

Love Revisited (2CE)

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Harvard Philosophy Professor, John Rawls.

Those who love one another, or who acquire strong attachments to persons and to forms of life, at the same time become liable to ruin: their love makes them hostages to misfortune and the injustices of others. Friends and lovers take great chances to help each other; and members of families willingly do the same. Their being so disposed belongs to their attachments as much as any other inclination. Once we love, we are vulnerable: there is no such thing as loving while being ready to consider whether to love, just like that. And the loves that may hurt the least are not the best loves. When we love we accept the dangers of injury and loss (1971/ 2003, p. 502)

I. Introduction

Most Americans have been exposed to the concept of love in academic setting when they were assigned to read William Shakespeare's (to those very well-read mental health professionals out there, the author is required to entertain the dispute that it might not have been Shakespeare who wrote those plays attributed to him) *Othello*, *Romeo and Juliet*, or *Troilus and Cressida* during middle-school or high-school. Homer's *Iliad* includes love as one of the central theme of this epic. (Again, the author is cognizant that it might not have been the blind man Homer who wrote this epic poem or at least, it was a variety of people who wrote *Iliad* and the *Odyssey*.) The ancient Greeks used the term *theia mania* (or madness from the gods) to describe the sudden lack of reason associated with falling in love; the similarities between passionate love and mental illness (Thallis, 2005). Plato also wrote a dialogue on love, which is called *Symposium*, where the phrase 'platonic love' in contrast with romantic love was derived (389 BC/1977). What this introductory remarks show is that discourse on love has always pre-occupied mankind.

But love persists considerably that it captures the imagination, creativity, intelligence of many professionals, artists and academics. Most of us, in one way or another, can attest to the experiences of a great difficulty of focusing on the task at hand, "walking on clouds," "nervous before dates," and strong physiological and physiological sensations such as cold hands and butterflies in the stomach (Kanin, Davidson, & Schenk, 1970).

This course includes the inquiry of what social scientists (sociology, psychology, philosophy, etc.) and hard scientists (neuroscientists, biologists, chemists, etc.) have to say about the nature of love. Among social work and mental health professionals, a licensed clinical social worker and professor of social work at Rutgers University and University of Pennsylvania, Danna Bodenheimer claims that "many of our clients have gone most of their lives deprived of love. Recognizing this reality, as well as realizing that social work is the realm of paradigm shift and equality, renders this research all the more important" (Bodenheimer, 2010, p. 40). Bodenheimer even went further by saying that it is common and should not be frowned upon if social workers developed some non-erotic love for the client:

[Social work] profession was characterized by a neutral, distant practitioner who performed his work upon an unknowing patient. The reality of the multiple complexities of this relationship has become clearer over time..... It is my sincere belief that an in-depth dialogue about the presence of love in the therapeutic relationship ought to take place in the field of social work: A field founded on the dismantling of hierarchical power structures and the curative nature of human relationships must also examine the curative nature of every element of such relationships. Love is an essential element in human interaction. Further, social workers and therapists work with populations that are historically underserved, oppressed, and placed on the periphery of services that make living a sustainable and fulfilling life possible (2010, p.41).

II. Conventional Conceptions and Models of Love

A critical feature of love is that it involves evaluative, physiological and emotional dependence; when one loves another one's well-being depends upon the life of the loved one going well (Jones 2012). To love one another, according to philosopher Ward E. Jones, means a lasting and intense expectation that loved person lives as a good person does (2012). One prudent way to understand the nature of loving someone is to consider the ways in which one who loves is affected by the person he loves (Jones, 2012). Early in the 1970's, Zick Rubin, social psychologist theorized that love as an attitude towards another person, which is a distinctive bundle of thoughts and feelings towards the loved person (1970, 1973). There are three main concepts in Rubin's line of thinking, which includes (a) *attachment*, which is the sense of needing the partner and realization that one is dependent on the other to provide valued rewards, (b) *care*, which means that the person who loves desires to promote, protect and improve the well-being of the person loved and (c) *trust and self-disclosure*, the ability and willingness to confide to one another and the leap of faith that the other is a trustworthy person (1970, 1973).

