### The Economist Explains...

### Sex, brains and inequality

# **How sexual equality increases the gap between rich and poor households**

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### IN “MAD MEN”, a series about the advertising industry in the 1960s, women are underpaid, sexually harassed and left with the kids while their husbands drunkenly philander. Sexual equality was a distant dream in those days. But when Don Draper, the show’s star, dumps the brainy consultant he has been dating and marries his secretary, he strikes a blow for equality of household income.

### Nowadays, successful men are more likely to marry successful women. This is a good thing. It reflects the fact that there are more high-flying women. Male doctors in the 1960s married nurses because there were few female doctors. Now there are plenty. Yet assortative mating (the tendency of similar people to marry each other) aggravates inequality between households—two married lawyers are much richer than a single mother who stacks shelves. A new study\* of hundreds of thousands of couples investigates the link.

### The wage gap between highly and barely educated workers has grown, but that could in theory have been offset by the fact that more women now go to college and get good jobs. Had spouses chosen each other at random, many well-paid women would have married ill-paid men and vice versa. Workers would have become more unequal, but households would not. With such “random” matching, the authors estimate that the Gini co-efficient, which is zero at total equality and one at total inequality, would have remained roughly unchanged, at 0.33 in 1960 and 0.34 in 2005.

### But in reality the highly educated increasingly married each other. In 1960 25% of men with university degrees married women with degrees; in 2005, 48% did. As a result, the Gini rose from 0.34 in 1960 to 0.43 in 2005.

### Assortative mating is hardly mysterious. People with similar education tend to work in similar places and often find each other attractive. On top of this, the economic incentive to marry your peers has increased. A woman with a graduate degree whose husband dropped out of high school in 1960 could still enjoy household income 40% above the national average; by 2005, such a couple would earn 8% below it. In 1960 a household composed of two people with graduate degrees earned 76% above the average; by 2005, they earned 119% more. Women have far more choices than before, and that is one reason why inequality will be hard to reverse.

### \*[Marry Your Like: Assortative Mating And Income Inequality](http://www.nber.org/papers/w19829), by Jeremy Greenwood, Nezih Guner, Georgi Kocharkov and Cezar Santos, NBER Working Paper 19829

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### The science of love at first sight

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BIOLOGISTS believe that love is fundamentally a biological rather than a cultural construct. That is because the capacity for love is [found in all human cultures](http://www.ted.com/talks/helen_fisher_studies_the_brain_in_love.html) and similar behaviour is found in [some other animals, such as prairie voles](http://www.economist.com/node/2424049). In humans the purpose of all the cravings, craziness and desire is to focus attention on the raising of offspring. Children demand an unusual amount of nurturing, and two parents are better than one. Love is a signal that both partners are committed, and makes it more likely that this commitment will continue as long as is necessary for children to reach independence. But what does science have to say about the notion of love at first sight?

In recent years the ability to watch the brain in action has offered a wealth of insight into the mechanics of love. Researchers have shown that when a person falls in love a dozen different parts of the brain work together to release chemicals that trigger feelings of euphoria, bonding and excitement. (These include dopamine, oxytocin, adrenalin and vasopressin.) It has also been shown that the unconditional love between a mother and a child is associated with activity in different regions of the brain from those associated with sexual, pair-bonding love.

Passionate love is rooted in the reward circuitry of the brain—the same area that is active when humans feel a rush from cocaine. In fact, the cravings, motivations and withdrawals involved in love have a great deal in common with addiction. Its most intense forms tend to be associated with the early stages of a relationship, which then give way to a calmer[attachment form of love one feels with a long-term partner. This has a slightly different chemistry](http://www.helenfisher.com/downloads/articles/08bbconair.pdf) but still involves the reward centres of the brain. What all this means is that one special person can become chemically rewarding to the brain of another. Love at first sight, then, is only possible if the mechanism for generating long-term attachment can be triggered quickly. There are signs that it can be. One line of evidence is that people are [able to decide within a fraction of a second](http://www.jneurosci.org/content/32/45/15647.abstract) how attractive they find another person. This decision appears to be related to facial attractiveness, although men also favour women with a waist-to-hip ratio of 0.7, no matter what their overall weight is. (This ratio may indicate a woman's reproductive health.)

Another piece of evidence in Cupid's favour comes from work by Ayala Malack-Pines, a psychologist at Ben-Gurion University in Israel, who found in a survey that [a small fraction (11%) of people in long-term relationships said that they began with love at first sight](http://books.google.co.uk/books?id=8pe4cgKww0cC&pg=PA72&lpg=PA72&dq=Ayala+Malach-Pines+%22first+sight%22&source=bl&ots=zvjFKdmdv5&sig=CI9cLgbyw_4vdNfFb8EWSShNvTc&hl=en&sa=X&ei=rhv6Ur3_HInY7AbjnICQBw&ved=0CFUQ6AEwBTgK#v=onepage&q=Ayala%20Malach-Pines%20%22first%20sight%22&f=false). In other words, in some couples the initial favorable impressions of attractiveness triggered love which sustained a lengthy bond. It is also clear that some couples need to form their bonds over a longer period, and popular culture tells many tales of friends who become lovers. One might also speculate that if a person is looking for a partner with traits that cannot be quantified instantly, such as compassion, intellect or a good sense of humour, then it would be hard form a relationship on the basis of love at first sight. Those more concerned only with visual appearances, though, might find this easier. So it appears that love at first sight exists, but is not a very common basis for long-term relationships.

