexual infidelity as worse (often as few as 25 to 30 percent). This is an effect of culture comparable in size to the effect of sex.

Some of us have pointed out that such sex differences need not reflect innate modules. One possibility is that men and women may simply draw different conclusions about the hypothetical infidelity and what other unpleasantnesses it would likely imply. These inferences, then, produce the sex effect on the forced-choice scenario. According to one view (nicknamed the “double-shot” or “two-for-one” hypothesis), men tend to think sexual infidelity would be more distressing because they infer that if a woman has sex with another man, she is probably also in love with him. Women tend to believe that men can have sex without being in love. Hence, sexual infidelity does not necessarily imply emotional infidelity. Instead, women reason that a man in love is likely to be having sex, and therefore they choose emotional infidelity as worse.

Evidence supporting this explanation for the sex difference in answers to the forced-choice question is somewhat mixed. Some investigators have confirmed that these differences in inferences mediate sex differences on forced-choice jealousy measures; others have not found support. Thus, such inferences probably play some role but cannot completely account for the difference.

David DeSteno and his colleagues at Northeastern University used an additional approach to exploring the causes of sex differences on the forced-choice question. They reasoned that if sex differences reflect wired-in, sex-specific evolved modules, then depriving people of the opportunity to reflect on the choice should increase the sex difference, polarizing the responses of men and women. They imposed a “cognitive load manipulation”

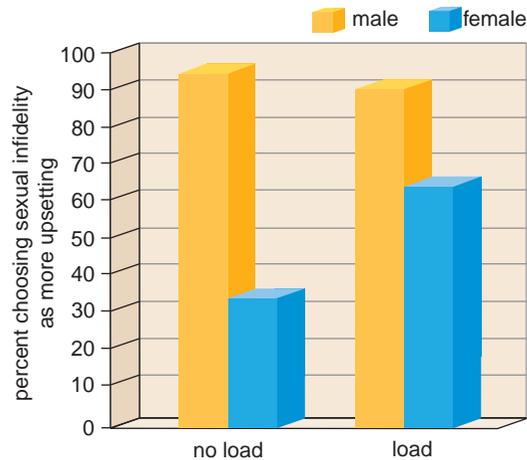


Figure 3. To help determine whether the sex differences in Figure 2 reflected “wired-in,” innate modules of male and female jealousy, David DeSteno and his colleagues imposed a cognitive load. Subjects were asked to retain in memory a string of seven digits while answering questions. The load had no effect on males’ responses, but females’ responses shifted toward picking sexual infidelity as the more powerful jealousy trigger. This shift suggests that women’s responses to forced-choice scenarios may reflect inferences or self-presentation strategies.

on study subjects by asking them to remember a string of seven digits while answering questions. The cognitive load did not change males’ responses, but females’ responses shifted toward picking sexual infidelity as the more powerful jealousy trigger. This suggests that females’ responses to the forced-choice questions may reflect inferences, along the lines of the double-shot hypothesis, or self-presentation strategies—the natural tendency of subjects to give answers that present a desired impression of themselves.

A number of investigators have tried presenting sexual and emotional infidelity scenarios separately, and assessing jealousy reactions with continuous rating scales rather than the forced-choice measure. Curiously, this tends to get rid of the predicted sex differences altogether, and on occasion it has even shifted them in the opposite direction (with women reporting *stronger* reactions to sexual jealousy). All in all, then, the forced-choice question clearly reveals some sort of sex difference, and one superficially in line with the evolutionary analysis. However, it is far from clear that it really reflects any sort of innate bias of the sort that evolutionary psychologists have proposed, rather than some other, more cognitively sophisticated kind of difference.

