

RESEARCH COMMENTARY

The Nature Of Romantic Love

Helen Fisher*

ABSTRACT: Romantic love (characterized by at least two emotional stages, attraction and attachment) is a cultural universal. I propose that the human neurophysiology for these emotions evolved in our first hominid forebears some 4 million years ago as chemical mechanisms designed to initiate affiliation and sustain ancestral pair bonds through the infancy of a single altricial (helpless) child, a period of about four years. Serial monogamy during reproductive years has had adaptive advantages throughout human evolution, and natural selection has resulted in primary human mating behaviors that are still visible in worldwide patterns of marriage, divorce, and remarriage, as well as in the characteristic ebb and flow of human romantic love.

"OH EYES BE STRONG, YOU CHERISH PEOPLE AND THEN THEY'RE GONE." Safia, a middle-aged Bedouin woman of Egypt's Western Desert, recited this short poem about lost love¹. She is not the only human being who has felt the angst or ecstasy of romance. In 1992, anthropologists William Jankowiak and Edward Fischer surveyed 166 societies and found evidence of romantic love in 88.5 percent of them². In some cultures, people sang love songs. Some eloped. Some informants recounted their anguish to the anthropologists, who lived among them. And the mythology of many societies portrayed romantic entanglements. So Jankowiak and Fischer concluded that romantic love, which they equate with "passionate love," constitutes a human universal. They attributed the absence of evidence for romantic love in the balance of these cultures to "ethnographic oversight," or lack of access to the folklore of the culture.

What is this thing called love? From the responses to a series of questionnaires administered at and around the University of Bridgeport, Conn., psychologist Dorothy Tennov identified a constellation of psychological characteristics common to the condition of "limerence," her term for being in love³. Limerence, she notes, begins the moment another individual takes on "special meaning"; the other person could be a stranger or an old friend seen in a new perspective. But as one informant

put it, "My whole world had been transformed. It had a new center, and that center was Marilyn."

Infatuation (the term I often use for attraction, limerence, or "being in love") then develops in a specific psychobiological pattern, according to Tennov, beginning with "intrusive thinking." As the obsession grows, many of Tennov's informants claimed that they spent from 85 to 100 percent of their waking hours thinking about their "love object." They doted on tiny details of the time they spent together. And they aggrandized trivial aspects of the adored one in a process Tennov calls "crystallization." Crystallization is different from idealization in that the infatuated person can list the faults of their love object. But the limerent casts these flaws aside and fixates on those characteristics that he or she finds unique and charming.

Tennov's subjects also reported feeling a panoply of emotions. Elation was paramount; hope, apprehension, uncertainty, and fear were commonly mentioned, as were trembling, becoming pale or flushed, being generally weak, and having overwhelming sensations of awkwardness and stammering. Shyness, fear of rejection, anticipation, and longing for reciprocity were other central sensations of infatuation. Most interesting, informants reported feeling helpless, the sense that this passion was irrational, involuntary, unplanned, and uncontrollable. And this mosaic of psychophysiological responses was only partially related to sex. Ninety-five percent of Tennov's female informants and 91 percent of her male subjects rejected the statement, "The best thing about love is sex."

"This whirlwind, this delirium of Eros," wrote poet Robert Lowell⁴. Why is it that scientists have failed to study such a profound and universal emotional state? Affiliative behavior plays a crucial role in the mating process of all birds and mammals—and mating is the single most important act of any individual of any sex-



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ually reproducing species. Yet in the 1970s, Sen. William Proxmire gave the Golden Fleece Award (for wasting public funds) to a group of psychologists studying romantic behavior.

Perhaps we think love is too private, too intangible, or too frivolous for scientific investigation. First, humankind studied the stars, plants, and animals; only in the past two centuries have the fields of psychology, sociology, and anthropology developed to examine human behavior systematically. Even now, as scientists explore the biochemistry of the basic emotions, investigations focus on the physiology of aggression, dominance, depression, and anxiety. Studies are just beginning on the biochemistry of affiliation⁵.

