compos mentis

A Re-Invention of Love

Bahaa Arbid
Loyola University Chicago

ABSTRACT
With the maturation of the field of neuroscience and discovery of new methods to explore the deepest corners of our psyche we are confronted with many questions never before imagined. In particular, love has currently come under the scrutinizing lenses of fMRI machines and EEGs to properly track its expression in the brain. In theory, like any other biochemical pathway, knowledge of love's associated pathways would allow one to physical intervene on the part of love: either elating the sensation or disrupting it entirely. More than a hypothetical, however, the long mythical 'love potions' and anti-love drugs are already in development and are now demanding of us to consider the nature of love and our subsequent role in crafting it. Brian D. Earp and colleagues, taking center stage on the discussion and optimistic of our role in crafting love, have already begun establishing the promises and possible ethical guidelines for the use of said drugs. Though his last criteria of 'necessity,' requiring one to exhaust every other non-pharmaceutical mean before taking the drug, has recently been scrutinized and even Earp considers this possibly sets the bar too high for the use of these drugs. As I will argue, the generalized use of this technology, as will be allowed with the removal of the 'necessity' requirement, would risk more than one would gain. This is because love is more than just a one-dimensional emotion, but rather a more complex human experience deeply intertwined with who we are. Moreover, to unnecessarily medicate the sensation would ignore personal and societal causes to ones distress and would further disempower us from dealing with our own perceptions of love. This is not to say, however, that this new perspective on the influences of love is not beneficial. Rather I believe demystifying the experience of love could serve in crafting in us better-equipped lovers. While an exciting avenue, we must distinguish between proper care and over-medicalization lest the disenfranchisement of ourselves from our emotions leaves us more confused than when we began.

KEYWORDS
Anti-Love Drug, Neuro-Enhancement, Love, Medicalization, Commercialization, Safety

I. INTRODUCTION

Rick Sanchez, the fictitious crazed scientist in the animated series *Rick and Morty*, once inquired to his grandson Morty, "Does evil exist and, if so, can one detect and measure it?" Such a wide-ranging question, it would demand reflection on the nature of evil, the role humans on earth, and the extent of human knowledge. Quickly shut down however, Rick continues, "Rhetorical question Morty, the answer's yes; [burping] you just have to be a genius" ("Something Ricked This Way Comes"). Time and time again, the progression of science has forced the reinvention of our worldview, and even our most foundational beliefs and ideals can fall from grace. Though this is nothing new, stretching back to the era of the Enlightenment and beginnings of the Scientific Revolution where the words of the existentialist philosopher Nietzsche could not have rung more true, "God is dead … and we have killed him." A seemingly mad idea, but the nuanced quote from *Parable of a Madman* can be best understood as how after the Enlightenment and Scientific Revolution God, once the centerpiece of a fulfilling life, took a diminished role in our daily lives. Before us stands a similar crisis: the maturation of the field of neuroscience. As we begin to explore the nature of our own being we similarly find ideals such as personhood, freedom of will, and consciousness called into question.

In particular, the nature of love has recently come under the scrutinizing lens of neurobiology. Love, as conceived by multiple neurobiological studies, is now deemed to be no more than a pattern of associated neurochemicals and hormones (Fisher, Aron, and Brown 2005). In a passion to better understand our world, science has seemingly robbed it of its mystery and beauty. Agreeably, the idea of neuroscientists carting off love sick and heartbroken individuals into MRI machines (magnetic resonance imaging used to track blood flow in the brain) to map out the expression of emotions in the brain seems deeply unromantic. However, to better understand love's neurobiological influences has the ability to create in us more knowledgeable, and therefore better-equipped, lovers. Like Nietzsche, who strove to exhibit the origins and therefore demystify concepts such as good and evil, neuroscience is similarly reorienting our perspectives on love by exposing its physical underpinnings. Though, unlike Nietzsche, neuroscience equips us further with a much more powerful tool: physical intervention. As we learn more about the associated pathways and neurochemicals of love, intervention becomes a more tangible reality and a readily available tool to grapple with the highs and lows of

love. According to the latest issues of *Nature,* the long-mythical pharmaceutical 'love potions' and anti-love drugs are in the making (Young 2009). This raises a number of questions: first, is love ultimately reducible to neurochemistry? Second, would it be desirable to use chemical interventions to support or undermine love? And lastly, with this newly found perspective of love, what is left of our prior conceptions and idealizations of it?