Physiological Measures of Jealousy

Scientifically minded readers will be wondering whether this question couldn’t be studied in a way that circumvents the issues raised by self-report measures. Buss and his colleagues have used measures of autonomic nervous sys-

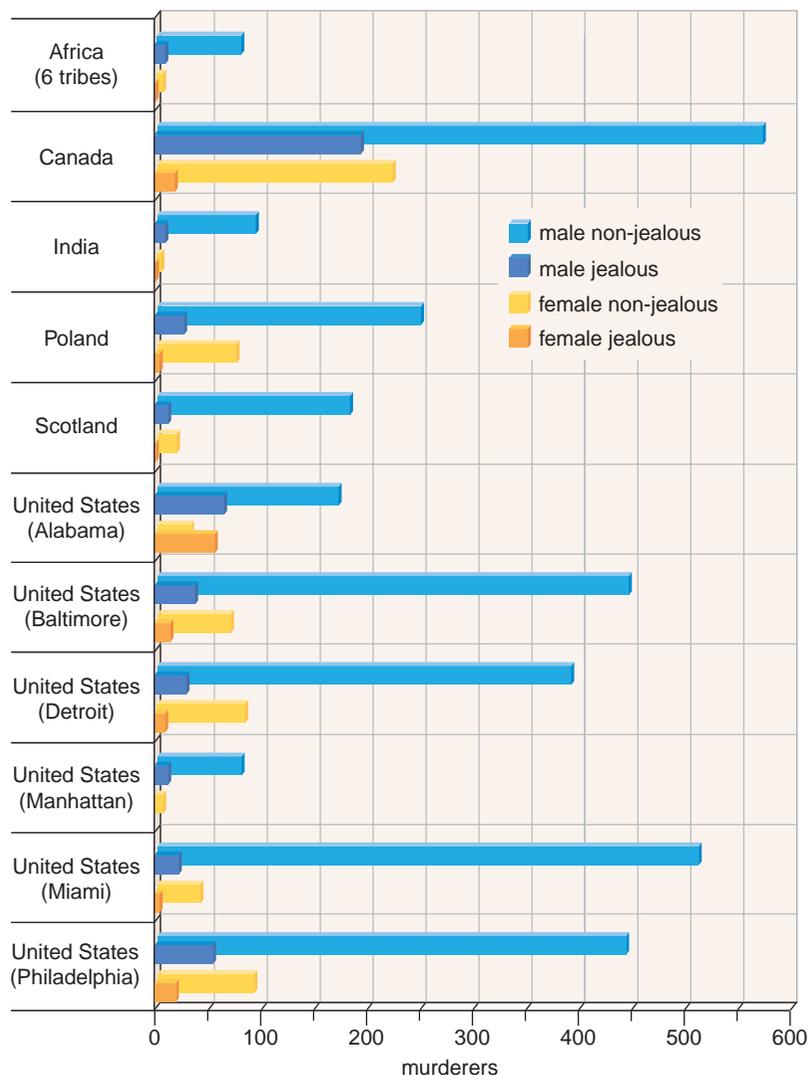


Figure 4. More men than women commit murders motivated by jealousy, various studies have found. However, men commit violent crimes of all types more frequently than women do. In an attempt to determine whether a sex difference could be demonstrated, the author examined 20 studies of murder motives from various cultures. The relative numbers of jealousy-motivated homicides by male and female murderers in these samples are shown here. No overall sex difference emerged, suggesting that murder studies do not provide evidence for a sex-specific jealousy module.

tem activity to do so. In 1992, they recorded physiological activation as people contemplated being victims of different kinds of infidelity. Increases in male undergraduates' heart rates and electrodermal activity were in fact higher when they imagined a possible mate engaging in sex with someone else, compared with the increases measured when these subjects imagined her falling in love with someone else. Female undergraduates showed a hint of the opposite pattern. These results have been interpreted as providing evidence for the predicted sex differences in jealousy.

Unfortunately, physiological arousal (reactivity) can reflect many different emotions—one reason lie detectors are not considered terribly trustworthy. Rises in blood pressure, increases in heart rate and sweating can accompany a variety of emotional states such as fear, anger or

even sexual excitement. Therefore, given that subjects are simply imagining infidelity, increases in reactivity might reflect other emotional or cognitive states besides jealousy.