The Chemistry of Attraction and Attachment

In seminal research done in the 1980s, psychiatrist Michael Liebowitz divided human romantic love into two basic stages, attraction and attachment, and he proposed that specific physiological events in the brain were involved in each⁶. After analyzing the effects of antidepressant drugs that inhibit monoamine oxidase (MAO) that were administered to lovesick patients, Liebowitz concluded that the exhilaration of attraction is associated with phenylethylamine (PEA), which is chemically related to the amphetamines, and/or with the action of the monoamine neurotransmitters nor-

logues in birds and other mammals—suggesting that these emotions evolved. Birds and mammals distinguish among potential mates, judge which would make better breeding partners, and exhibit interest in some individuals more than others. Much like humans, chimpanzees, gorillas, baboons, elephants, wolves, and many other social mammals express attraction with an array of pats, rubs, taps, gazes, licks, and nibbles, as well as with close body contact, play gestures, and tolerance of one another⁷. And while courting, many mammals are energized.

The same chemical compounds that affect human mating behaviors appear to be important in other mammals, too. When rhesus monkeys are given MAO inhibitors to raise PEA concentrations in the brain, these primates become more social, more active, and more playful⁶, behaviors commonly associated with courting. When a female monogamous prairie vole is exposed to male odors, concentrations of norepinephrine neurotransmitters rise in the area of the olfactory bulb and (along with a subsequent flood of other chemical and neural events in the brain) induce estrus and estrous behavior⁸.

Like the phenomenon of attraction, something akin to human attachment is also visible in other species. When a mated pair of zebra finches are separated, both eat more, defecate more, and lose weight, "signs of anxiety and increased emotionality⁹." Behaviors associated with attachment have been observed in many other species of birds, as well as in all of the social mammals. Anyone who owns a dog, for example, is aware of its capacity to "love" its owner—devotional behaviors that feral dogs direct toward members of their own species.

Humans and other mammals may share similar brain chemistry for attachment as well. The endorphins have been associated with attachment in humans, and they play a significant role in social bonding in several other species¹⁰. Concentrations of vasopressin and oxytocin in plasma rise during sexual arousal and ejaculation in men and during sexual arousal in women^{11,12}, and humans generally express affection and pairing behavior when sexually aroused. Concentrations of oxytocin and vasopressin increase in the limbic system in both males and females of other mammalian species during mating⁵. In a monogamous species of prairie voles, intracerebroventricular injections of vasopressin stimulate male pair-bonding behavior¹³, and in female voles, intracerebroventricular infusion of oxytocin induces female pair-bonding behavior¹⁴.

The specific contributions of the endorphins, oxytocin, and vasopressin to human romantic love remain unknown. But increased concentrations of oxytocin in the hypothalamus are associated with penile erection in rats, rabbits, and monkeys¹⁵. Moreover, humans "high" on narcotic-analgesic drugs often experience impotence, and when morphine is injected into the hypothalamus of guinea pigs, it inhibits the activity of oxytocin by acting on opiate receptors¹⁶. These and findings from other studies showing the inhibitory effects of opioid peptides on oxytocinergic transmission suggest that the endorphins, oxytocin, and vasopressin interact and/or operate in conjoining neuronal systems. Oxytocin and vasopressin could be alternative (or additional) psychopharmacological mechanisms for human attachment.



Pygmy chimpanzees often display affectionate behaviors that seem to parallel those of humans. [Courtesy Amy Parrish, University of California at Davis.]

epinephrine, dopamine, and serotonin in the limbic system and associated areas of the brain.

Liebowitz attributed the second stage of romantic love, attachment, and its concomitant feelings of tranquility and peace to heightened production of the endorphins, peptide neurotransmitters that are chemically related to morphine. Newer data suggest that oxytocin and vasopressin, peptide neurotransmitters that play central roles in male-female bonding, group bonding, and mother-infant bonding in other mammalian species, may also be involved in human attachment⁵.

Moreover, human attraction and attachment have ana-

Does a male elephant feel attraction as he strokes a female's back with his trunk just before he mounts her? Does a male wolf feel attachment as he nudges a chunk of meat toward his hungry mate while she is nursing in their den? Questions about the animal correlates of the human emotions remain. But the above data suggest that attraction and attachment are emotions as primitive and universal as fear, anger, and surprise, which are (at least in part) psychopharmacological events arising from arousal circuits located primarily in the limbic system and surrounding regions of avian and mammalian brains.

I think these emotions evolved in birds and mammals to initiate mating and sustain male-female associations long enough to ensure reproduction and survival of the young. (Because each species has a distinctive breeding system, the brain anatomy and physiology for these emotions undoubtedly vary to correspond with each species-specific mating cycle.) Then, with the evolution of the cerebral cortex among the first hominids, our ancestors began to build on this core of primitive emotions associated with reproduction, eventually developing complex romantic feelings and elaborate traditions to celebrate and curb what European cultures would come to call romantic love.