Robert Steinberg gave the academia a handy chart by positing the triangular theory of love, where (a) intimacy, (b) passion and (c) commitment compose the sides of the triangle (1986). Thus, with three constant there are seven possible kinds of love depending on the combination of the constants or lack thereof. The presence of all three constants means consummate love while certain combinations may mean different kinds of love:

1. Liking: intimacy without passion or commitment,
2. Infatuated love is the experience of passion without intimacy and commitment, as in puppy love.
3. Empty love, which is the experience of commitment without passion and intimacy,
4. Romantic love, which is the experience of passion without intimacy, as in romantic affair,
5. Companionate love, which is the phenomenon of intimacy and commitment without passion, as in long term marriage,
6. Fatuous love, which is entails the presence of passion and commitment absent intimacy, and
7. Consummate love,

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which as the title suggests complete love which is said to be *true* love and the presence of all constants.

What is common to all love is this: Your own well-being is tied up with that of someone (or something) you love. When a bad thing happens to a friend, it happens to her and you feel sad for her. When something bad happens to one you love, though, something bad also happens to you. (It need not be exactly the same bad thing. And I do not mean that one cannot also love a friend.) (Nozick 1989, p. 68)

One description of *passionate/romantic love* is: a state of intense longing for union with another and generally evolves into *companionate love*, which means deep friendship, easy companionship and sharing of common interests, but not necessarily involving intensity, sexual desire, or attraction (Berscheid and Hatfield, 1969; Grote and Frieze, 1994). However, a group of psychologists, anthropologist, and neurologist (Acevedo, Aron, Fisher & Brown, 2012) suggest that there might be mechanisms through which romantic love may be sustained over time in relationships. They hypothesize that long-term romantic love is similar to early-stage romantic love (Acevedo, Aron, Fisher & Brown, 2012). They also theorized that a group of happily married individuals reporting intense romantic love for their long-term partners (10 years or more) would show neural activity in dopamine-rich regions associated with reward and motivation. Thereby, they hypothesized that long-term pair-bonds share neural circuitry with parent–infant bonds; hence, they concluded that adult attachment work has been built on the notion that pair-bonds are the adult instantiation of attachment in childhood (Acevedo, Aron, Fisher & Brown, 2012; Aron et al., 2005; Bartels & Zeki, 2004). The upshot of the experiment of Acevedo et al. is that for some individuals the reward-value associated with a long-term partner may be sustained, similar to new love (2012).

III. A Deeper Look at Science of Love

A. Irrationality and Mental Illness

Philosopher David Hume famously pronounced that “reason is and only ought to be the slave of the passions” (1739-1740/1978). Emotions and passions come first no matter how devoid of intellectual qualities. What reasons or the intellect can do is to rationalize or justify what people feel. Consider the time where people strongly feel something for no apparent reason. Sometimes a woman knows about her husband or boyfriend’s misgivings. Ask her why does she love a womanizing, lying, parasitic Romeo? She may reply, well, he reads poetry to me before and after lovemaking; he touches my face and whispers to my ears. The poor woman seems to overlook the possibility that Romeo does this to other women. If by rationality, we mean one’s capability to conceive what is good for him or the ability to consider what is in one’s best interests, a person in love may sacrifice what is in his best interests for the sake of someone he loves. Say, a man is willing to spend time for the one he loves albeit he could have made more money, write poetry, make friends or exercised at the gym—

notwithstanding the fact the spending time with the loved one will not in any way contribute to one's intellectual, physical or financial well being. These are instances of reason or rationality being enslaved by the passions. These explain why lovers do things that they do—no matter how obtuse and they come up with reasons and rationales to explain their actions.

Jones using similar line of thinking speaks about the denial of the possibility of a loved having done something wrong, which may lead to what he calls a *lover's shame*: Loving someone involves or entails believing that she is a good person. This is not the same thing as believing that she always has or always will act well. Nonetheless, believing that someone is a good person involves an expectation that she will act well. Furthermore, when that expectation is not met—when one discovers that she has acted badly—her doing so can challenge one's belief that she is a good person. Accordingly, because lovers believe that their beloveds are good persons, they have persistent expectations that their beloveds will act well, and when those expectations are not met, their love can be challenged. Loving someone thus creates something like a barrier or impediment to accepting that she has done wrong. This barrier will be weaker or stronger in proportion to the strength of the lover's love and the severity of the beloved's wrongdoing. At one end of the spectrum, a deeply loving spouse or parent will have an extremely difficult time accepting that his life partner or child has committed a crime that he sees as heinous. At the other end of the spectrum, even a new romantic lover requires more evidence to believe that his partner has lied or broken her promise than he does to believe that a stranger or acquaintance has done the same (2012, p. 620).

