

The Biology of Romance: Genes, Pheromones & Oxytocin

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Technologies Conference
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The Biological Building Blocks of Love

- Love, romance and lust have been among the most enchanted, inspiring, mysterious and powerful of human emotions
- Science is now identifying the genetic, neurological, and hormonal building blocks of love and romance
- The “medicalization of love” (Earp et al. 2014)
- Neurobiologist Larry Young: romantic love is “an emergent property of a cocktail of ancient neuropeptides and neurotransmitters” (Young 2009)

MHC-dependent mate preferences in humans

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SUMMARY

One substantial benefit of sexual reproduction could be that it allows animals (including humans) to react rapidly to a continuously changing environmental selection pressure such as coevolving parasites. This counteraction would be most efficient if the females were able to provide their progeny with certain allele combinations for loci which may be crucial in the parasite-host arms race, for example the MHC (major histocompatibility complex). Here we show that the MHC influences both body odours and body odour preferences in humans, and that the women's preferences depend on their hormonal status. Female and male students were typed for their HLA-A, -B and -DR. Each male student wore a T-shirt for two consecutive nights. The next day, each female student was asked to rate the odours of six T-shirts. They scored male body odours as more pleasant when they differed from the men in their MHC than when they were more similar. This difference in odour assessment was reversed when the women rating the odours were taking oral contraceptives. Furthermore, the odours of MHC-dissimilar men remind the test women more often of their own actual or former mates than do the odours of MHC-similar men. This suggests that the MHC or linked genes influence human mate choice today.

Proceedings: Biological Sciences

Vol. 260, No. 1359 (Jun. 22, 1995), pp. 245-249







I like your genes: People more likely to choose a spouse with similar DNA

Date: May 19, 2014

Source: University of Colorado at Boulder

Summary: Individuals are more genetically similar to their spouses than they are to randomly selected individuals from the same population, according to a new study. Scientists already knew that people tend to marry others who have similar characteristics, including religion, age, race, income, body type and education, among others. Scientists now show that people also are more likely to pick mates who have similar DNA.

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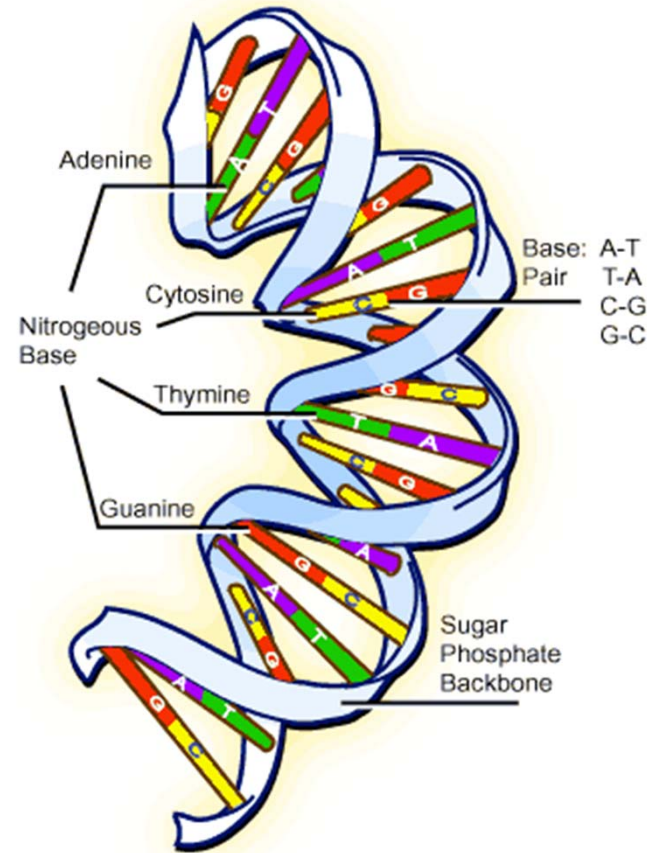
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Genetics and Happy Marriages

- Men with variant of a gene called *avpr1a* twice as likely to remain bachelors, or if they marry, are more likely to be unhappy
- Gene variant also associated with lower empathy
- Similar results with oxytocin receptor gene

(Uzefovsky et al, 2015)



Other Relevant Gene Variants

- *5HTTLPR* (serotonin transporter gene) – 2 short alleles more sensitive to negative emotional behavior; decline in marital satisfaction
- Variants in dopamine receptor D2 (*DRD2*) gene associated with age of first sexual experience and number of sex partners in previous year
- Variant in dopamine transporter gene (*DAT1*) associated with number of lifetime sexual partners
- Variants in *DRD4* and vasopressin gene [females only] associated with infidelity

The genes that turn a lady into a love cheat

YOU may have thought Amanda Holden had a fling with Neil Morrissey because she was bored with being married to Les Dennis.