How Love Progresses

"When two people are first together, their hearts are on fire and their passion is very great. After a while, the fire cools and that's how it stays. They continue to love each other, but it's in a different way—warm and dependable¹⁷." So said Nisa, a !Kung San woman of the Kalahari Desert of southern Africa to anthropologist Marjorie Shostak in her 1981 book, *Nisa: The Life and Words of a !Kung Woman*. At some point, that magic wanes. Tennov measured the duration of limerence from the moment infatuation hit to the moment a "feeling of neutrality" for one's love object began. She concluded that the most frequent duration of "being in love," as well as the average, was between approximately 18 months and three years. Sexologist John Money agrees, proposing that once you begin to see your sweetheart regularly, the elation typically lasts two to three years¹⁸.

Liebowitz has hypothesized that the transition from attraction to the second stage of romantic love, attachment, is also grounded in brain physiology; either neurons in the limbic system become habituated to the brain's natural stimulants or concentrations of PEA and/or other endogenous amphetamine-like substances begin to drop. Then, the endorphin system begins to take over, giving partners feelings of safety, stability, tranquility, and peace. Perhaps as feelings of attachment grow, the production of oxytocin and/or vasopressin or the sensitivity of the receptor sites for these peptides increases as well.

No one has examined how long human attachment lasts, but clearly many matings end. So, for some men and women, there is a third stage of romantic love, detachment. To my knowledge, the physiology of detachment has not been explored. But in trying to explain why birds abandon their nests at the end of the breeding season to join a flock and why many creatures leave the safety of their natal home after infancy, ethol-

ogist Norbert Bischof has theorized that an animal gets an "excess of security," to which it responds by withdrawing from the object of attachment¹⁹. The same phenomenon may occur in humans. At some point in some long relationships, the brain's receptor sites for the endorphins, oxytocin, vasopressin, and/or other neurochemicals may become desensitized. Thus attachment wanes and sets up the mind for separation.

None of the above is meant to suggest that men and women are biologically *compelled* to fall in love, to attach or detach from one another. Cultural forces play

"When two people are first together, their hearts are on fire and their passion is very great. After a while, the fire cools and that's how it stays."

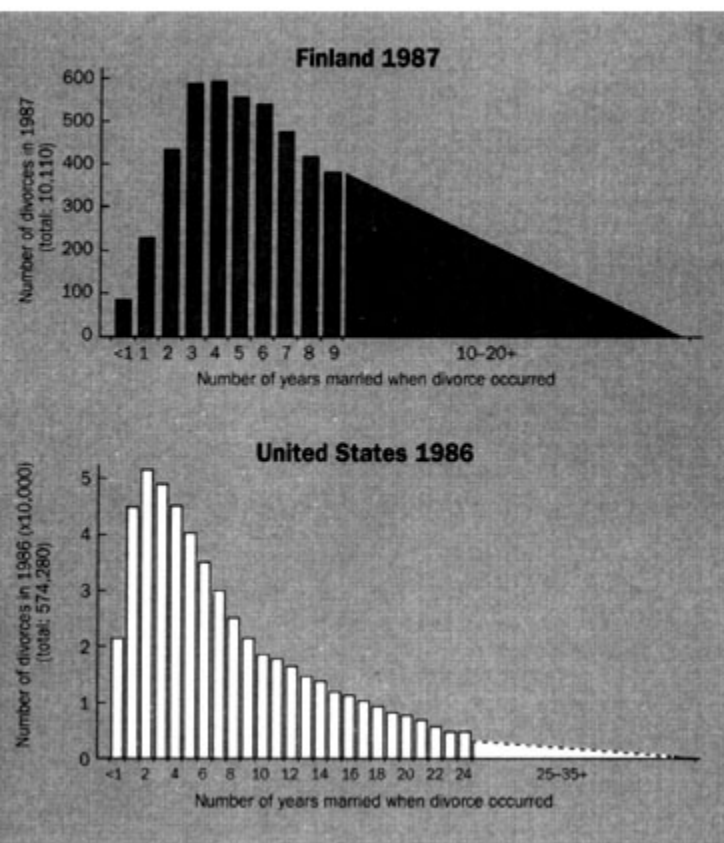
a powerful role in directing behavior, as does one's idiosyncratic perspective—what philosophers have long called "free will." But marriage is a cultural universal and divorce is common in societies around the world. Moreover, worldwide data on marriage and the timing of divorce suggest that, like attraction and attachment, the physiology of detachment evolved to direct the ebb and flow of our ancestral hominid mating system (discussed below).