Accordingly, this denial that a loved one has done something wrong is on a par with the dictum that reason is the slave of the passions. Because when one loves another, one rationalizes to the best of one's ability that the beloved person has not actually done anything wrong. But the main point that Jones made is that if a loved one has done something shameful, the one that loves also feels shameful (2012).

Clinical psychologist, Frank Tallis argues that the idea that love is similar to mental illness and it was never entirely undermined; and it occupied the works of many contemporary psychologists (2005). Indeed, according to Tallis, most common types of love, theories of love and descriptions of love acknowledge at least one feature or mechanism that might be described as 'psychopathological' (2005). Love, irrationality and unstable mind are not easily separable. The effects of love are so severe and so debilitating that, Frank Tallis believes it should be classified as a mental illness (2005). This is not as ridiculous as it seems. If the reader remembers the days when the *proverbial* butterfly in the stomach still exists, the reader can easily see that love shares a lot of symptoms with various forms of psychopathology, notably obsessionality, depression, mania and manic depression (Tallis, 2005). (This, of course, assumes that the presence of symptoms suffices to warrant the inference of the existence of the disease.)

When we fall in love we become different persons; the emotional center of gravity is displaced and people topple headlong into the hands of fate (Tallis, 2005). Truly, madly, deeply: if you haven't actually said those words, you've probably thought them – and they are very revealing. They suggest that, as a society, we consider 'madness' to be as significant an indicator of love's authenticity as honesty and depth. People do not expect love to be rational –they expect it to be overwhelming, improvident and unpredictable (Tallis, 2005). To 'go crazy' is an inherent part of love. Passionate love and mental illness and their similar behavioral manifestation have been noted since classical times (Tallis, 2005).

Once love becomes too 'heated', vital fluids evaporate creating a cold, dry state known as love melancholy (Babb, 1951; Burton, 1621/2001). Freud believed that romantic love was caused by the suppression, repression, or frustration of sexual desire (1930/2010; 1905/2007). However, for Tallis, Charles Darwin has an explanation for this irrationality. (2005). Love may bypass reason, but intrinsically so. Evolution expects us to love madly, otherwise we might not love at all; reproduction being far too important to be left to good sense. Passionate love, according to Tallis, is generally described as a state of intense longing for the loved one (2005). Tallis expands the evolutionary explanation:

Evolutionary theory also explains another puzzling feature of passionate love – its relative brevity. Although when in the throes of love, we think that loves will last forever, this is rarely the case. Love diminishes, dies or becomes – over time – something closer to friendship (i.e. companionate love). Evolution is parsimonious. Love, on the other hand, is florid and wasteful.Perhaps, because love is so wasteful, evolutionary pressures have ensured that we fall in love only for as long as it is necessary to achieve evolutionary goals – but no longer. To ensure reproductive success, the pair-bond that keeps men and women together does not need to last forever. It only needs to last long enough for one or two children to be produced and raised (of course, the evolutionary foundations of this argument – which give considerable emphasis to the dynamics of reproduction – do not invalidate or depreciate love between people of the same sex). In the ancestral environment, the earliest cut-off point would probably have been linked with the termination of breast-feeding. Thus, intense, passionate love might only be sustainable for a few years (2005, p. 85).

Geoffrey Miller (2001) notes: 'The wastefulness of courtship is what makes it romantic; the wasteful dancing, the wasteful gift-giving, the wasteful adventures' (p.128). (Keep in mind, however, the claims of Acevedo et al., in the preceding section that in some romantic/passionate love does not evolve or devolve to mere companionate love.) If passionate love is reciprocated, it is associated with joy, euphoria and ecstasy; however, these feelings are almost invariably shadowed by darker emotions such as anxiety, jealousy and sadness (Hatfield, 1988). Therefore, it is difficult to experience passionate love in the absence of at least some psychological pain. When unrequited

(or frustrated), passionate love reliably engender a sense of emptiness– and even despair (Tallis, 2005).

