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February 12, 2009 in Mind & Brain | 0 comments | Post a comment Optical Illusions and the Illusion of Love How do we fool thee? Let us count the ways--that illusions play with our hearts and minds By Susana Martinez-Conde and Stephen L. Macknik SHARE 1 diggs diggit Idiggs diggit Image: Stumple! Like it? Image: ShareThis



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This is the seventh article in the <u>Mind Matters</u> series on the neuroscience behind visual illusions.

It's Valentine's season, which means that everywhere vou look there are heart-shaped balloons, pink greeting cards and candy boxes filled with chocolate. But what is true love? Does it exist? Or is it simply a cognitive illusion, a trick of the mind? Let us count the ways. Contrary to the anatomy referenced in all of our favorite love songs, love (as with every other emotion we feel) is not rooted in the heart, but in the brain. (Unfortunately, Hallmark has no plans to mass-produce chocolate-covered arrow-pierced brains in the near future.) By better understanding how the brain falls in love, we can learn about why the brain can get so obsessed with this powerful emotion. In fact, some scientists even see love as a sort of addiction. For instance, neuroscientist Thomas Insel and colleagues at Emory University in Atlanta discovered that monogamous pair bonding has its basis in the same brain reward circuits that are responsible for addiction to drugs such as cocaine and heroin. Their study was conducted in the prairie vole, a small rodent that mates for life. But the conclusions are probably true for humans, too, which may explain why it is so hard to break up a long-term romantic relationship. Losing someone you love is like going through withdrawal.

This month's slide show features a number of visual

illusions with a romantic motif. We hope that you and your special one will enjoy them. And remember, even if love is an illusion, that doesn't mean it's not meaningful and real (to our brains, anyway).

Are you a scientist? Have you recently read a peer-reviewed paper that you want to write about? Then contact Mind Matters editor <u>Jonah Lehrer</u>, the science writer behind the blog <u>The Frontal Cortex</u> and the book <u>Proust Was a</u> <u>Neuroscientist</u>. His latest book is How We Decide.

ABOUT THE AUTHOR(S)

Susana Martinez-Conde is director of the Laboratory of Visual Neuroscience at the Barrow Neurological Institute in Phoenix. She holds a Ph.D. in medicine and surgery from the University of Santiago de Compostela in Spain. Stephen L. Macknik is director of the Laboratory of Behavioral Neurophysiology at the Barrow Neurological Institute and earned a Ph.D. in neurobiology from Harvard University.





Pop! Goes My Heart

Nothing is more romantic than curling up in front of a fire with your loved one on Valentine's Day, as you lovingly whisper, "chromostereopsis." Okay, maybe it's not as passionate as a sonnet-unless you are a vision scientist. Look at the red and blue hearts and examine their depth with respect to the background. Most people find that the red heart pops in front of the blue background whereas the blue heart sinks beneath the red background. This illusion comes about because our eyes' lenses refract blue light more than red. This phenomenon is called a chromatic aberration; another example of this effect is seeing a rainbow when you shine white light through a prism. When both eyes view the red and blue images simultaneously, the cornea and lens of the eyes refract different amounts of the colors, which results in their systematic and symmetric binocular mislocalization. The brain deals with this sensory aberration by imagining depth-the red heart is in front of the blue background and vice versa-even though none actually exists.





Illusions That Move the Heart

Your wandering eyes pull at your lover's heartstrings. In this illusion, the heart appears to move and even pulsate as you look around the image. When your eyes move, they shift the retinal images of the white/black edges in the pattern, activating the motion-sensitive neurons in your visual cortex. This neural activation leads to the perception of illusory motion. Note that if you focus your gaze on a single point, the illusory motion slows or stops.





Illusory Neon Heart

Notice that the yellow fields inside of the heart appear paler than the fields forming the contour of the heart, which appear to be a darker shade of yellow/orange. Right? Wrong. Actually, all of the yellow fields in the figure are identical. Any differences that you see are all in your mind. This effect is called "neon color spreading," because it resembles the effect of the light spreading from a neon lamp. The neural underpinnings of this effect are not yet understood.





Is Love an Illusion?

Spanish essayist Miguel de Unamuno said, "Love is the child of illusion and the parent of disillusion." Is this view cynical or biologically based? This series on the neuroscience of illusions highlights that illusions are, by definition, mismatches between physical reality and perception. Love, like all emotions, has no external physical reality: it may be driven by neural events, but it is nevertheless a purely subjective experience. So, too, is the wounded heart we have drawn in this slide. Where the arrow enters and exits the heart there is no heart whatsoever, except for how the arrow itself defines the edges of the imagined heart.

This effect is called an "illusory contour." We perceive the shape of the heart only because our brains impose a shape on to a very sparse field of data. Neuroscientist Rudiger von der Heydt, of Johns Hopkins University, has shown that illusory contours are processed in neurons within visual brain area called V2. The illusory heart even looks slightly whiter than the background, although it is actually the same shade. Much of our day-to-day experience is made up of analogous feats of filling in the blanks, as we take what we know about the world and use it to imagine what we don't.





Love and Amor

Here we see that love and *amor* are two sides of the same ambiguous object. This sculpture represents an "ambigram." Judith Bagai, editor of *The Enigma*, the official journal of The National Puzzlers' League, coined the term by contracting the words "<u>ambiguous" and "anagram</u>" (the original ambigrams were represented by the same word in both directions).





Love and Hate

Even more ambivalent is this mirror-symmetric ambigram of love and hate. Talk about mixed feeling two hope she brings a mirror on her Valentine s Day date. There is even a T-shirt available at http://www.madeindesign.com/prod-Psyshirt-love-femme-Pa-Design-refpa85t11.html.





Seven Hearts

Ambiguity and camouflage both make it difficult to understand what you are seeing. In this painting by Jim Warren, seven hearts are hidden in the romantic scenery.





For Coffee and Tea Lovers

"Yuan yang" is a typical Hong Kong beverage mix of tea and coffee, and also a symbol of marriage and love. Sculptor Tsang Cheung-shing has united both concepts in a beautiful ceramic work, in which tea and coffee poured from two stylish cups meet and kiss each other.



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Love Is All Around

Romance is not just a concept for humans and voles. This slide shows that love, and illusions, surround us all.