Or that Zoë Ball carefully considered her options before cheating on Norman Cook with Dan Peppi.

But the truth is that, in both cases, it was probably down to their genes.

At least, that is the claim of a new study that questioned thousands of women about their secret sex lives.

The researchers asked more than 1,600 pairs of female twins about their attitudes to sex and relationships.

The women gave confidential details of infidelity and the number of sexual partners they had.

The study found that, if a woman was an identical twin and was unfaithful, the chances of her sister cheating on a partner would double.

The non-identical twin of an unfaithful woman had a 50 per cent higher risk of having an affair. The scientists concluded that genetic factors accounted for 40 per cent of the reasons for an affair.

Prof Tim Spector, director of the Twin Research Unit at St Thomas' Hospital, Central London, who carried

BY DAVID HARDING

out the study, said no one gene was responsible for the behaviour.

'There is not an infidelity gene but 50 to 100 genes are important and give us the tendency to respond to our environments in different ways,' he added.

In evolutionary terms there were good reasons for straying. Prof Spector said: 'It's important we all don't behave the same. In terms of our evolution, some people have a high tendency to multiple partners and mix the genes.'

The research also revealed the number of sexual partners a woman had was 38 per cent down to her genes.

Those who had been unfaithful had an average of eight partners, while those who hadn't strayed had four.

One in five of the 3,200 women admitted to having an affair, while nine out of ten had thought about it.

'There is not one gene, but 50 to 100'

Other women celebrities who cheated include Kelly Brook with

Billy Zane, and Ulrika Jonsson with cameraman Phil Pietrowski and later Gladiator Hunter, aka James Crossley.

The full study will be published in scientific journal *Twin Research*.



Playing away: Amanda Holden, Zoë Ball and Ulrika Jonsson



Dress excess: Kelly Brook cheated with Billy Zane

Picture: Na

METRO weather

London Today
Staying mainly overcast, but generally dry

South-East and the Home Counties

Luton 7°

Britain Today

North 10° South

Infidelity Lurks in Your Genes

MAY 22, 2015



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AMERICANS disapprove of marital infidelity. Ninety-one percent of them find it morally wrong, more than the number that reject polygamy, human cloning or suicide, according to a 2013 Gallup poll.

Yet the number of Americans who actually cheat on their partners is rather substantial: Over the past two decades, the rate of infidelity has been pretty constant at around 21 percent for married men, and between 10 to 15 percent for married women, according to the General Social Survey at the University of Chicago's independent research organization, NORC.

We are accustomed to thinking of sexual infidelity as a symptom of an unhappy relationship, a moral flaw or a sign of deteriorating social values. When I was trained as a psychiatrist we were told to look for various emotional and developmental factors — like a history of unstable relationships or a philandering parent — to explain infidelity.

But during my career, many of the questions we asked patients were found to be insufficient because for so much behavior, it turns out that genes, gene expression and hormones matter a lot.



Marion Fayolle

REVIEW

Pairomics, the omics way to mate choice

Sergio Ulhoa Dani¹, Winfried März², Paulo Mauricio Serrano Neves¹ and Gerhard Franz Walter³

The core aspects of the biology and evolution of sexual reproduction are reviewed with a focus on the diploid, sexually reproducing, outbreeding, polymorphic, unspecialized, altricial and cultural human species. Human mate choice and pair bonding are viewed as central to individuals' lives and to the evolution of the species, and genetic assistance in reproduction is viewed as a universal human right. Pairomics is defined as an emerging branch of the omics science devoted to the study of mate choice at the genomic level and its consequences for present and future generations. In pairomics, comprehensive genetic information of individual genomes is stored in a database. Computational tools are employed to analyze the mating schemes and rules that govern mating among the members of the database. Mating models and algorithms simulate the outcomes of mating any given genome with each of a number of genomes represented in the database. The analyses and simulations may help to understand mating schemes and their outcomes, and also contribute a new cue to the multicued schemes of mate choice. The scientific, medical, evolutionary, ethical, legal and social implications of pairomics are far reaching. The use of genetic information as a search tool in mate choice may influence our health, lifestyle, behavior and culture. As knowledge on genomics, population genetics and gene–environment interactions, as well as the size of genomic databases expand, so does the ability of pairomics to investigate and predict the consequences of mate choice for the present and future generations.

