

# LOVE IN QUESTION

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## Abstract

Investigating love as a natural phenomenon means to make available this particular aspect of human life – always considered as something evanescent, impalpable and deeply subjective – to the scrutiny and understanding offered by contemporary science. The sciences of nature are modifying the intuitive concept that each one of us has of the love sentiment showing how human beings are universally tied in the phenomenon of love as well. Darwinian natural selection, namely the effect of reproductive success deriving from *intersexual* and *intrasexual* competition for reproduction, emphasizes the invariants of the dynamics of falling-in-love and of sexual attraction. Natural selection is the engine that triggers the necessary changes an organism must make in order to better face the continuous challenges posed by the environment. In it, genetic, biological and cultural aspects coexist, tied together by the rhythms of evolution. Doubt exists, however, on whether this set of ties is able to entirely account for the phenomenon of human love. It seems in fact, that in humans love is a way of understanding reality and that it not only serves reproductive purposes, but social ones as well. All of this implies the necessity of considering explanatory theoretical models stemming from the modern sciences of mind, and those proposed by evolutionary psychology, in particular.

**Key-words:** love, sexual selection, evolutionary psychology, brain chemistry, human mind.

## The question of Love

Since antiquity, philosophers have considered love as a crucial issue in their studies. Modern day psychologists have discussed its dynamics and dysfunctions. However, it has rarely been investigated as a genuine human cognitive phenomenon. In its more common sense, love has been considered in poetry, philosophy, and literature, as being something universal, but at the same time, as a radically subjective feeling. This ambiguity is the reason why love is such a complicated subject matter. In what follows, I will argue that love, by means of its rational character, can be studied in a scientific way. According to the philosophical tradition, human beings are rational animals. However, the same rationality guides us in many circumstances, sometimes creates difficult puzzles. Feelings and emotions, like love, fortunately are able to offer an efficient reason for action.

Even if what “love” is, defies definition, it remains a crucial experience in the ordinary life of human beings. It participates in the construction of human nature and in the construction of an individual’s identity. This is shown by the universality of the feeling of love across cultures. It is rather complicated to offer a precise definition of “love”, because its features include emotional states, such as tenderness, commitment, passion, desire, jealousy, and sexuality.

Love modifies people’s way of thinking and acting, and it is characterized by a series of physical symptoms. In fact, love has often been considered as a type of mental illness. How many kinds of love are there? In what relation are they?

Over the past decades many classifications of love have been proposed. Social psychologists such as Berscheid and Walster (1978), for example, in their cognitive theory of emotion, propose two stages of love. The former has to do with a state of physiological arousal and it caused by the presence of positive emotions, -- like sexual arousal,

satisfaction, and gratification, or by negative emotions, such as fear, frustration, or being rejected. The second stage of love is called “tagging”, i.e., the person defines this particular physiological arousal as a “passion” or “love”.

A different approach is taken by Lee (1976) and Clyde, Hendrick (1986, 1992). Their interest is to identify the many ways we have of classifying or declining love. They focus their attention on love styles, identifying six: *Eros*, *Ludus*, *Mania*, *Pragma*, *Storge* and *Agape*. *Eros* (passionate love) is the passionate love which gives central importance to the sexual and physical appearance of the partners; *Ludus* (game-playing love) is a type love exercised as a game that does not lead to a stable, lasting relationship; *Mania* (possessive, dependent love) is a very emotional type of love which is identified with the stereotype of romantic love; *Pragma* (logical love) lovers have a concrete and pragmatic sense of the relationship, using romance to satisfy their particular needs and dictating the terms; *Storge* (friendship-based love) is a style in which the feeling of love toward each other grows very slowly. Finally, it is possible to speak of *Agape* (all-giving selfless love) characterized by a selfless, spiritual and generous love, something rarely experienced in the lifetime of individuals. Robert Sternberg (1986) offers a graphical representation of love called the “triangle theory”. The name stems from the fact that the identified components are the vertices of a triangle. The work of the psychologist at Yale deviates from previous taxonomies, or in other words, the previous attempts made to offer a catalogue of types of existing love.