Human Reproductive Strategies

Records going back to the mid-1800s indicate that over 90 percent of American men and women in every birth cohort marry. The 1982 *Demographic Yearbook of the United Nations* lists the number of men and women who have married by age 49 in 97 industrial and agricultural countries: Between 1972 and 1981, an average of 93.1 percent of women and 91.8 percent of men married in these 97 countries²⁰. These figures have not changed significantly since then⁷. Although no worldwide tabulations have been made on the percentage of men and women who marry in horticultural and hunter-gatherer cultures, the ethnographic literature confirms that marriage is a pancultural custom; in nonindustrial communities, men and women who have never married are rare.

Moreover, most men and women are monogamous; they wed only one individual at a time²¹. What is permissible to each gender varies, however. In 99.5 percent of 853 cultures for which anthropologists have data, women are permitted to marry only one man at a time, monandry. Each woman forms a social and economic relationship that entails sexual rights and privileges with only that one man.

Eighty-four percent of the 853 human societies on record permit polygyny (many women), and 44 percent of these 717 cultures regard polygyny as the preferred marriage form. However, in most of these 717 societies only about 10 percent of men actually practice polygyny. Even where polygyny is widespread, only about 25 percent of men have several wives at once. Hence, in



Divorce profiles for Finland (1987) and the United States (1986), showing the number of divorces that occur with each year of marriage. In Finland, the divorce peak occurs between the fourth and fifth years of marriage; the U.S. peak occurs between the second and third years. Data were averaged for years 10-20+ for Finland and for years 25-35+ for the United States. Data were obtained from demographic yearbooks of the United Nations and from several editions of Vital Statistics of the United States from the National Center for Health Statistics.

practice, monogyny (pairing with one woman) is the predominant marriage pattern for men, while polygyny is a secondary, *opportunistic* reproductive tactic. Because polygyny in humans is regularly associated with rank and wealth, ethologists Martin Daly and Margo Wilson propose that monogamy was even more prevalent in prehorticultural, unstratified societies²².

These data on monogamy do not suggest that human beings are sexually faithful to their spouses, however. Extra-pair copulations are commonly seen in monogamous species of birds and mammals; adultery is clearly a secondary *opportunistic* reproductive strategy in humans. However, this article addresses only the primary human reproductive strategy: monogamy, specifically *serial* monogamy, because human pairing displays several patterns of decay that are relevant to understanding the evolution and nature of human romantic love.

Human Divorce Patterns

With a few exceptions, peoples from Amazonia to

Siberia divorce. Several patterns of divorce have purely cultural explanations, but four of these patterns do not correlate with the divorce rate^{7,20}. These four patterns, I think, evolved in humans and resulted in the characteristic ebb and flow of human romantic love.

The first pattern is reflected in the duration of marriage that ends in divorce. Data from the demographic yearbooks of the United Nations on 62 available industrial and agricultural societies for all obtainable years between 1947 and 1989 (188 graphs, or cases, each showing the divorce profile for a specific country, area, or ethnic group in a specific year) indicate that divorces exhibit a skewed distribution, characterized by the occurrence of the mode (or divorce peak) during and around the fourth year, followed by a gradual, long-tailed decline in divorce counts^{7,20}. Divorces peak during and around four years after marriage.

The second common aspect of human divorce patterns evident in the demographic yearbooks of the United Nations is the age at which divorce occurs. Age at highest divorce risk was tabulated for 24 available societies in selected years (80 cases each showing the divorce profile for a specific country in a specific year) between 1966 and 1989^{7,20}. Divorce risk was highest among men in the age category 25 to 29; divorce risk for women was equally highest in age categories 20 to 24 and 25 to 29. Across the 62 sampled societies (188 cases), the mean percent of divorces that involved women under age 45 was 81 percent; the mean percent of divorces that involved men under age 45 was 74 percent^{7,20}. Thus, in the above cross-cultural sample, divorce risk was greatest at the height of reproductive and parenting years.

The third pattern is seen in the number of children per couple who divorce. In the 59 societies recorded between 1950 and 1989, 39 percent of divorces occurred among couples with no dependent children, 26 percent occurred among those with one dependent child, 19 percent occurred among couples with two dependent children, 7 percent occurred among those with three children, 3 percent occurred among couples with four young, and couples with five or more dependent young rarely split. Hence, divorce counts were highest among couples with no children or one dependent child, and they decreased with increasing numbers of dependent young. (The demographic yearbooks of the United Nations do not provide comparative cross-cultural data sufficient to establish divorce risk by number of dependent young^{7,20}.)