Brian D. Earp and his colleagues, committed to the role that neuroenhancements could take in relationships, have already published multiple papers outlining the promises and ethics of anti-love drug technology, or as he states it a 'chemical breakup.' Making the case for anti-love drugs, described as "any substance that works to block or diminish a feeling of love, lust, attraction or attachment," Earp speaks on certain 'perilous loves' that would be beneficial to disrupt (Earp 2013). Perilous loves may include an unrequited love that arouses thoughts of despair or suicide, incestuous love, pedophilia, and so on. The most persuasive example was for those who were tied down to abusive relationships and could not compel themselves to leave (Earp 2017). New findings in neuroscience are now suggesting that this is due in part to the fact that the same pathways responsible for the sensations of love are the that go awry in addiction (Zeki 2007). Clearly, there are certain manifestations of love that are not healthy, and it would serve us all well to curb these forms of love. As such, the idea of positive intervention to suppress love is a promising and exciting avenue.

However, those advocating for the more general use of these drugs make the all too common mistake of neuro-realism. Coined by bioethicist Eric Racine, neuro-realism, used to describe neuroscience in the popular media, is the tendency to over exaggerate the qualifications of a particular research (Racine 2006). To do so is understandable, especially when pertaining to neuroscience, because the findings are both incredibly interesting and far-reaching: one need not go further than the science tab of a news site to find stories reading 'Neuroscience Proves Free Will Doesn't Exit!' and 'Dawn of the Super Soldier in the Era of Neuroscience.' However, to do so ignores both the limitations of the findings as well as the grander social and ethical effects. Herein lies a few considerations to hesitate popping a pill after your most recent heartbreak. In particular, the shift towards medicalization of an otherwise normal human experience and subsequent commercialization of love should raise concern. As I will argue, while society as a whole could benefit from the demystification of love and individualized positive interventions, a more

generalized use of therapy does so with a serious misunderstanding of the nature of love.

II. NEUROBIOLOGICAL FOUNDATIONS OF LOVE

a. 'Your Love is My Drug'

In order to best tackle the neurochemistry of love and the ethics of love drugs, a bit of background on current findings is necessary. From the perspective of the brain, love is, "a complex neurobiological phenomenon" deeply rooted within the, "trust, belief, pleasure, and reward activities within the brain," which constitute the limbic processes (Esch and Stefano 2005, 175). Evolving from our ancient ancestors' reproductive needs, love's ability to bring and keep human beings together has played a key role in maintaining the species (Earp 2017). It is important to note that this is not limited to sexual desire and/or possessiveness, but also encompasses a deep desire for intimacy. Moreover, a "craving for emotional union supersedes the need for sexual contact" (Fisher, Aron, and Brown 2005, 494). This can otherwise be defined as 'romantic love.' This system of adult bonding seems to have its roots from early structures involved with mother-infant bonding. As higher order functioning came about, this system was only reinforced and selected for, as greater paternal investment was needed to care for offspring with increasingly large and complex cerebellum, who, in turn, required greater attention and protection in the early stages of life (Young 2009).

Underlying human love, then, is a set of basic brain systems for lust, attraction, and attachment (Fisher, Aron, and Brown 2005, 494; Earp 2017). As proposed by Helen Fisher and her colleagues, attraction enables and motivates individuals to seek out a range of mating partners; attraction motivates individuals to focus their efforts on a specific partner i.e. partner preference; and the attachment system ensures both parents stay together long enough to fulfill their parental duties (Fisher, Aron, and Brown 2005, 494). These three systems, though interrelated, are distinct enough to where neurologists can distinguish say romantic love from lust via their distinctive neurochemical patterns and pathways.

To see how these ancient systems manifest themselves, one need not look further than the countless amounts of novels, songs, and poems given to the subject of love. Writing to the all-encompassing feeling, Nizar Qabbani writes:

I hadn't told them about you,

But they say you in my eyes.

I hadn't told them about you,

But they saw you in my written words.