When people fall in love, they often exhibit symptoms that appear under several DSM-IV and ICD-10 diagnostic headings – mania, depression and obsessive compulsive disorder) (Tallis, 2005). Moreover, some contemporary diagnoses comprise symptom clusters that were originally subsumed under the ancient rubric of love melancholy (e.g. delusional disorder – erotomanic and jealous types) (Tallis, 2005). The similarity between lovesickness and certain types of mental illness are not superficial. For example, when people fall in love their estimated serotonin levels drop to levels found in patients with obsessive-compulsive-disorder(Tallis, 2005). Further, in a brain scan investigation conducted by Semir Zeki and Andreas Bartels, people who profess to be ‘truly, deeply and madly’ in love, show activity in several structures implicated in the neuro-anatomy of obsessive compulsive disorder, for example the anterior cingulate cortex and caudate nucleus (2000; 2004). These recent findings were anticipated by the writings of the 10th-century Iranian physician Ibn Sena (known more commonly in the West as Avicenna), who identified obsession as the principal symptom and cause of lovesickness (Tallis, 2005). The historical success of lovesickness as a diagnosis, the findings of contemporary psychologists, and recent biological evidence, all suggest a phenomenon worthy of more serious scientific scrutiny.

B. Love on the Bright Side

Love is not all about irrationality or reducible to mental illness; on the contrary, Gustavo Ortiz-Millan proposes the idea that rather than disrupting rationality, as the common-sense conception has done it, love may actually help us develop form rational ways of thinking and acting (2007). He makes the case for romantic or erotic love, since this is the kind of love that is more frequently associated with irrationality in acting and thinking. Ortiz-Millan opines that this kind of love may make us develop epistemic and practical forms of rationality (Ortiz-Millan, 2007). Based on an analysis of its characteristic action tendencies, he argues that love may help us to develop an instrumental form of rationality in determining the best means to achieve the object of love. Finally, love may generate rational ways of belief-formation by framing the parameters taken into account in perception and attention, and by bringing into light only a small portion of the epistemic information available. Love may make us perceive reality more acutely (Ortiz Millan, 2007). Ortiz-Millan recognizes the common view that emotions and reason do not always coincide but recent developments in neurophysiology says otherwise:

According to an old commonplace, emotions are potential disrupters of rationality. Traditionally, people have thought that emotions are impulses or urges that interfere with our capacity to form rational judgments and beliefs and with rational action more generally. Rationality and emotions, we are told, form part of a duality, in which both appear, to have very clear and separate realms. The notion of rationality seems to preclude any involvement of emotions; emotions

are a paradigm of unreflective and subjective motives, and whenever they appear in the justification of our judgments and actions, that is reason enough for suspecting that this justification may not be objective or guided by logic and proper reflection. To be sure, this view, the received view, is true in many cases: emotions may perturb clear and rational thinking, but it is no less true that they also have a role as parts of rational thinking without which the latter would very likely not work. Recent studies in neurophysiology, for instance, have shown that emotions and feelings are the system of support without which the building of reason would not work properly and might even collapse: rational decisions require the support of emotions and feelings and not only of logic (2007, p. 129).

Neuroscientists Joseph Ledoux and Antonio Damasio are those scholars who found relationships between emotions and reasons (1996; 1994). They profess to find by means of experiment and empirical study that emotions are essential to people's reflective thinking because emotions are *the* reasons for judging as much as beliefs, desires and intentions. Consequently, emotions are the most common reasons that we have for acting; without them, we would probably have few reasons for acting. The human brain function suggests prominent roles that emotion and feelings have in rationality. Damasio opines that the same brain structures conduct both human biology and behavior and are necessary normal cognitive processes (1994). Contrary to what Hume said, reason is not only the slave of the passions but the latter serve as guide to our thinking.

The succeeding paragraphs demonstrate how recent developments in brain science entail that love, although it may disrupt rational thinking, is a complex phenomenon that results in elimination of reasons but benefits to the people who are in love and society as a whole.