The fourth pattern of human pair-bonding concerns remarriage. The U.S. Census Bureau reports that approximately 75 percent of American women and 80 percent of American men who divorce remarry, and one-half of American remarriages take place within three years of a divorce⁷. Moreover, most remarriages occur during reproductive years: 76.3 percent of American women who divorce during their 20s remarry; 56.2 percent of those who divorce in their 30s remarry; and 32.4 percent of those who divorce in their 40s remarry⁷. In 1979, the modal age at remarriage for American men was 30 to 34 years, and the modal age at remarriage for American women was 25 to 29 years.

Cross-culturally, remarriage by divorced individuals also peaks among men and women of reproductive age.

Among the 98 peoples surveyed by the United Nations between 1971 and 1982, the modal age at remarriage among men was 30 to 34 years; women who remarried after a divorce were a modal age of 25 to 29 years. The United Nations Statistical Office does not tabulate the percent of divorced individuals who remarry. Remarriage is frequent, however, in those places for which data are available, and remarriage rates are highest for men and women of reproductive age.

Human marriages, then, have several general patterns of decay. They tend to disband during and around the fourth year of existence. Men and women around the world tend to divorce while in their twenties—the height of reproductive and parenting years. Men and women regularly abandon a partnership that has produced no children or one dependent child. Most divorced individuals of reproductive age remarry. And the longer a mateship lasts, the older the spouses get, and/or the more children they bear, the more likely a couple is to remain together.

Why Love Ends—and Begins Again

Why do human beings pair up, establish a home base, build networks of business associates, family, and friends, and bear and nurture children—only to leave each other and pair anew? From a Darwinian perspective, it is remarkable that we pair at all. Monogamy is rare in mammals; only 3 percent pair up, and they do so only under specific circumstances^{23,24}. Many of these circumstances may have contributed to the evolution of monogamy in hominids. But a factor proposed by Kleiman is particularly relevant. She writes that monogamy is favored in evolution “whenever more than a single individual (the female) is needed to rear the young²⁵.”

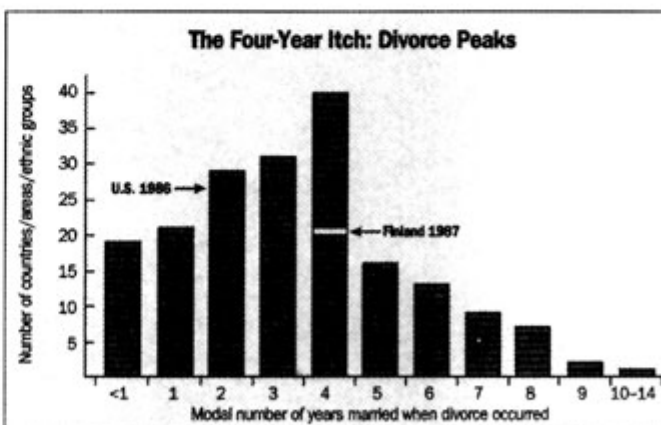
Canid species are good examples. The female red fox bears as many as five altricial kits that need to be fed almost continuously, so she must stay in the den to attend to them; she needs a mate to bring her food. For the male fox, polygyny is impractical because resources are usually spread out; he cannot acquire enough food to feed a harem. So, a male and female fox form a pair-bond in midwinter and raise their young together during the spring and early summer. But the pair-bond lasts only through the breeding season; as the kits become independent, mates part company. Serial monogamy in conjunction with a breeding season is also a common reproductive strategy among birds. In at least 50 percent of the 9,000 or so avian species, individuals pair at the beginning of the mating season, rear their chicks together until the young are fledged, and then part to join a flock. Some pair together at the beginning of the next breeding season, while others choose new mates.

Homo sapiens shares traits with seasonally parenting foxes and birds. The modal duration of marriage that ends in divorce, four years, conforms to the traditional period between human successive births, four years²⁶. So, I propose that the human tendency to pair up and remain together for a modal duration of about four years reflects an ancestral hominid reproductive strategy to pair and remain together throughout the infancy of a single highly dependent child. Once a child

living in a hunter-gatherer society could join a multi-age play group at about age 4, however, and be raised by other members of the band, the pair-bond broke up—enabling both partners to choose new mates and bear more varied young. And I think the physiologically based emotions associated with romantic love—specifically attraction, attachment, and restlessness during long relationships—evolved to stimulate this ancestral cyclic breeding system, serial monogamy.