The perfume of love cannot be concealed

As such, the sensation of love is all consuming and, in many cases, literally addicting. The areas of the brain activated in response to romantic feelings are largely co-extensive with regions high in concentrations of neuro-modulators associated with reward and desire as well as addiction and euphoric states, namely dopamine. These same regions become active when exogenous opioid drugs like cocaine are ingested (Zeki 2007). Further research suggest people in love are similar to individuals suffering from Obsessive Compulsive Disorder – not only mimicking their obsessive thinking and compulsive behavior but also paralleling certain physiological cues such as low levels of the neurotransmitter serotonin in the blood (Marazziti, Akiskal, Rossi, Cassano 1999). As such, romantic love is in many ways involuntary and difficult to control, altering the reward system to drive goal directed behaviors (Fisher, Aron, and Brown 2005, 494).

b. What the Science Actually Tells Us

While studies, such as those discussed above, are beginning to crack the underpinnings of love, their associated limitations should be considered. By probing the neurochemical foundations of love the prospects of active intervention are becoming much more likely. Indeed Earp is optimistic that as techniques in neuroimaging, neurobiology, brain modeling, and drug delivery continue to advance we may find ourselves with an array of love-diminishing interventions able to counter problematic passions (Earp 2017). The excitement of learning the underpinnings of love is real (take for example Brain Harp and his "Emotional Arcade" where contestants compete to see who can feel a certain emotion the hardest as tracked by an EEG headset). However, it is important to understand what we are actually uncovering and how they should be interpreted. While I cannot go fully into these criticisms, I will quickly outline them for the sake of future

arguments: particularly the ill found interpretation of love as a sort of 'recipe' of neurochemicals.

For one, Earp's optimisms for anti-love drug therapies operate under the assumption of love as analogous to its associated neurochemicals. This is because the neurochemicals we observe, while generating some distinctive patterns in our brain, are not operating in a vacuum. Take for example a famous study done on prairie voles – often used to study human mating because they are known for "coupling up into life-long pair bonds, for sharing parental roles, and egalitarian nest building" – to explore the role of oxytocin and vasopressin in modulating attachment and bonding behaviors (Mallet). It was found that introducing oxytocin antagonists caused the otherwise committed partners to split up and look for other mates. Similarly, a more promiscuous species of voles would form life-long pairs after the addition of oxytocin (Liu and Wang 2003; Cho, DeVries, Williams, Carter 1999). While an oversimplification, oxytocin was deemed the 'bonding chemical.' Additional research has shown to confirm these results, but it is usually overlooked that the voles were not simply injected with oxytocin or oxytocin antagonists, but rather required six hours of cohabitation with other voles. As Mohamed Kabbaj, a neuroscientist at Florida State University in Tallahassee, told *Nature*, "The drug by itself won't do all these molecular changes—you need the context: It's the drug plus the six hours of cohabitation" (Wang, Duclot, Yan, Wang, and Kabbaj 2013). Scientist later pointed to an epigenetic system, a control of genetic expression, to explain the results. While dependent on neurochemicals, the expression and development of love cannot be reduced to said chemicals. Rather, love is a complex phenomenon that involves multiple chemical, biological, and sociological factors.

Skepticism runs even deeper with many believing a specific recipe for love could never be found. The biggest reason being that we all have different chemical starting points and what could be considered my love drug could be your hate drug (Mallett). Also, we should be wary of the reductivist argument that explains love as a combination of certain neurochemicals. As put by Larry Young, a professor in the Department of Psychiatry at Emory University, "It would be impossible to make a drug that would block a specific bond because there is no single molecule that is involved in love, per se," he says, "I think you have to think of chemistry in combination with connectivity." Being such an intense emotion and deeply intertwined with other regions of our brain such as those concerning

memories, love cannot be disrupted by simply altering the chemistry. While we have intervened on behalf of the neurochemistry, the overall neural circuitry that our particular love stories have woven would not be affected (Szalavitz).