Functional magnetic resonance imaging (fMRI) measures the blood flow in the brain. Similarly with muscles, brain cells need more blood when they work and less when they're inactive. Putting someone in an fMRI machine is a way for scientists to make an inference as to which parts of the brain are working. The caveat is that it gives *no direct evidence* of which neurotransmitters relating signals from one brain-cell to another.

Neurotransmitters also play prominent part in the neurobiological aspect of love (Ecsh & Stefano, 2007, Bartels & Zeki, 2004, Bartels & Zeki, 2000). The term neuron is synonym for brain cell, which has cell membrane and central nucleus. A common type of neuron has threadlike protuberance called an axon extending on one side that has spiny and spiky branches called dendrites. A neuron receives and sends electrical signals through the dendrites. The axon of a neuron, though, is not directly connected to the dendrites of another neuron; instead the area in which the signal is transmitted from one cell to the next is a small gap called synaptic cleft. The signal is not proximately sent to the surface of the dendrite but through the release of infinitesimal fluid called neurotransmitters, like serotonin, dopamine, *inter alia*.

But fMRI technology helps scientists locate the chemical changes and discover the parts of the brain that activate when people are said to be in love. Andreas Bartels and Semir Zeki postulate that:

The neural correlates of many emotional states have been studied, most recently through the technique of fMRI. However, nothing is known about the neural substrates involved in evoking one of the most overwhelming of all affective states that of romantic love, about which we report here. The activity in the brains of 17 subjects who were deeply in love was scanned using fMRI, while they viewed pictures of their partners, and compared with the activity produced by viewing pictures of three friends of similar age, sex and duration of friendship as their partners. The activity was restricted to foci in the medial insula and the anterior cingulate cortex and, subcortically, in the caudate nucleus and the putamen, all bilaterally. Deactivations were observed in the posterior cingulate gyrus and in the amygdala and were right-lateralized in the prefrontal, parietal and middle temporal cortices. The combination of these sites differs from those in previous studies of emotion, suggesting that a unique network of areas is responsible for evoking this affective state. This leads us to postulate that the principle of functional specialization in the cortex applies to affective states as well (2000, p.3829).

The frontal cortex, which is vital to judgment, shuts down when we fall in love. FMRI scans show this de-activation occurs only when someone is shown a photo of the person they adore, causing them to suspend all criticism or doubt. The limbic system, which is a part of the brain that is responsible for emotions, also is involved when one experiences love (Schneiderman, Zilberstein-Kra, Leckman, & Feldman, 2011; Ecsh & Stefano, 2007; Hauser, 2006; Bartels & Zeki, 2004, 2000). If one looks at someone one is passionate about, some areas of the brain become active; but a large part is de-activated, the part that plays a role in judgment. Cognitive scientist Marc Hauser adds that damages in the frontal lobe in conjunction with an impaired amygdala, which he calls “emotional conductor” –result in irrational, impulsive actions and inappropriate decisions due to insensitivity to consequences (2006). Therefore, if one is in love, one can reasonably infer that one is susceptible to irrational, impulsive actions and inappropriate judgments and behaviors.

Other than the frontal lobe, amygdala and temporal cortex, Esch and Stefano found that larger parts of the brain, the limbic system and hippocampus, play magnificent roles in love and bonding formation and they regulate the processes that relate to trust, belief, pressure and reward (2007). The hypothalamus and cingulated cortex are also crucial to love and bonding formation. Both the amygdala and hippocampus contain dopamine, serotonin and norepinephrine; the amygdala is modulated by these neurotransmitters.

Studies have shown brain that the brain chemical dopamine is at higher levels in those people who are in love, according to neuroscientists Ecsh & Stefano (2007).