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**I get a kick out of you**

# \* “[Why We Love: The Nature and Chemistry of Romantic Love](http://www.amazon.com/exec/obidos/tg/detail/-/0805069135/theeconomist)”, by Helen Fisher. Henry Holt and Company, New York.

# **Scientists are finding that, after all, love really is down to a chemical addiction between people**

OVER the course of history it has been artists, poets and playwrights who have made the greatest progress in humanity's understanding of love. Romance has seemed as inexplicable as the beauty of a rainbow. But these days scientists are challenging that notion, and they have rather a lot to say about how and why people love each other.

Is this useful? The scientists think so. For a start, understanding the neurochemical pathways that regulate social attachments may help to deal with defects in people's ability to form relationships. All relationships, whether they are those of parents with their children, spouses with their partners, or workers with their colleagues, rely on an ability to create and maintain social ties. Defects can be disabling, and become apparent as disorders such as autism and schizophrenia—and, indeed, as the serious depression that can result from rejection in love. Research is also shedding light on some of the more extreme forms of sexual behaviour. And, controversially, some utopian fringe groups see such work as the doorway to a future where love is guaranteed because it will be provided chemically, or even genetically engineered from conception.

The scientific tale of love begins innocently enough, with voles. The prairie vole is a sociable creature, one of the only 3% of mammal species that appear to form monogamous relationships. Mating between prairie voles is a tremendous 24-hour effort. After this, they bond for life. They prefer to spend time with each other, groom each other for hours on end and nest together. They avoid meeting other potential mates. The male becomes an aggressive guard of the female. And when their pups are born, they become affectionate and attentive parents. However, another vole, a close relative called the montane vole, has no interest in partnership beyond one-night-stand sex. What is intriguing is that these vast differences in behaviour are the result of a mere handful of genes. The two vole species are more than 99% alike, genetically.

## Why do voles fall in love?

The details of what is going on—the vole story, as it were—is a fascinating one. When prairie voles have sex, two hormones called oxytocin and vasopressin are released. If the release of these hormones is blocked, prairie-voles' sex becomes a fleeting affair, like that normally enjoyed by their rakish montane cousins. Conversely, if prairie voles are given an injection of the hormones, but prevented from having sex, they will still form a preference for their chosen partner. In other words, researchers can make prairie voles fall in love—or whatever the vole equivalent of this is—with an injection.

A clue to what is happening—and how these results might bear on the human condition—was found when this magic juice was given to the montane vole: it made no difference. It turns out that the faithful prairie vole has receptors for oxytocin and vasopressin in brain regions associated with reward and reinforcement, whereas the montane vole does not. The question is, do humans (another species in the 3% of allegedly monogamous mammals) have brains similar to prairie voles?

To answer that question you need to dig a little deeper. As Larry Young, a researcher into social attachment at Emory University, in Atlanta, Georgia, explains, the brain has a reward system designed to make voles (and people and other animals) do what they ought to. Without it, they might forget to eat, drink and have sex—with disastrous results. That animals continue to do these things is because they make them feel good. And they feel good because of the release of a chemical called dopamine into the brain. Sure enough, when a female prairie vole mates, there is a 50% increase in the level of dopamine in the reward centre of her brain.

Similarly, when a male rat has sex it feels good to him because of the dopamine. He learns that sex is enjoyable, and seeks out more of it based on how it happened the first time. But, in contrast to the prairie vole, at no time do rats learn to associate sex with a particular female. Rats are not monogamous.

This is where the vasopressin and oxytocin come in. They are involved in parts of the brain that help to pick out the salient features used to identify individuals. If the gene for oxytocin is knocked out of a mouse before birth, that mouse will become a social amnesiac and have no memory of the other mice it meets. The same is true if the vasopressin gene is knocked out.

The salient feature in this case is odour. Rats, mice and voles recognise each other by smell. Christie Fowler and her colleagues at Florida State University have found that exposure to the opposite sex generates new nerve cells in the brains of prairie voles—in particular in areas important to olfactory memory. Could it be that prairie voles form an olfactory “image” of their partners—the rodent equivalent of remembering a personality—and this becomes linked with pleasure?

Dr Young and his colleagues suggest this idea in an article published last month in the *Journal of Comparative Neurology*. They argue that prairie voles become addicted to each other through a process of sexual imprinting mediated by odour. Furthermore, they suggest that the reward mechanism involved in this addiction has probably evolved in a similar way in other monogamous animals, humans included, to regulate pair-bonding in them as well.