The psychological elements identified by Sternberg to decline the feelings of love are three: intimacy, passion, decision / commitment. The different forms of love that you may encounter in everyday life would result from a combination of each of these elements or the lack of them. Again, in the study and analysis of the feeling of love we encounter a list of types of love: non-love, affection, infatuation, empty love, romantic love, friendship, love, fatuous love, love lived.

Philosophers, fleeing from any kind of taxonomy, approach the feeling of love cautiously, surveying it and perhaps even fearing it. Love seems to have something in common with the deepest of mysteries, i.e. the end of life. It leads us to question, as does death, the reality around us as well as ourselves, in the hope that something precious and important not pass us by. But love is also the guardian of an evil secret that is revealed, which consists in the nonexistence of the love object, in that it is nothing but a projection of our own desires. Love is, according to Arthur Schopenhauer, a sequence of actions performed by those who know perfectly that it is a betrayal in that it does nothing else but carry out the painful event that is life. Thus, love too, has its Maya veil and once torn down, what remains? What remains is the imperative of the sexual reproduction of the species instinct.

Human nature has for Harry G. Frankfurt two fundamental characteristics: rationality and the capacity to love. Reason and love are the regulatory authorities that guide the choices to be made, providing the motivation to do what we do and constrain this by creating a space which circumscribes or delineates the area in which we can act. On one hand, the ability to reflect and think about ourselves leads to a sort of paralysis. The ability to reflect, in fact, offers the tools to achieve our desires, but at the same time, is often an impediment to their satisfaction, leading to an inner scism. On the other, the ability to love unites all our fragments, structuring and directing them towards a definite end. Love, therefore, seems to be involved in integration processes of personal identity.

### **Fools for love**

Sexual behavior and love are two of the preferred topics of our species. Only science has maintained silence on them for a long time. It cannot be denied, that even upon a certain amount of reflection and thought, certain aspects of human sexuality and romantic love escape survey and analysis. It is as if they were surrounded by an inscrutable and unfathomable mystery. How can we analyze and profoundly investigate unique and subjective experiences such as those of falling in love with a person rather than another? This difficulty becomes apparent when you look at relationships and how individuals choose partners across cultures. And what to say about the real possibility of conducting an objective and experimental study of sexuality, which is often considered a taboo subject, especially in many Western societies?

Love has a central role in the experience and lives of humans. Romantic love, understood as the combination of several components that prove to be crucial as the sense of responsibility, commitment to another individual, sacrifice, tenderness and passion, is a universal experience, found throughout times and cultures. It is usual to consider how romantic love pervades many forms of our existence, from poetry to music, to literature, it is found in our most personal fantasies and influences the way we conduct our everyday life.

But often the relationships that characterize the human species are characterized by deep contradictions. A person can spend a lifetime searching for the love that will change his life or, conversely, have his life destroyed by a wrong or failed relationship. At the end of a love affair, in fact, the sense of euphoria that characterizes the initial stage may be substituted by depression or even obsession leading to murder or suicide. The search for love upon which a person builds his life is a strong driving force that can modify his mind and deliver behavior in the realm of flexibility and diversification. Why does romantic love fascinate us, disturb us and upset us? Steven Pinker (2001, 2002) develops a rather utilitarian view of love feelings that embraces several economic and social theories (Schelling, 1960, 1984, Frank, 1988). Pinker's answer to the previous question is that romantic love is just like any other tactic used in our everyday life. Love presents a paradox, just like many other strategies, that is, in some cases the winning strategy might be that of sacrificing oneself and one's personal interests. The aim of this strategy would increase the probability of attracting a partner. Locating and selecting the best person out of over six billion people is an impossible feat, and perhaps what works best is to be content with the best person encountered so far. Courtship would thus be a type of "market", in which each individual tries to "buy" the best person under the premises of rational reasons (good looks, well-balanced character, finances, etc.). Such a view of courtship and mating, however, does not explain the particular choice that each person makes, or the associated extremely strong feelings that produce significant physiological symptoms such as tachycardia, insomnia and loss of appetite.