This concern has been brought to the forefront in the jealousy debate by recent research conducted here at the University of California, San Diego, as well as in the laboratory of James Grice at the Southern Illinois University. Our lab found that men showed the same degree of increased physiological reactivity when they imagined *themselves* having sex with their girlfriends as they experienced when imagining someone else having sex with their girlfriends—that is, the same increase relative to their responses to imagined emotional entanglements. Thus, men's increased reactivity may reflect sexual arousal rather than, or as well as, sexual jealousy.

This newer work also failed to support the contention that women, in general, show stronger reactions to imagined emotional infidelity. Sexual experience appeared to modulate women's responses: Women who had actually experienced sexual relationships showed greater reactivity not to emotional infidelity, but rather to sexual-infidelity imagery. In other words, they showed a pattern of arousal resembling that of males.

At best, the psychophysiological data give an equivocal answer to questions about the innate-module hypothesis. Perhaps these studies fail to provide a good test of the hypothesis simply because the measures used are not picking up jealousy or distress. At worst, these measures *do* tap distress, but women and men both react more strongly to sexual than to emotional infidelity (at least when one examines individuals with actual relationship experience). Because investigators cannot randomly assign subjects to experience infidelity and then record their reactions when they learn about it, the issues raised by testing responses to imagined infidelity are not easily circumvented.

Jealousy, Murder and Mayhem

Some have argued that the strongest evidence for a sex-specific jealousy module can be found in patterns of violent behavior observed in many different cultures. In 1982, Martin Daly and Margo Wilson at McMaster University reviewed studies that looked at the motives behind murder. They concluded that more men than women committed homicide inspired by sexual jealousy. However, men commit all forms of violent crimes, including murder, at far higher rates than women. So comparisons drawn from the sheer numbers of jealousy-inspired murders could be misleading. Two new studies have looked at jealousy as a motivating factor, taking differences in overall murder rates into account. The results paint a strikingly different picture. Recently I looked at murder mo-

tives across 20 cross-cultural samples (totaling 5,225 murders) and found no overall sex difference. Earlier, Richard B. Felson of the State University of New York at Albany examined 2,060 murders recorded in a database of 33 large, urban U.S. counties and found that women were twice as likely to murder out of jealousy as were men (a significant difference).

Fitting well with the revised view of the violence studies, other recent studies have asked adults to describe their reactions to real infidelity in their lives. In a sample of heterosexual and homosexual individuals of diverse ages who had experienced actual infidelity, both men and women reported that they focused significantly more on the emotional aspects of a mate's actual affair than on the sexual aspects. Other work examining college students' experiences with real infidelity also failed to show a sex difference.

Morbid Jealousy

Another line of evidence that has been offered to bolster the innate-module hypothesis comes from clinical cases of "morbid jealousy." Psychiatrists use this term to describe patients who display a conviction, most often delusional, that their mate is cheating on them. Often they experience anger and depression and feel compelled to check up on and spy on their mate. In some cases, morbidly jealous people attempt to prevent infidelity in an aggressive fashion. Some have even imprisoned their mates.

Aggregating across the five published studies that include both females and males, one finds 228 men (64 percent of the total) versus 127 women (36 percent) diagnosed with morbid jealousy. In an early analysis, Daly, Wilson and Suzanne J. Weghorst interpreted the preponderance of male patients in such studies as indicating the existence of a sexual-jealousy mechanism in men that is not present in women.

Assuming for the moment that a roughly 65:35 preponderance of male cases reflects the true incidence, and that the males' obsessions focus on sexual betrayal, what can be concluded? For many mental disorders, sex ratios are not 1:1. Men are overrepresented in several disorders ranging from substance abuse to autism. Australian psychiatrists Gordon Parker and Elaine Barrett have suggested that morbid jealousy is often a form of obsessive-compulsive disorder, or OCD. A number of clinical groups have reported successful treatment of morbid jealousy with fluoxetine, a serotonin reuptake blocker widely used in treating OCD. For example, in a study at Columbia University, Dan J. Stein, Eric Hollander and Stephen C. Josephson found the response of patients with obsessive jealousy to be as robust as one typically finds with traditional symptoms of obsessive-compulsive disorder.