Serial monogamy may have evolved at any of several times in hominid evolution. But it most likely occurred during the basal radiation of the hominid clade, or lineage onto the grasslands of Africa some 5 million years ago. With the evolution of bipedalism, females had to carry their infants in their arms instead of on their backs, increasing their “reproductive burden.” It is unlikely that hominid males were able to obtain enough resources to attract or sustain a harem in a savanna environment where resources were spread out and danger constant; but like male foxes and male birds of many species, they could provide supplementary subsistence and protection for a single mate.

The trajectory for the evolution of human pair-bonding may have been relatively simple. Prothominids probably traveled in communities similar to those of common chimpanzees. Then, individual females evolved “special friendships” with particular males²⁷. (A “special friendship” is a male-female relationship characterized by reciprocal perquisites and responsibilities that are commonly observed among savanna baboons.) And with time these special friendships evolved into partnerships that lasted long enough to rear the young through infancy. Those who (unconsciously) pursued serial monogamy reared more varied young, and these young disproportionately survived—passing the brain physiology for attraction, attachment, and detachment on to subsequent generations.



Composite divorce profile from 62 societies (1947–1989) showing that more divorces occur between the fourth and fifth years of marriage than at any other time. Each horizontal bar represents the peak year of divorce for each society sampled. For example, the red bar in column two represents the U.S. divorce peak, which occurs between the second and third years of marriage.

Despite the social disruption that detachment entails in humans (and many other species), serial monogamy may have had several genetic benefits in our prehistoric past. Variety in one's lineage has been mentioned. Furthermore, males who dissolved one partnership for another acquired the opportunity to select a younger mate more likely to produce more viable offspring. Ancestral females who dissolved an unsatisfactory relationship, on the other hand, acquired the opportunity to choose a mate who provided better protection, food, and nurturance for her, her children, and her forthcoming infants. So, regardless of the social complexities inherent in changing partners, serial monogamy during reproductive years became an adaptive reproductive strategy, leaving this legacy not only in contemporary worldwide patterns of divorce and remarriage but in our universal struggle with primitive, powerful, and often transitory reproductive emotions that many associate with romantic love.

Nature, Culture, and Romantic Love

Someone once asked Margaret Mead why all of her marriages failed. Mead reportedly replied, "I beg your pardon, I had three marriages and none of them was a failure." Most Americans do not view marriage so pragmatically. Even fewer are willing to consider the possibility of genetic components to divorce—largely because this perspective threatens their concept of free will. Many scientists resist exploring the biological bases of attraction, attachment, and divorce for an historical reason. Soon after Darwin proposed the concept of natural selection by survival of the fittest, these ideas were marshaled by conservatives to vindicate the social hierarchy of Victorian England. Women, poor people, immigrants, colonized peoples, and the outcasts of society were dismissed as "less fit." This credo led to a bitter reaction by the 1920s and ushered in several decades of "cultural determinism." Today, many lay people and scientists still hold that love is a purely cultural phenomenon, outside the realm of scientific inquiry.

But romantic love is an elegant example of the complex mixture of environment and heredity. Culture, for example, plays an essential role in one's choice of partner and the timing and process of courting. As children, for example, we develop specific likes and dislikes in response to family, friends, and experiences. So, by the teenage years, each individual carries within him or her an unconscious mental template, or "love map," a group of physical, psychological, and behavioral traits that he or she finds attractive in a mate²⁸. People fall in love when they are ready. Barriers (such as geographic or social constraints) enhance infatuation, as does novelty and unfamiliarity. And cultural beliefs regularly tie partners together. In fact, 50 percent of Americans marry for life—an excellent example, I believe, of the triumph of culture and personal commitment over nature.

So, culture plays a crucial role in *whom* you find attractive, *when* you court, *where* you woo, *how* you pursue a potential partner, *how* you resolve your problems, and (depending on economic factors) *how many* people stay together. But beliefs, traditions, family,

friends, books, songs, and other cultural phenomena do not teach one *what to feel* as one falls in love, becomes attached to a mate, or becomes restless in a long relationship. Instead, these emotions are generated by brain-body physiology. They evolved long ago to direct the ebb and flow of our primary reproductive strategy, serial monogamy, and they came across the eons to invigorate and complicate our lives.

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