Journal of Human Genetics (2013) 58, 643–656; doi:10.1038/jhg.2013.86; published online 15 August 2013

The Pheromone Parties

a matchmaking experiment based on scent



get email updates about the next party
or stay tuned on facebook

participate

about

How The Party Works

1. Guests sleep in a clean, white, cotton tshirt for 3 nights in a row to capture their odor print and bring this in a ziplock bag to the party.
2. Bags are labeled pink for girl, blue for boy. Each bag is assigned a number. Only the guest knows what their shirt's number is.
3. Bags are placed on a table. Guests smell the bags at their leisure throughout the party.
4. If a guest finds the smell attractive, they take a picture with the bag at a photographer station. These pictures are projected as a slide show on the wall at the party.
5. If you see a picture of a guest you find attractive holding your number, this is the greenlight to talk to them. Haaaay.
6. At the end of the party, a facebook album is created and all of the pictures are tagged - so if you missed your match at the party, you can still contact them.



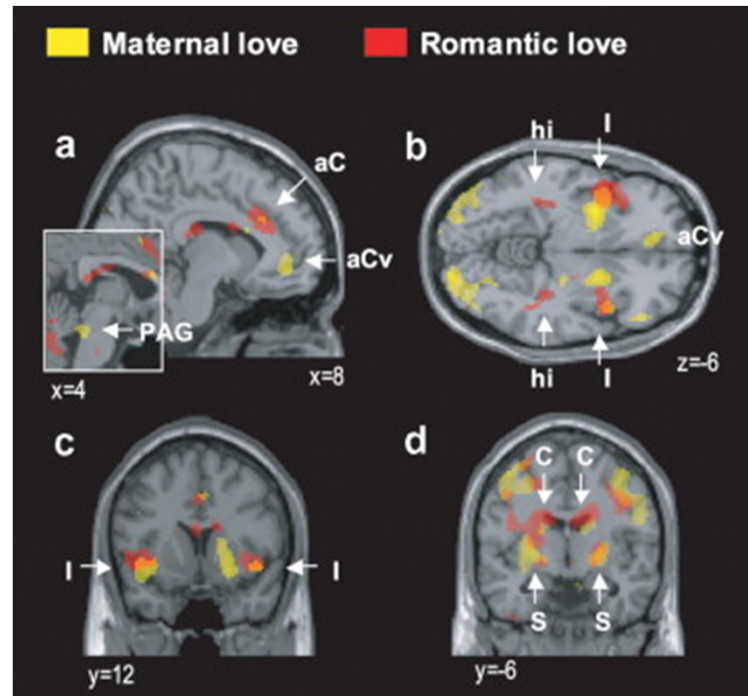


Fig. 4 Brain activity produced by maternal love and romantic love (in both males and females) (shown in red and yellow). Note that there are considerable areas of overlap, although there are as well regions that are activated only by maternal or romantic I...

S. Zeki

The neurobiology of love

FEBS Letters, Volume 581, Issue 14, 2007, 2575 - 2579

<http://dx.doi.org/10.1016/j.febslet.2007.03.094>

Jun 20, 2012 3:18pm

Are You In Love or Lust? Depends on Which Part of the Brain Is Activated

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Getty Images

Is it love, or just lust? The answer, it turns out, might have to do with which part of our brain is being activated.

The study, published Wednesday in the [Journal of Sexual Medicine](#), analyzed 20 studies related to the effects of sex and love on the body. The research included brain scans of people who viewed erotic photos, photos of their significant others, food and other pleasure triggers.

Brain Scans and Love

Brain Scans Could Reveal If Your Relationship Will Last

By: Natalie Wolchover, Life's Little Mysteries Staff Writer

Date: 14 February 2012 Time: 10:42 AM ET

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When you're in the early stages of falling in love, you might hide it from friends and family. But you can't hide it from neuroscientists. By charting brain activity with an fMRI (functional magnetic resonance imaging) machine, scientists can spot telltale regions of your brain glowing joyously when you look at a photograph of your beloved.