The overall incidence of OCD seems to be about the same in men and women, although some studies have found that men are slightly overrepresented. There appears to be general agreement, however, that OCD with sexual obsessions occurs much more frequently in men than it does in women. For example, Patrizia Lensi and her colleagues at the University of Pisa reported a more than 2:1 male:female ratio for these symptoms within a large sample of consecutive patients admitted to an Italian psychiatric hospital for evaluation of obsessive-compulsive disorders.

If morbid jealousy is a manifestation of OCD, and males are prone to suffer from the same disorder with sexual obsessions, it seems questionable to draw general conclusions about male psychology based on the occurrence of this disorder. Symptoms found in male OCD patients might reflect male-female differences in the general population, or they might not. "Exactness and symmetry obsessions" are other OCD symptoms that show up much more often in men than women (ratio more than 3:1). It would be a mistake to infer from this that men in general have more appreciation of symmetry or exactness than do women.

In sum, when we leave the pallid laboratory studies behind and look at people dealing with real infidelity, people driven by jealousy to commit crimes or people morbidly obsessed with the possibility of infidelity, we do not find that particularly stark sex differences support the notion of a sex-specific innate module. Individuals of both sexes experiencing betrayal report that they focus more on the emotional rather than sexual aspects of the situation (in contrast to the physiological data). Men show a greater degree of violent or obsessional jealousy.

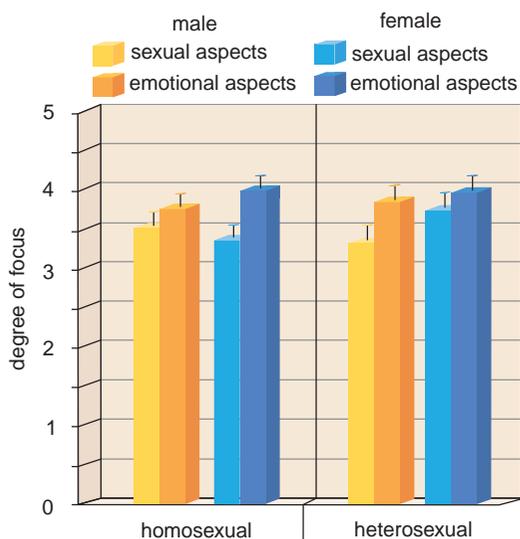


Figure 5. One of the author's studies suggests that male and female responses to real (rather than imagined) infidelity may be similar. In this study, both men and women focused more on the emotional aspects of a mate's actual affair than on the sexual aspects.

ousy, but they do so only roughly in proportion to their general tendency toward violence and sexual obsession.

Jealousy and Natural Selection

At first blush, the basic tenets of the innate-module theory—that different selective pressures on men and women gave rise to different proximate mechanisms—are compelling. The theory offers an exciting opportunity to link human psychology to the ultimate driving force behind the design of all life on Earth, namely evolution by natural selection. The questionnaire data provided a tantalizing hint that such linkages could be sustained.

As the preceding discussion shows, however, the evidence for fundamentally different wired-in jealousy mechanisms in the two sexes weakens as one moves away from asking college students to choose among hypothetical alternatives toward real infidelity among adults. Why would this be the case? Alternative explanations at two levels, not mutually exclusive, occur to me and suggest a need for continued research.