### **Brain chemistry and the pathways of love**

In this section I will try to offer a neuroscientific account of romantic love. What exactly happens in our brain when we fall into a romantic obsession? Many scholars, including the New York anthropologist Helen Fisher (2004), were guided in their studies by the idea of the universality of the feeling of love. Their investigations focused on brain chemistry that, according to their intuition confirmed by what happens in the world of non-human animals when choosing a suitable partner for mating, could be involved in the passion of love, namely, dopamine, norepinephrine (a derivative of dopamine) and serotonin.

The main question (à la Shakespeare) Fisher poses, however, is: What is love? The answer she gives is typical of an evolutionary anthropologist. According to Fisher, in fact, you can find the answer by following the course of the evolutionary history of humans. A history that is characterized the development of three brain systems, three access codes that make possible the conduct aimed at reproducing. Every part of the brain has evolved to govern the various aspects of reproduction. Those surveyed and identified by anthropologists at Rutgers University in New Jersey, were lust, romantic attraction (a kind of precursor of romantic love) and attachment (Fisher, 1989, 1992,

1998, 1999). Each represents a system of interdependent biological impulses each with a specific function. Lust impels each individual to search for a sexual relationship with any partner. The role of attraction is instead romantic; its focus is to direct what was at first undifferentiated attention, to a particular individual. It comes into play only after male-female attachment evolved to provide protection, safety and adequate care to their offspring. After having identified the three drives, Fisher concentrated his attention on how one of these three elements, namely romantic passion, affects libido (desire for sexual gratification) and all those feelings that are related to long-term attachment (serenity, security, union). The stage of sexual attraction is associated with the production of large amounts of testosterone that pushes the individual to mate. The increase of dopamine and norepinephrine are, however, the substances primarily responsible for the feeling of ecstasy characteristic of falling in love, together with the release of serotonin in the brain. With regard to the emotional attachment that allows the formation of stable and lasting bonds there is a difference between men and women. In humans beings, in fact, these feelings are related to increased production of vaso-pusher, in women, however, increased oxytocin. They are hormones produced by the hypothalamus, an area at the bottom of the diencephalon. The Hypothalamus' role is twofold and is linked to survival and reproduction: it controls the production of hormones (it is in fact a major player in translating information into nerve signals and plays a part in the endocrine control of the main vegetative functions) expression of some primary and innate behavior patterns such as sleeping, eating, body temperature, the mechanism of defense and aggression and sexual behavior. Fisher's studies on romantic love can be compared to other studies based on the identification of brain areas involved in sexual arousal and instinctual manifestations (Tiihonen et al. 1994; Beauregard, Levesque, Bourgouin, 2001, Karama et al. 2002). What clearly emerges is that the two drives are elaborate in different brain areas. Furthermore, there is a deep difference between the sexes in relation to factors that produce sexual stimulation. Male sexual desire is aroused primarily by visual stimuli, and in fact, it is well known that men are the primary consumers of the multi-million dollar porn industry. Women, as is easy to understand, instead, need words, romantic movies and novels, affection, devotion and all those things that rekindle memories. The brain areas that are activated are those that are primarily involved in emotions, desire, memory and attention (Ellis, Symons, 1990). Serotonin, dopamine and norepinephrine seem to exert a very important role in the initiation of the passion of love.

In synthesis, love and its related features would be determined by low serotonin levels (due to, for example, the obsessive thought of a loved one) and high levels of dopamine and norepinephrine (high levels of two neurotransmitters that cause feelings of euphoria, loss of appetite, insomnia, and focused attention). A second stage of that research was to focus on the brain areas that were interested in what Homer calls the «vehemence of desire». To do this, Fisher analyzed the brain activity of twenty men

and twenty women, who claimed to be madly in love, using fMRI. The experiment lasted a total of twelve minutes for each subject during which they were shown photos of the loved one for about thirty seconds.