III. THE PROMISES OF INTERVENTION AND LIMITS AS PROPOSED BY EARP

Thus far, I have shown you that love is not reducible to its neurochemical underpinnings as Earp might hope. However it is clear that love can be affected by chemical interventions and as drug therapies that affect relationships are already in development, we need to grapple with whether we *ought* to chemically intervene with love processes. Take for example the ideal case for intervention as laid out by Earp and his colleagues of a mother trapped in a physically and verbally abusive relationship (Earp 2013). While objectively realizing leaving is both best for herself and her children, she always believes in her husband when he swears his eternal love for her and promises to stop. Understanding the intense and strong feelings that tie her down, would it not be morally permissible, so long as she was not coerced, to take a pill that alleviates her from said emotions? Earp would think so and follows through by laying down the guidelines to expand on when it may be appropriate for such a chemical break up: 1) The love in question is clearly harmful and needs to dissolve one way or another, 2) The person would conceivably want to use the technology—and if he or she did want it, there would be no problematic violations of consent, and 3) The technology would help the person follow his or her higher order goals instead of his or her lower order feelings. As it is understood, an individual who fulfilled these requirements would have pursued the drug for the right reasons, is operating of their own free will, and, instead of being driven by one's emotions, would be acting on their sense of reason. However, the strongest moral justification for undergoing the use of love intervening drugs would be, 4) It might not be psychologically possible to overcome the perilous feelings without the help of anti-love biotechnology. This requirement has been the most scrutinized by bioliberals, those advocating for the more general use of cognitive enhancement, as 'setting the bar too high.' However it is here many begin to ignore the grander societal consequences of such an intervention in favor of immediate results. As I will argue, it is this requirement that prevents the harmful effects that can be associated with the generalization of such technologies.

IV. DANGERS OF GENERALIZED USE AND WHY THE FOURTH CRITERIA SHOULD BE RESPECTED

a. Nature of Love

Medicalization is a termed coined by sociologist to define the process, "by which 'non-medical' (or 'life' or 'human') problems become understood and treated as 'medical' problems" (Conrad 2007). The notion in itself is meant to be neutral and in his paper *On Good and Bad Forms of Medicalization* Erik Parens states, "as tempting as it is to lie down and rest with our favorite insight, we need to gather the energy to have a conversation about the difference between good and bad forms of medicalization." While many of the promises and ideal cases for love drug interventions have been explored, it is necessary to reflect on the limitation of said interventions as most properly reflected in Earp's fourth criteria of necessity.

As explained above, love is a powerful force whose symptoms such as obsessive and consuming thoughts can have an incredibly debilitating effect on an individual's life. Consider then the temptation to use these interventions when love is most powerful: first love as a teenager. While it is not necessary to intervene in such cases, one could still argue a case for an individual's well being: the incredibly consuming nature of love is a distraction and an unnecessary source of potential suffering, and so it should be disrupted if wished. Take for example then a teenager, we'll call him Bob, who has recently fallen in love, but considers his thoughts on his newfound love to be excessive and distracting from other areas of his life such as academics, sports, etc. If, say, his beloved had also rejected him it would only exasperate the situation. Not being coerced into the decision by a parent, he desires to intervene, and, in doing so, follows a 'higher order goal' (academic or athletic success) rather than maintaining his love, a 'lower order feelings' driven by the prospects of reproductive success more so than anything else. The case fulfilling Earp's first three criteria, it would then seem appropriate to follow through with the intervention. However, drugging an otherwise normal human experience, especially one as critical as a first love, misunderstands the nature of the experience.

Love, as in Bob's case, is more than just an emotion or drive to compel animals to breed, and rather serves a more holistic goal in the life of an individual. Many 'self-shaping' enthusiasts and bioliberals miss this point by reasoning