Deep inside, your mind may already be made up about the fate of your relationship.

Oxytocin and the Prairie Vole



Prairie vole is a monogamous species. That is, it finds a mate and stays together for life

Its close cousin, the Montane vole, is non-monogamous. It never mates with the same partner twice

Yet, the Prairie vole and Montane vole have essentially the same brain and very similar genetics.

Effects of Oxytocin on Behavior: Moles

- Injecting oxytocin into a Montane vole will cause it to temporarily act like a Prairie vole (i.e. monogamous)
- Injecting a Prairie vole with an oxytocin blocker will cause it to temporarily act like a Montane vole (i.e., non-monogamous)

Oxytocin: The “Love Hormone”

- In humans, oxytocin levels increase when we are in love, increase when we simply touch our pets, and, in women, increase dramatically just after childbirth or when breastfeeding
- People in love have higher levels of oxytocin; people in distressed relationships have lower oxytocin levels
- Nasal spray of oxytocin strengthens romantic bonding, increases sexual receptivity, and cures impotence

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Policy/Legal Issues

- Bio-reductionism
- Privacy and stigma
- Neuro-enhancement of relationships
- Blocking pathological relationships
- Involuntary chemical interference in relationships
- Guilt/Innocence
- Excuse

Bio-Reductionism

- Concern that focus on molecular level will under-emphasize important sociological, psychological, and political factors
 - May promote “disease mongering” by pharmaceutical companies
 - e.g., “commitment phobias,” “hypoactive love disorder,” “adultery proneness syndrome” (Earp et al, 2014)
 - May result in pathologizing sexual differences

Privacy and Stigma

- What are personal and social implications of discovering that ne carries gene variant predisposing to be bad spouse
 - e.g., newborn whole genome sequencing
- Can/should prospective spouse request genetic testing of partner
- Surreptitious testing – not health related, not protected in many states

Natural Selection, Childrearing, and the Ethics of Marriage (and Divorce): Building a Case for the Neuroenhancement of Human Relationships

Brian D. Earp • Anders Sandberg • Julian Savulescu

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Abstract We argue that the fragility of contemporary marriages—and the corresponding high rates of divorce—can be explained (in large part) by a three-part mismatch: between our relationship values, our evolved psychobiological natures, and our modern social, physical, and technological environment. “Love drugs” could help address this mismatch by boosting our psychobiologies while keeping our values and our environment intact. While individual couples should be *free* to use pharmacological interventions to sustain and improve their romantic connection, we suggest that they may have an *obligation* to do so as well, in certain cases. Specifically, we argue that couples with offspring may have a special responsibility to enhance their relationships for the sake of their children. We outline an evolutionarily informed research program for identifying promising biomedical enhancements of love and commitment.

Chemical Enhancement of Love

- Advocate recommends that court require parents in troubled family to be treated with love-enhancing agent as a condition for keeping custody of their children
- Covenant marriages – couple agrees in marital contract to periodically reinforce romantic bond with chemical agent
 - what if one spouse later elects against treatment

Blocking “Perilous Loves”

- Abused partner who keeps returning to abusive relationship
- Romantic love for someone already married or otherwise unavailable
- Pedophilia
- Incestuous love
- Love for a cult leader
- [Homosexual or inter-racial love]
 - Earp et al. 2013

Real Life Examples

- Sex offenders offered “chemical castration” with anti-androgen drugs
- Media reports of some ultra-Orthodox yeshiva students in Israel being given psychiatric drugs by rabbi to suppress sexual urges
- Christian man suffering from internet “sex addiction” prescribed oral naltrexone to control urges
 - Earp et al 2013

Involuntary Exposures to Love-Enhancing or Anti-Love Agents

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Earp and colleagues (2013) address the ethics of voluntarily treating consenting individuals with anti-love agents. However, if and when such agents become available, they, along with ones that induce positive emotions of love, could also be used in a variety of contexts to covertly and involuntarily manipulate pro-love or anti-love emotions in unsuspecting individuals. We briefly discuss such potential scenarios here, along with current legal protections and the need to strengthen those protections in anticipation of this emerging technology.