The results of this study are as follows: strong activity of the right caudate nucleus, a subcortical structure contained in the basal ganglia. The activity of this system would increase in proportion to the passion of love experienced by the subjects and the sight of a photograph of a loved one (H. Fisher, 2002a, 2002b; H. Fisher et al., 2003). The caudate nucleus with the limbic system (ventral tegument area VTA and NAc nucleus accumbens) is one of the most important areas involved in what is called the mechanism of reward and expectation of a reward (Delgado et al., 2000, Schultz, 2000; Elliott et al. 2003; Gold, 2003). With this particular structure (reward system) we can implement actions to discriminate between different rewards possible to exercise a preference over them, all this in a general situation of waiting, anticipation and motivation. The caudate is part of the reptilian brain or R-complex. The reason for this particular designation is the fact that this brain region evolved about sixty-five million years ago, long before the emergence of mammals. Another brain circuit involved in romantic love, whose activity was detected during the same experiment, is the area right ventral integument, ATV, (Wise, 1996; Schultz Dyyan, Montague, 1997, Breiter et al. 2001; Fiorillo, Tobler, Schultz, 2003). This is a major dopaminergic stream. The task is to distribute ATV dopamine in many brain areas including the caudate nucleus. Energy, the ability to focus, stamina, focused attention, euphoria and motivation are the consequences of such massive distribution of dopamine. These features mentioned above are present and occur in the event of romantic love. The emotion of love is actually a boost, just like hunger and thirst. In summary, symptoms of sexual passion are a strong dependence on the love object, insomnia, loss of appetite, increased energy and states of euphoria in the presence of those we love, and separation anxiety in his absence. These are the very same symptoms that characterize mania and dependencies. Romantic love, then, would have the appearance of a motivation rather than an emotion, a motivational state that looks to achieve a goal and a reward. It would seem that, more than a sexual impulse, it is something very much like a biological impulse such as hunger or sleep.

### **Love and nature's game**

Romantic love is a complex emotional state, often declined as an internal state that drives us to take certain actions and to assume a particular kind of attitude towards another person. The feeling of love, then, is not only an inner state of mind in that concrete actions are involved which, as David Buss says, have important consequences on all those behaviors aimed at the reproduction and survival of the species. According to evolutionary psychologists, the existence of love and its even most naive phenomenology, can be illuminated by Darwinian considerations, a proposition that strongly clashes with more

extreme culturalist assumptions that instead sustain that many people would never even be in love if they had not received information concerning the existence of love. We observe this phenomenon, instead, as a biological process, a ploy devised by evolution to help cement ties and relations. Taking this approach means putting love in a naturalistic perspective. Attracting a partner, establishing bonds, having and caring for children fall into that special outlook that allows us to see romantic love as a natural phenomenon. The theory of natural evolution also suggests the possibility of treating and interpreting the same phenomena as mental adjustments; we think, for example, of the mixture of psychological and physiological changes that occur when you try to cause fear of imminent danger. The same approach could be used with a highly complex and emotional state such as that presented by the case of romantic love. This comparison is less risky if we accept not being able to understand the phenomenon in an exhaustive manner, something that is inherent in questions that ask “what” something “is”. If instead of asking what love “is”, we free ourselves of the anxiety of drafting a comprehensive description from its manifestations, and we instead ask ourselves what “the point” of love is, the question as well as the possible responses would take on an explanatory nature. The adoption of an evolutionary explanation of love as an adaptation is necessary in order to consider it in the context of Darwinian sexual selection. From this perspective, in order for a possible partner to be considered as a good candidate for reproduction he or she must exhibit certain characteristics that meet the wishes of the opposite sex. From this it follows that a significant proportion of what is called a “loving act” has literally more to do with a display of the resources possessed.