First, it should be noted that almost nothing is known for certain about the social or cultural environment of the Pleistocene. The threats

to Darwinian fitness that our ancestors faced did not necessarily present themselves in the way that biology alone might predict. Cuckoldry rates may not have been as high as evolutionary psychologists have assumed; for early hominids living in small bands, betrayal may have been far harder to achieve than in present-day urban societies. Males may not have expended enough resources on their offspring to impose the severe consequences of cuckoldry envisioned by evolutionary psychologists. In their review of present-day hunter-gatherer societies, Wendy Wood of Duke University and Alice Eagly at Northwestern University have shown that there is a great deal of cross-cultural variability in the relative contributions of men and women to subsistence, and women sometimes contribute more. Such variability makes it difficult to infer from evidence at hand what conditions prevailed in the Pleistocene.

Furthermore, even if our ancestors did pay a great price for cuckoldry and resource loss, evolution may have solved this problem in a somewhat different way than the innate-module account suggests. For one thing, focusing on a mate's sexual or emotional betrayal may

The Folklore of Jealousy

In 1899, young Frances Baker was jailed in St. Louis, Missouri. Frankie had fatally stabbed her boyfriend after catching him with another woman. She was acquitted after claiming self-defense—about 50 years after another St. Louis murder trial in which a woman

named Frankie had killed an unfaithful lover. By the early 20th century the conflated stories had become “Frankie and Johnny,” an American blues ballad celebrated in endless variations and interpretations. These excerpts are from the transcriptions of Max Hunter, who

traveled through the Ozark Mountains recording folk songs between 1956 and 1976. Like many versions of the story they are salted with fanciful details such as the inclusion of Nellie Bly, the pseudonym of a crusading journalist of the period.



Panel from a mural painted in 1936 by Thomas Hart Benton for the House Lounge in the Missouri State Capitol illustrates the story of Frankie and Johnny.

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*Frankie and Johnny were lovers
O Lordy, how they could love
They swore t' be true to each other
Just as true as th' stars above
He was her man but he done her wrong*

*Frankie took a cab, at th' corner
Says, driver step on this cab
She was just a desperate woman
Gettin' two timed by her man
He was her man but he's doin' her wrong*

*Frankie got out at south Clark Street
Looked in a window, so high
Saw Johnny man, a lovin' up
That high brow, Nellie Bly
He was her man but he done her wrong*

*Johnny saw Frankie a comin'
Out th' back door he did scoot
But Frankie took aim with her pistol
An' th' gun went roota-toot-toot
He was her man but he done her wrong*

not have been such an effective way to *prevent* infidelity. According to proponents of the hypothesis, the sex act *per se* is the trigger that most activates the male jealousy mechanism, whereas the female jealousy mechanism is most activated by evidence that a mate is falling in love. Buss and others have pointed out that signal detection among victims of jealousy can be quite accurate; that is, a jealous individual is often correct in believing that infidelity has taken place. If the cues that trigger jealousy were readily apparent to our Pleistocene forefathers only after the infidelity was a *fait accompli*, the sex-specific triggers would likely have rung alarm bells too late to avoid the Darwinian penalty. The fitness advantage of jealousy that follows sexual infidelity is somewhat unclear.

Instead, a more effective strategy for our ancestors may have been vigilance to the precursors of betrayal. Infidelity rarely occurs abruptly. Presumably, well before copulation, our ancestors—like modern-day humans—engaged in behavior that signaled the beginnings of sexual interest, emotional interest or both (an ambiguity that has occurred to more than one woman when trying to gauge her date's interest). Hence, there may be no need for men and women to have evolved different sex-linked jealousy triggers. Instead, both sexes might best prevent infidelity by being alert to, and ill-disposed toward, flirtatious behavior and other common early warning signs of sexual or emotional interest. This hypothesis is consistent with evidence that men and women may not have innately different responses to the two forms of infidelity.

One might wonder how people compare with other animals. Cross-species comparisons can be quite enlightening in our search for knowledge about evolution and the human mind. Indeed, several evolutionary psychologists have bolstered their arguments for greater male sexual jealousy by pointing out that in many species, males engage in mate guarding when females are sexually receptive—that is, when they are in estrus and can conceive. In such cases, a male follows a female and attempts to repeatedly mate with her while trying to prevent other males from getting near her.