that enhancements, such as love interventions, reach the same end as non-pharmaceutical means, getting over our obsessive or painful love, but do so more efficiently. They consider that if both conventional and pharmaceuticals methods are simply aiming at a change in neural circuitry then it would be illogical to not pursue the easier method to do so. In response, one must make the distinction between properly integrating an experience and simply blunting an emotion. Whilst both end up moving on – as reflected in the neural chemistry of romantic love's associated pathways more or less inactivated – I would not consider them equal. One important reason, as such, is the context this love was overcome, which aims to morph brain physiology in its entirety when engaged as opposed to knocking out a step in a biochemical or neurological pathway (as was the case in the vole experiment in the prior section). For Bob to engage his emotions enables a much grander effect on his psyche than simply moving on. In many ways it crafts his definition of love for future reference. To lose this would be a hit to our future emotional health. As commented on by Dr. Niloo Dardashti, an adult and couples therapist in New York, to reflect on our first love reminds us how, "surprised and open and receptive" we can be and encourages us to engage this behavior in future relationships. In particular she emphasizes the strength of the emotions associated with a first love to be particularly important in said reflection (LaFata). Similarly the beauty of love is in its ability to show us the world through, "the point of view of difference" as opposed to one of self-interest and to feel conflicted when confronted as such is to be expected (Badiou 56). Its an important challenge, however, forcing us to consider the feelings of the other, but instead one only reaffirms a narcissistic world view by simply blunting their emotions and walking away. What a reasonable individual may then define as an inconvenience, whose disruption would be an opportunity for growth via 'self-shaping,' as Bob had, would in fact undermine a critical opportunity to do so. The experience of love is multi-dimensional, interconnected to memories and powerful emotions, but under the lens of medicalization it tends to be reduced to either a pleasantry to uphold or suffering to cure. This view of love only considers its immediate effects whilst ignoring the grander role it plays in developing our emotional and social health.

Another concern of medicalization is that its narrow focus on an individual's biology is incredibly disempowering, contrary to the opinion of many bioliberals. To use the language of Parens, to medicalize heartbreak we are under the

impression of ourselves as *objects*, at the will of neurobiology, rather than *subjects*, with a freedom to choose and to be reasoned with (Parens 2011). While our particular neurochemical patterns are correlated to ourselves, they are by no means a one to one cause of our individual behaviors and tendencies. In fact, to rewire the emotion medically largely ignores both the societal influences and personal tendencies, which led to emotional distress. Consider again Bob, the overly excitable teenage lover. What if his distress is due to a particular attraction to women who are cold and belittling? While it may seem strange it is important to note that we are not free to love just anyone, but rather form strong psychological types from early childhood. This is because what we are looking for in love is not necessarily someone who is pure or kind, but rather someone who is familiar ("Who We Can Love"). If Bob's first 'loving relationship' was with a distant and cold mother then it may not be unlikely that Bob would attempt to emulate this love on the basis of familiarity, especially as he is first engaging romantic love. Such love maps are already difficult to tease out, but now consider the effect of love drug interventions that work to alleviate the negative outcomes without addressing the distorted perception: in short, our goals in love become even harder to realize. While these interventions can divert our attention away from specific individuals, they cannot probe these distorted perspectives as a whole. If we make no attempt to reason the gap between what we thought we wanted and the negative outcome in favor of medicating an emotion then we risk our emotional health and ability to expand our notions of love. This is because to medicate would be to concede to the notion that our emotions cannot be influenced, reasoned, or reflected upon, but, at best, only redirected. As I argue, while love in its immediacy may seem to warrant an external intervention, we risk losing much more than we hope to gain. In fact, what we gain seems to be little more than a short-lived sense of comfort in exchange for our overall sense of emotional and social health, and our autonomy.

b. Commercialization of Love

Further, it must be considered whether or not we as a society are comfortable with equating human emotions such as love to any other commodity in the grander economy. This is in itself an extension of medicalization. As explained by Parens, medical science has an incredibly narrow view of health whilst determining any sort of variation as pathological. However, to treat human problems in this way undermines its complexity and the varied manifestations that should be affirmed,

not homogenized. However, retailers and drug companies, who could soon provide love drugs ideal in crafting your 'perfect love,' are keen to exploit certain ideals for profit. While haphazard, items such as oxytocin nasal sprays already exit and can be bought on sites such as amazon promising to elevate feelings trust and empathy, and receptiveness to social cues. By approaching love in this way and further commodifying the experience works to stress a particular ideal of love instead of appreciating its multiplicity. Earp directly comments on this by describing certain contentious cases such as the fear of medicating homosexual love, inter-caste love, and (until recently) interracial love. Any attempt at subduing such experiences can be considered misguided, especially when inflicted on a child. I would like to further argue that attempting to subdue or enhance certain aspects of love – essentially homogenizing the multiple aspects of love towards only its pleasantries – as experienced by the individual would be similarly misguided and inappropriate further debilitating individuals such as Bob.