Males and females of every animal species have a strong sexual dimorphism; and each possesses features that are considered attractive to the opposite sex. These traits are beneficial in that they allow the competition compete with reproductive rivals and may consent the eventual winning out in moments of conflict. Sexual dimorphism is not as pronounced among males and females of the human species. However, we can say that males and females have significant differences. The same differences in the ancestral environment could have served as indicators of fertility, good health or as the result of sexual preference. There is also an asymmetry between the sexes that result from a number of biological constraints. Reproductive success, as we saw earlier, is not measured equally between males and females. A woman cannot increase her opportunity of reproductive success by choosing many companions, while on the other hand a man can increase his reproductive success by simply increasing the number of partners, this of course before the advent of contraception. This happens for a reason, quite simply, that of the huge difference between the production of eggs and sperm. The eggs that a woman will have in her lifetime are about four hundred, while a man produces three thousand sperm per second with a clear reproductive potential. It is precisely this biological constraint that characterizes and influences the way mates are chosen and strongly characterizes what

can be described by the term reproductive psychology. On the one hand, a smaller investment for males (Trivers, 1972) would lead to searching for more partners, while the higher price that the females pay would result in a more careful selection process employed by women in choosing a mate. This results in the following dynamic: men court - females choose. The role of emotions for the survival of the species is very important. Emotions have been subject to natural selection because they allow the rapid and effective response to threats from the outside world. Consider, just to mention some examples, the reaction of disgust at the sight of decomposing substances, the feeling of fear that guards and protects us by increasing our level of attention, or the feeling of pain, a symptom that something in our body is just not as it should be.

Another feature of the important role played by emotions in the natural history of living creatures is the social role they perform. Emotions, in fact, enable us to relate with each other, cooperate, create bonds and facilitate mutual understanding. The possibility of contact with others is facilitated by facial expressions. The outward expression of emotion has a universal nature that on one side shows their biological nature and on the other allows a one-way correspondence between what you feel inside and what is made manifest outside. Social behavior passes, then, through emotions and we cannot even think of ourselves as social creatures without the mediation of emotion and without the understanding of other people’s behavior patterns. While the exact number of basic emotions remains a matter of controversy, there is a general consensus among scholars that includes joy, anger, suffering, fear, surprise and disgust (Ekman, 1999, 2003). There is no culture that does not include them in their emotional repertoire. The emotion that has divided the opinions of many scholars is romantic love. The dispute concerns its alleged universality. For some, romantic love has a role in organizing and triggering actions, equal to that of basic emotions, whose aim is that of improving reproductive success. The obsessive tendency typical of romantic love focuses the attention of a given individual on her lover and encourages the establishment of pair bonds. Moreover, the passion of love seems to involve and activate the same brain areas that are involved in receiving rewards and punishments. The philosopher Paul Griffiths suggests that besides universal and culture-sensitive emotions there is another category, namely, “higher cognitive emotions”. These have a difference in grade compared to basic emotions in regard to their innate character. They are not automatic and quick like basic emotions. It is not possible find for them a specific facial expression. Among the higher cognitive emotions are included romantic love and all those emotions elaborated by the cortical areas in the human brain, that is, the regions of the brain that emerged and developed five million years ago that and that codify our most complex cognitive abilities. The importance of the greater involvement of the cerebral cortex may explain the influence such emotions may receive from conscious thoughts that would explain the cultural variations that characterize the experience of love and the