Dopamine is crucial to our experiences of pleasure and pain; it is linked to desire, addiction, and euphoria (Paris, 2008; Ecsh & Stefano, 2007; Colt, 2006; Solomon, 2001) and a surge may cause such acute feelings of reward that it makes love hard to give up. Experiments reveal that certain drugs such as cocaine have a similar effect on dopamine as love (Ecsh & Stefano, 2007; Solomon, 2001). A side effect of rising dopamine levels is a reduction in another chemical, serotonin, a crucial neurotransmitter related to people's moods and appetite (Ecsh & Stefano, 2007; Colt, 2006; Tallis, 2005; Solomon, 2001). Low-level of serotonin are also found in people with obsessive-compulsive disorder, general anxiety disorder, and depression, which explains why love can make us feel anxious, sad for no reason and jittery (Ecsh & Stefano, 2007; Colt, 2006; Tallis, 2005; Solomon, 2001).

Endorphine and endogenous morphinic mechanism are also active micro-physical entities when people are said to be in love (Ecsh & Stefano, 2007). Another love chemical is adrenaline, which is usually related to energy and excitement (Ecsh & Stefano, 2007). The presence of high-level adrenaline leads to mania, euphoria and the like, which explains why people who are said to be in love experience manic and euphoric episodes. Love, viewed in this light appears to be a primal drive, on a par with hunger or lust (Ecsh & Stefano, 2007). However, according to Esch and Stefano, social attachment and the inclination to experience social bond, are also intrinsic features of love (2007).

Two brain chemicals called vasopressin and oxytocin, which are known to be involved in forming attachments, are found in the olfactory and limbic-hypothalamic systems, as well as in spinal cord areas and brainstem proved to be necessary ingredients of love (Schneiderman, Zilberstein-Kra, & Leckman, 2011; Ecsh & Stefano, 2007). The neurohormones oxytocin and vasopressin have also always been thought to be involved not only in both human maternal bonding and adult pair-bonding but also in non-human animals (Schneiderman, Zilberstein-Kra, & Leckman, 2011). Bonding or mating generates the release of oxytocin; together with vasopressin, the combination of which, generates bonding and propensity to form attachment (Ecsh & Stefano, 2007). Thus, hunger; lust, irrationality and madness are not the only by-products of love.

Love is merely the first step in pair formation, which includes attachment and bonding. Hence, love is not merely a matter primitive drive closely associated with madness or irrationality—rather it is a complex and dynamic neurobiological phenomenon that can provide fulfillment of well-being for an organism and it can also be stress-reducing and health-promoting (Ecsh & Stefano 2007). Love has certain evolutionary and biological goals that go beyond reproduction; its function generates long-lasting relationship, which is linked to beliefs and trust which, may function as *support* for challenging and stressing circumstances. Remember the Nozickian dictum that if one loves another, the pain suffered by the beloved person is also felt by the person who loves. This can easily derive *support* for the loved one who suffers. Also, Rawls has claimed that “friends and lovers take great chances to help each other; and members of families willingly do the same. Their being so disposed belongs to their

attachments as much as any other inclination” (1971/2003, p. 502). Hence, love and the forming of love have the inherent features, which indicate the formation of physiological and transient states that are biologically useful behaviors that include behavioral changes, which result in positive social interactions (Ecsh & Stefano, 2007).

In addition, neuroscientists Inna Schneiderman and Yael Zilberstein-Kra and psychologists Ruth Feldman and James Leckman conducted an experiment in which they found that vagal regulation may be a mechanism through which love and attachment reduce stress and promote well-being and health (2011). A significant aspect of the parasympathetic nervous system is the tenth cranial nerve, the vagus, with branches originating in the medullary source nuclei. Among mammals, the heart is conducted by the evolutionary-recent myelinated vagus. Parasympathetic activity provides the basis of social engagement and support the formation of affiliative bonds (Porges, 1998). Simultaneous with social engagement, the myelinated vagus maintains calm states by providing tonic control over the heart, whereas under stress, vagal control is rapidly attenuated to support fight-and-flight behaviors (Porges, 1997; Porges, Doussard-Roosevelt, Portales, & Greenspan, 1996). The extent of vagal reactivity—is thought to indicate the level of stress experienced by the organism (Porges, 2003). In support, a growing body of research indicates that RSA is involved in processes of emotional perception, responding, and regulation (Beauchaine, 2001). These findings suggest that attachment relationships may function to increase autonomic regulation, particularly during periods of bond formation, similar to the results reported for other mammals (Schneiderman, Zilberstein-Kra, & Leckman, 2011).