POTENTIAL SCENARIOS

Some applications of pro-love or anti-love agents could be beneficial, depending on where one draws the ethical red line. Yet one can envision inappropriate, manipulative instances where such substances could be misused to gain an unfair advantage. Use of bio-agents to evoke particular responses in human beings is certainly not new and is continuing. From historical examples of germ warfare to gain tactical or strategic advantages over one's enemies to recent reports of modern-day "energy sprays" (e.g., <http://sprayable.co>), the study and development of such

dle loving emotions between committed partners in a long-term relationship (Savulescu and Sandberg 2008; Wudarczyk et al. 2013); (2) help foster or adopted children bond with their new families and vice versa; (3) assist people subject to abuse to gain trust, confidence, and hope; (4) support people in cases where adaptation to new or extreme situations is required; or (5) help promote or increase compassion in individuals where such a trait is beneficial to their role in life (e.g., priest, counselor, or caregiver).

When it comes to love-diminishing interventions, there are, of course, the examples cited by Earp and colleagues, along with the following scenarios, where application of a particular technology may be beneficial in some circumstances but not in others. For instance, consider administering an anti-affection cocktail to (1) help end a marriage with one's clingy spouse; (2) disrupt a loved one's interest in a romantic rival; (3) curtail a teenager's romantic interest in a bad choice; (4) disturb a relationship out of personal spite or a feud; (5) interfere with nonromantic affections; (6) eliminate parental preference for a rival sibling; or (7) defeat employer loyalty and affection toward a workplace competitor.

Involuntary Love-Enhancing or Love-Diminishing Agents

- Man on date sprays companion with love-enhancing agent
- Spouse secretly administers anti-affection cocktail to help end a marriage with clingy spouse
- Parents expose teenage child to curtail her romantic interest in a bad choice

Involuntary Exposures: Legal Remedies

- Crime to try to manipulate someone by involuntarily exposing them to love-enhancing or love-impeding agent?
 - Generally not recognized crime, but can be aggravating factor in recognized crime such as rape
 - Question: how is this different from alcohol, perfume, flowers, etc
- Tort of battery? Trespass?
- Only 8 states now recognize “heart balm” torts (e.g., alienation of affection)

Guilt/Innocence

- Study identified fMRI profile of stalkers
 - Pre-crime enforcement? (Marazziti et al, 2015)
- Many drugs have side-effects that include aberrant sexual behavior
 - e.g., May 2015 – Pfizer agrees to settle claims that Parkinson's drugs caused sex addiction and hypersexuality
 - Could someone convicted of sex crime use such evidence as mitigating factor?

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The Telegraph

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Parkinson's caused teacher's child porn habit, judge rules

A former headmaster who had thousands of indecent images of children on his computer walked free from court after a judge ruled the drug he had taken to treat his Parkinson's disease was responsible for his crime.

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Philip Carmichael had 8,000 images and videos on his computer Photo: INS News Agency Ltd

By Chris Irvine

9:21AM BST 12 Sep 2008

Philip Carmichael said the drugs he was taking caused him to become hyper-sexually active.

The 58-year-old from Wantage, who had 8,000 images and videos on his computer, including one of a nine-year-old girl before he started taking the drugs, was given an absolute discharge despite pleading guilty to the offences.

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Britain celebrates VE Day



VE Day remembered



Princess Charlotte in

Conclusion

- Genetics, neuroscience and endocrinology increasingly identifying biological building blocks of love, romance and lust
 - Like all behavioral scientific data, these data are noisy, complex and need more validation
- Implications
 - Benefits for better relationships?
 - Potential for misuse?
 - How does it affect our perceptions of love and romance?

Richard Feynman

- “I have a friend who's an artist and has sometimes taken a view which I don't agree with very well. He'll hold up a flower and say "look how beautiful it is," and I'll agree. Then he says "I as an artist can see how beautiful this is but you as a scientist take this all apart and it becomes a dull thing," and I think that he's kind of nutty. First of all, the beauty that he sees is available to other people and to me too, I believe. ...At the same time, I see much more about the flower than he sees. I could imagine the cells in there, the complicated actions inside, which also have a beauty. ... All kinds of interesting questions which the science knowledge only adds to the excitement, the mystery and the awe of a flower. It only adds. I don't understand how it subtracts.” (Quoted in Earp et al. 2014)