However, there are several striking differences between human beings and such species. For one, female humans are fairly unusual in that they are physically capable of having sex throughout their reproductive cycle but have hidden estrus: There are not clear signs when a female is most fertile. Another difference is that the males of many of these species do not engage in paternal investment, supporting the care of their offspring, a factor that is key in the theories of human mating. Even monogamous bird species with high paternal invest-



Figure 6. Do primate studies offer insights into human jealousy? Male baboons engage in mate guarding—following a female around during estrus to prevent other males from mating with her. But many aspects of human biology are unique, and primate reproductive behavior is widely variable. For example, of the apes, only gibbons form monogamous pair-bonds. (Photograph courtesy of Susan Alberts, Duke University.)

ment differ from humans in several ways, including the fact that they have clutches, whereas human babies generally enter the world in single file.

Might clearer insights into our own nature be obtained from data on other primates? As noted by Alan Dixson in his synthesis of primate sexuality, there is tremendous variability in sexual and mating behavior across primate species. Of the apes, gibbons are the only ones that form monogamous pair-bonds. It is of interest that a female gibbon will run off other female gibbons that stray into her territory, apparently without waiting to see whether they have sexual or emotional intentions toward her mate.

A Social-Cognitive Theory of Jealousy

Some of the liveliest moments in the classic situation comedies of early American television followed this formula: Husband (or wife) responds to the attentions of an attractive, admiring and perhaps openly flirtatious stranger with a flush of pleasure; this enrages a spouse (perhaps hidden behind the flowerpot), who in turn begins to act in irrational and hilarious ways. In early television, these jealousy plots added a touch of sexual spice to a medium where direct presentation of sex was forbidden. A single smile or fluttering of eyelashes could spark a riotous cascade of preposterous events.

The work of emotion theorists who take a social-cognitive perspective offers a dry but straightforward explanation for the actions that such a smile might trigger in the mind of an anxious mate. These theorists emphasize the importance of cognitive appraisal. They suggest that jealousy is particularly likely to arise over perceptions that a potential rival poses a



Figure 7. Sibling rivalry may provide clues to the developmental origins of jealousy. Sybil Hart found that babies as young as six months old displayed negative facial expressions when their mothers interacted with a lifelike baby doll. The babies' responses suggest that complex cognitions are not needed to elicit a rudimentary form of jealousy. A social-cognitive theory of jealousy, the author proposes, might unify the experience of sexual jealousy with the sense of threat primitively expressed by the infant. The innate or "hard-wired" emotion of jealousy likely serves an adaptive function in mating relationships, but it may turn out to be a more general psychological mechanism that in adults is tuned by personal experiences and culture. (Photographs courtesy of Sybil Hart, Texas Tech University.)

threat to what one perceives to be valuable in oneself and in an important relationship.

Drawing on the work of the late psychologist Richard Lazarus at the University of California, Berkeley, one model distinguishes between what are called *primary* and *secondary appraisals*. In a primary appraisal, an individual assesses an event as having positive, negative or no consequences for himself or herself. If the appraisal is negative, the individual tries to determine the scope of the threat and engages in secondary appraisals designed to cope with the threat.

I have argued that in the case of jealousy the primary appraisal of threat might be elicited by an input as simple as a positive interaction between the beloved and any potential rival (in sitcom terms, an act of gallantry or a sideways glance at a swinging skirt). Such an interaction between two others may elicit a vague sense of threat that does not have to be consciously assessed, may be innate and may occur in other animals. It functions to motivate actions that will break up the threatening liaison. At least in human adults, additional appraisals also come into play, including efforts to figure out what the liaison implies for one's relationship and oneself. These appraisals affect both the intensity and direction of jealous feelings.