Selling the experience of love through neurochemical alterations, I believe, runs a 'safety first model of love' as conceived by French philosopher Alain Badiou (Badiou 6). Similar to the rise of dating apps that advertise, 'Get love without chance!' 'Be in love without falling in love!' or, even more bluntly, 'Get perfect love without suffering!' the notion of controlling love via disruption of the negative and enhancement of the euphoric is an attempt to attain love without its associated risks. One would have love, but it has been so thoroughly controlled by outside factors, based on what is defined as 'acceptable' in normal life, that it in many ways loses its authenticity. For example, we lose the randomness of love by attempting to direct our attention to what we believe to be the ideal sort of lover. There is no room for, "lovers who come from different worlds, or work through their respective difference" ("Is Tinder Killing Love?"). Instead, as was the critiqued with the misuse of dating apps, we have a tendency to interact narcissistically with those we wish to court and attempt to find ourselves within the other. Instead, for Badiou, love is like, "two musical instruments that are completely different in tone and volume, but which mysteriously converge when unified by a great musician in the same work" (Badiou 75). Rather than consider we know what we want, either from love or in the context of 'higher end goals,' love surprises us with the possibility that we may not. To allow for generalized use, the medicalization of an otherwise normal human experience and the following commodification of the experience should give pause to what we conceive of the true nature of said

experience as opposed to simply move towards an eradication of suffering, both real and perceived.

V. POSITIVES IN DEMYSTIFYING ROMANTIC LOVE

While the line should be drawn for medical intervention at necessity, this does not address the nature of neuroscientific findings themselves in relation to current conceptions of love. As I see it, the demystification of love as conceived by neurological studies can have many benefits. The concern, however, is if love is no more than, "an emergent property of a cocktail of ancient neuropeptides and neurotransmitters," as articulated by neurobiologist Larry Young, then what is left of that universally admired concept (Young 2009)? However, to reduce love to its neurochemical foundations, I believe, would be an overreaction. For one, not much has changed: science has been pointing to this conclusion for a while without the need of neurological evidence. The only difference now is that we feel the evidence much more compelling because it is rooted in the brain, which is much more associated with our sense of personhood. However it is important to note the distinction between the natural phenomenon and the concept we are trying to elicit in using words such as love. In other words, when I conjure the feelings of love it is not to portray the neurobiological reasons as to why I am in love, but rather address aspects of the human experience: the turmoil in pursuing a beloved, feelings ranging from vulnerability to pure ecstasy, and so on. To go about love by describing the concentration levels of various neurotransmitters then would be to miss the point.[1]

That aside, I believe the neurobiological conception of love gives us a greater appreciation of love in general. The primary way I see this come to fruitation is by countering the dominant Romantic conception of love. In his books and web series *School of Life*, where he emphasizes philosophy's relevance to everyday life, author Alain de Bottom has argued extensively over how Romanticism has ruined love. More suited to the upper class, 18th Century intellectuals that conceived the

1. This precisely what is done by neuro-existentialist such as Patricia Churchland. She defines concepts such as love as types of folk psychology that will ultimately be replaced with more accurate neurobiological representations. One such example was sketched from Pat coming home from a frustrating faculty meeting and exclaiming, "Paul, don't speak to me, my serotonin levels have hit bottom, my brain is awash in glucocorticoids, my blood vessels are full of adrenaline, and if it weren't for my endogenous opiates I'd have driven the car into a tree on the way home. My dopamine levels need lifting. Pour me a Chardonnay, and I'll be down in a minute."

movement than for modern relationships, romanticism idealizes a very impractical conception of love. Take for instance the obsession that a particular feeling rather than practical considerations must guide love. Understanding then that the evolutionary and selective causes for said feelings are more based on reproductive success rather than some sort of other worldly connection should serve as a slap to the face to romantics. Especially in understanding how these systems were never meant to uphold monogamous relationships for as long as we do now should remind us that, as put by Alain de Bottom, "love is a skill, not a enthusiasm" (de Bottom 182). While this sounds like a very pro self-shaping mindset, I should stress that this works so much as it is the knowledge of these processes, which can help guide our pursuit of love, rather than permanent alterations, whose efforts may be misguided as discussed in the prior sections.

VI. CONCLUSION

It is not unreasonable to want to intervene on the part of love and its particularly violent and intense nature. However, any sort of intervention needs to consider the broader nuances in its application to be successful. I have tried to portray here that while it may be tempting to intervene on behalf of love it would be a misunderstanding of the nature of love if used beyond the requirement of necessity. However, it is by no means a betrayal of love to continually seek out its influences, but rather the discussion on these factors and our possible role in them only crafts us into better lovers.