Autonomic reactivity and emotion regulation assume important roles in the partners’ communication within a romantic relationship (Roisman, 2007). It is believed that they can predict marital dissatisfaction and even divorce (Gottman & Levenson, 1992; Levenson & Gottman, 1983; Levenson & Gottman, 1985). Therefore, Schneiderman et al. found it useful to examine changes in autonomic nervous system reactivity during the initial stages of a romantic relationship in relation to the individual well-being and emotional distress (2011). In their experiment, they studied autonomic reactivity to the presentation of negative and positive films in 112 young adults, including 57 singles and 55 new lovers who began a romantic relationship 2.5 months prior to the experiment (2011). The autonomic reactivity was measured by Respiratory Sinus Arrhythmia (RSA) to two baseline emotionally neutral films, two negative films, and two positive films.

Results showed that RSA in singles decreased during the presentation of negative emotions, indicating physiological stress response. On the other hand, there was no decrease found among new lovers, pointing to more optimal vagal regulation during the period of falling in love. Autonomic reactivity, measured by RSA decrease from the positive to the negative films, was greater among singles as compared to lovers, and this suggested that love buffers against autonomic stress and facilitates emotion regulation (Schneiderman, Zilberstein-Kra, Leckman, & Feldman, 2011).

Such attenuation of the physiological stress response may indicate that love and attachment provide a cushion against the experience of stress; the new lovers' autonomic response to the evocation of negative emotions differed from the singles' despite the fact that their reported emotional response was the same, suggesting that some of the effects of love occur at a physiological level and are not captured by more conscious processes. These findings are consistent with the polyvagal theory on love and close relationships in mammals (Porges, 1998).

The theory is that functional changes in the vagal system occur during the initial periods of bond formation in mammals. Schneiderman et al. found similar alterations in vagal reactivity during the period of falling in love in humans (2011). The failure to show a decrease in RSA during the experience of negative emotions suggests that vagal regulation "may be one mechanism by which close relationships reduce stress and promote well-being and health" (Schneiderman, Zilberstein-Kra, & Leckman, J. 2011, 1318-1319).

The mechanism that explains the change in vagal regulation during the initial stages of romantic love may relate to the oxytocinergic system and the joint contribution of oxytocin and the vagal nerve to the formation of affiliative bonds (Schneiderman, Zilberstein-Kra, & Leckman, 2011). Oxytocin is a social hormone found in mammalian attachment, bonding, and social behaviors, which has an anxiolytic effect that enables bond formation (Carter, 1998; Uvnas-Moberg, 1997). Plasma oxytocin levels increase during periods of both parental and romantic bond formation (Gordon et al., 2010; Feldman, 2011). That parent-infant touch and contact increase both oxytocin levels (Feldman, Gordon, Shneiderman, Weisman, & Zagoory-Sharon, 2010) and vagal regulation (Feldman & Eidelman, 2003) indicate that the two systems are interrelated and play an important role in the formation of close bonds. This supports the inference that the vagal system undergoes structural changes in the early stages of romantic relationships under the influence of the oxytocinergic system (Schneiderman, Zilberstein-Kra, & Leckman, 2011).

Another explanation for the absence of the expected vagal attenuation during the presentation of negative stimuli by new lovers may relate to the general euphoria experienced during the early stages of a romantic relationship (Aron et al., 2005) that may prevent new lovers from experiencing physiological stress. Most probably, the differences found here are transient and characterize only the early stages of a romantic relationship. Research has pointed to transient neurobiological changes, such as elevated plasma nerve growth factor levels that are associated only with the early phase of a romantic relationship (Emanuele et al., 2006). Furthermore, romantic love is accompanied by a dynamic brain process and the neural correlates of romantic love change over time (Kim et al., 2009; Bartels & Zeki, 2004, Bartels & Zeki, 2000). Bartels and Zeki (2004) in their paper called *The Neural Correlates of Maternal and Romantic Love* also found certain similarities in neural activities between what happens in the brain of a mother forming bond and attachment with the new born child and what happens in the brain of those people who are said to be in love as they explain:

The tender intimacy and selflessness of a mother's love for her infant occupies a unique and exalted position in human conduct. Like romantic love, to which it is closely linked, it provides one of the most powerful motivations for human action Both ensure the formation of firm bonds between individuals, by making this behavior a rewarding experience. They therefore share a similar evolutionary origin and serve a similar biological function. It is likely that they also share at least a core of common neural mechanisms. Neuro-endocrine, cellular and behavioral studies of various mammalian species ranging from rodents to primates show that the neurohormones vasopressin and oxytocin are involved in the formation and maintenance of attachment between individuals, and suggest a tight coupling between attachment processes and the neural systems. The design of this experiment, like our previous one (Bartels and Zeki, 2000), allowed us to determine the activation related to maternal love while at the same time controlling for the effects of familiarity, friendly feelings and visual input. The activity observed depended therefore primarily on attachment-specific emotions that our volunteers experienced during the presentation of the photographs (2004, p. 1155).

Esch and Stefano agree with this assessment and maintain that maternal and romantic love share the function of perpetuating the existence of a species and that certain hormones and other brain chemical chemicals and large part of the brain have the role for bonding formation not only among non-human animals but in terms of *Homo sapiens* social harmony within the species (2007). The upshot is that this supports that view that love, although its chemical properties entail irrationality and even fluctuating levels of neurotransmitters, such as dopamine and serotonin, among others, which indicate causes of mental illness, love still has beneficial by-products not only for those who are in love but also to species of organism capable of love and society as a whole. All these can be derived from the fact that bonding and attachment are elementary features of love and the same phenomena serve to be the driving force of different species and also society as a whole.

Because attachment, bonding and trust are features of love and attachment, bonding and trust are necessary for stable society by means of the logical property called transitivity. Love also is the heart that serves as a means of subsistence of an otherwise heartless society. In sum, love is a rewarding experience notwithstanding the neural-chemical processed it projects, which are similar to those who suffer from mental illness. And, in terms of rationality because love derives rewarding experience and it serves as the foundation for attachment and bonding and as an edifice of any thriving relationship, the negative aspects of love, e.g., irrationality and behavioral manifestations of chemical imbalance associated with mental illnesses are outweighed by the bright side of love. But again, Bartels and Zeki, however, also found that the areas of the brain that are deactivated during intense passionate love are also the same areas that shut down during the formation of maternal love:

If anything, this should also be read in the most favorable light. After all, if it is true that maternal love involves attachment and bond, and maternal love is necessary for a healthy familial relationship, and society is composed of and

built on the fabrics of strong and loving families, then, by means of simple logical inference of hypothetical syllogism, love is an indispensable, complex and dynamic phenomenon that preserves not only those people who are said to love one another but society as a whole; it also preserves different species of organism who share similar chemical and biological constitutions as humans do. As Schneiderman et al. (2011) Ecsh & Stefano (2007), and Bartels & Zeki (2004) point out, like romantic love, maternal love provides powerful motivations for human actions and these actions are not limited to irrational and impulsive ones; some of them, as already expressed out result in rewarding, stress-reducing, and health promoting actions, not to mention the chemical mechanism found in love being the source of pro-social bonding.

IV. Conclusion:

Love is a double edge sword, so to speak. It is the source of happiness, euphoria, mania, and fulfillment. Its chemical mechanism is similar to the neural pattern of people who are said to be mentally-ill. Love is stress-reducing and health promoting, which in any case a wonder drug for our well-being. At the same time, love can be the source of stress or in the worst case scenario, it can lead to obsession and compulsion —if not delusion or paranoia. Love is an enigmatic, dynamic and subjective mental state explainable in terms of science, which is said to be objective; it is enigmatic and dynamic because love captures both subjectivity and objectivity. It is the source of inspiration, hope, romantic and social bond; in a sense, it is the engine of survival of certain species and human society. It is also the source of heartache, disappointment and rejection—even madness. But as John Rawls said: *the loves that may hurt the least are not the best loves. When we love we accept the dangers of injury and loss (1971/ 2003, p. 502)*. The corollary is that the greatest love hurts the most (when it is done or it goes astray). Thus, enjoy love. If it does not hurt or it does not make one mad, one must ask: what is the point? (By the way, the author does not suggest emotional masochism.)

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