This perspective on jealousy is consistent with a theoretical framework that has been applied to other social and "moral" emotions, such as anger. (What will make someone angry? No exhaustive list is possible: The answer depends on what the individual believes he or she is justly entitled to.) In this view, emotions have a "primordial" form that is hard-wired into the nervous system by evolution, but they also have an "elaborated" form that reflects cultural norms and meanings.

There is no conflict between such a view and the idea that jealousy serves an adaptive function by maintaining mating relationships, which are important to both sexes for many

reasons. Contemplating the meaning and causes of a mate's infidelity might prove adaptive, by helping identify behavioral strategies that could help sustain this or a future relationship. Theories that view jealousy as a general psychological mechanism have two advantages. For one, they readily provide flexibility to account for cross-cultural differences in jealousy. For another, they can encompass jealousy outside the context of mating (for example, jealousy between siblings or friends), obviating the necessity to define separately emotions that often can be quite similar.

The Ontogeny of Jealousy

It is even possible that jealousy originally evolved outside the mating context, as a response to competition between siblings—who from conception are rivals for a parent's resources—and was later usurped for the purpose of keeping friendships and mateships together.

Sibling rivalry is not an unfamiliar phenomenon in nature. In several avian species that typically have a clutch size of two, such as the black eagle, the older sibling routinely kills the younger one. (See "Avian Siblicide," September–October 1990.) In many more avian species, siblicide appears facultative, only occurring sometimes, such as when an older chick is not receiving enough food to maintain its body weight. Work examining proximate mechanisms leading to sibling rivalry and competition in other species, including primates, might help provide cues about the origins of jealousy in humans.

Because recent jealousy studies have focused on adult relationships, the experimental investigation of the ontogeny of jealousy is still in its infancy. To date, experiments with children have focused on the jealousy commonly observed when a sibling enters a family. The older child, usually a toddler, often displays a range of negative emotions, and parents often appear to be less positive in their

interactions with the older child (showing less playfulness and more confrontation) than with the new arrival.

Although changes in parental behavior clearly contribute to the child's distress, it appears that jealousy in infants can be elicited simply by a parent directing attention to another. Sybil Hart at Texas Tech University and her colleagues found that infants as young as six months who did not themselves have siblings displayed greater negative facial expressions (furled eyebrows, downturned lips) when their mothers interacted with a lifelike baby doll, relative to when their mothers behaved the same way toward a nonsocial toy. In another study, eight-month-olds verbally and physically attempted to distract their mothers to stop them from interacting with another child.

These findings suggest that complex cognitions are not needed to elicit at least some primitive form of jealousy in infants. However, with development, social and cognitive factors become increasingly important. Even by preschool age, the specifics of a social triangle influence whether jealousy arises. For example, two Canadian investigators, Sonia Masciuch and Kim Kienapple, found that four-year-olds demonstrated more jealousy when their mothers interacted with a similar-aged peer than when she interacted with an infant. Younger infants' jealousy did not appear to be affected by the rivals' age.

One issue raised by this research is whether the expressions and behaviors of infants in triads can be taken as evidence for jealousy in particular or whether such displays are simply unspecified distress. A similar issue confronts the adult literature: Is jealousy a basic emotion, a blend of various negative emotions or a label for a particular social situation? It is likely that a new definition of jealousy itself will emerge as various lines of evidence converge.

Conclusions

Exploration of the evolutionary roots of behavior and emotion can be a fruitful source of hypotheses for psychology. The research discussed here, however, suggests that robust sex differences in jealousy over infidelity probably do not exist. It seems more likely that natural selection shaped fairly general jealousy mechanisms designed to operate across a variety of interpersonal contexts. What sex differences do exist seem likely to reflect differences in cognitive judgments rather than sexually dimorphic hardwired structures. In sum, it seems altogether likely that the same green-ey'd monster may dwell within the hearts of men and women—a monster that might first arise in the minds of babes, long before sex and romance have emerged. It is as we emerge from under a parent's protective wing that, painfully, jeal-

ously becomes what Havelock Ellis called "that dragon which slays love under the pretence of keeping it alive."

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