REFERENCES

Cho M. M., DeVries A. C., Williams J. R., Carter C. S. 1999. "The effects of oxytocin and vasopressin on partner preferences in male and female prairie voles (*Microtus ochrogaster*)." *Behavioral Neuroscience* 113 (5): 1071–1079.

Conrad, Peter. 2007. *The Medicalization of Society: On the Transformation of Human Conditions into Treatable Disorders*. Baltimore: The Johns Hopkins University Press.

de Botton, Alain. 2017. *The Course of Love.* New York City: Simon & Schuster.

Earp, B. D., Wudarczyk O., Sandberg A., Savulescu J. 2013. "If I Could Just Stop Loving You: Anti-Love Biotechnology and the Ethics of a Chemical Breakup." *The American Journal of Bioethics* 13 (11): 3–17.

Earp, Brian D., Anders Sandberg, and Julian Savulescu. 2015. "The Medicalization of Love." *Cambridge Quarterly of Healthcare Ethics* 24 (3): 323–336.

Esch, Tobias, and George Stefano. 2005. "The Neurobiology of Love." *Neuro Endocrinol Lett* 26 (3): 175-92.

Fisher, Helen, Arthur Aron, and Lucy Brown. 2005. "Romantic Love: An fMRI study of a Neural Mechanism for Mate Choice." *The Journal of Comparative Neurology* 493: 58-62.

Griffith, Leslie C. 2008. "Neuroscience: Love hangover." *Nature* 451: 24-25.

LaFata, Alexia. 2016. "We Never Forget Them: Are Our First Loves Really The Deepest?" *Elite Daily*, 26 Feb. http://elitedaily.com/dating/are-first-loves-really-deepest/1055283/.

Lehrer, Jonah. 2010. Depression's Upside. *New York Times Magazine*, 28 February: 42.

Liu Y., and Z. Wang. 2003. "Nucleus accumbens oxytocin and dopamine interact to regulate pair bond formation in female prairie voles." *Neuroscience* 121(3): 537–544.

Mallett, Whitney. 2015. "Sometimes When You're In Love, You're Not." *Fast Company*, 14 Feb. https://www.fastcompany.com/3042501/the-science-and-art-of-a-brain-in-love.

Marazziti, Donatella, Hagop Akiskal, Alessandra Rossi, and CB Cassano. 1999. "Alteration of the platelet serotonin transporter in romantic love." *Psychol Med* 29 (3): 741-5.

Parens, Erik. "On good and bad forms of medicalization." *Bioethics*. 2013;27(1):28–35.

Racine E., Bar-Ilan O., Illes J. "fMRI in the Public Eye." *Nat Rev. Neurosci.* 2006; 6 (2): 159-164.

Rick and Morty. 2014. "Something Ricked this Way Comes." Adult Swim. *CART*, Atlanta. 24 March.

Szalavitz, Maia. 2014. "Is It Possible to Create an Anti-Love Drug?" *Science of Us*, 19 May. http://nymag.com/scienceofus/2014/05/anti-love-drugs-will-change-how-we-end-romances.html.

The School of Life. 2016. "Who We Can Love." *Youtube*, 30 March.

Truong, Nicolas, Alain Badiou, and Peter R. Bush. 2012. *In Praise of Love*. London: Serpent's Tail, an Imprint of Profile.

Wang, H., F. Duclot, L. Yan, Z. Wang, and M. Kabbaj. 2013. "Histone deacetylase inhibitors facilitate partner preference formation in female prairie voles." *Nature Neuroscience* 16: 919–924.

Wisecrack. 2016. "Is Tinder Killing Love?" *Youtube,* 28 May.

Young, Larry J. 2009. "Being human: Love: Neuroscience reveals all." *Nature* 457 (7226): 148.

Young, Larry J., and JP Burkett. 2012. "The behavioral, anatomical and pharmacological parallels between social attachment, love and addiction." *Psychopharmacology (Berl)* 224 (1): 1-26.

Zeki, Semir. "The Neurobiology of Love." *FEBS Letters* 581.14 (2007): 2575-579.