meaning and nuances of meaning each culture gives to it. Higher cognitive emotions have a greater degree of sociality than basic emotions. This difference is the necessary presence of another person so you can experience them. Human creatures had to face an increasingly complex and articulated social environment. Even the higher cognitive emotions seem to play into the hands of nature, just as the basic emotions do. Allies of our rationality, they guide us in decisions, choices appropriate to different situations in which we are immersed and embody the rich network of relationships that so particularly characterize humans. Evolutionary psychology invites us not to approach the study and analysis of the rationality that characterizes humans releasing it from the rest. However, a “pure” independent mental life, not tied to emotions, seems to be a means by which common sense assumes no reflection on rationality. Investigating emotion in the light of Darwinian evolutionary theory gives us two ways to refer to emotions. On the one hand we can consider a top-down view of emotions that encompasses emotional thinking completely eliminating the profound differences between emotion and cognition. On the other, there is the bottom-up building of cognitive processes. This is the innovation of evolutionary psychology. Emotions play a central role, and the idea that characterizes traditional theories of social constructivism that consider the emotional aspects tied exclusively to the cultural context in which each of us is surrounded and cut out the biological factors, falls away. There are certainly deep cultural differences in manifested emotional states, but you can bring these differences back into the realm of universal emotions. Universality characterizing emotional states makes it much more possible to identify a universal human nature than that which is made possible by studying other cognitive states.

### 5. The ambition of evolutionary psychology

Can we arrive at the understanding of the cognitive architecture of human beings? Evolutionary psychology (EP), using the principles of evolutionary biology, attempts such a feat. All our natural abilities such as language, vision, ability to attract a person of another sex, fear and aggression, moral judgments, are made possible thanks to the presence of a complex computing system that works so well that sometimes we forget its existence, as if we were affected by a strange and peculiar blindness.

The EP turns his attention to this biological system of diverse skills to provide models of understanding. The identification of selective pressures and, therefore, of the many adaptive problems might offer a possible explanation of cognitive processes and also allow the identification of the neurophysiological basis. Darwin himself in a sense dictated the future implications that could arise from applying his theory and its principles to the study of human nature and he does so in the concluding chapter of the *Origin of Species*. According to Darwin, the psychology of his time had roots that would someday be based on a new foundation, the principles of natural selection responsible for the evolution of human capabilities. Our

evolved cognitive abilities, like the bipedal gait and the posture that characterize us, are subject, therefore, to natural selection. In a sense, this could be considered a fairly modest declination of EP, and it is in this sense that we believe does not cause disagreement among scholars or among those who accept the theory of natural selection and the extraordinary intellectual revolution that it entailed. A different argument would be made instead for the supporters of creationism or intelligent design who hold the deepest reservations concerning whether the theory of evolution is able to give sufficient explanations for each aspect of biology. The scope of the EP is too wide for a narrow definition. EP is looking for the place human beings have in nature. A crucial point in the EP perspective is to figure out that between non-human animals and human beings there is no Rubicon. His greatest ambition is to see that our mind would be an adaptation but not to exigent circumstances, but to our ancestral environment. Leda Cosmides and John Tooby, two leading representatives of this field of study, provide their readers with the following description:

The human mind is the most complex natural phenomenon humans have yet encountered, and Darwin’s gift to those who wish to understand it is a knowledge of the process that created it and gave it distinctive organization: evolution (Cosmides, Tooby 1992, p.163).

The human mind, as Cosmides and Tooby argue, is the product of the evolutionary process, the very same mechanism that governs the whole of nature. The human mind is a set of innate mechanisms specialized to perform certain functions, useful for solving problems that humans faced in their ancestral environment: the search for food, the choice of suitable mating partners, the defense against predators, the ability to predict future actions and to understand the actions of others, managing family relationships, etc. These problems are known as “selective pressures”. The modern mind is the result of a series of adjustments, the result of selective pressures, the product of a long evolutionary history. The “environment of evolutionary adaptation”, under which this development took place is not to be understood in its common sense meaning, that is, it is not defined by space-time coordinates. The notion of “environment of evolutionary adaptedness” was introduced by John Bowlby (1969) in his studies on attachment theory. Bowlby uses this expression to refer to natural circumstances in which one species evolved with behavioral manifestations adapted to that type of environment. This definition has become central in the EP. The environment of evolutionary adaptedness does not correspond to a physical environment (such as, for example, the forest or the savanna) because two species may have evolved in exactly the same way but differ in the physical environment of evolutionary adaptedness. In the genus *Homo* the evolutionary environment of adaptedness refers to that of about ten thousand years ago. During this period, individuals belonging to *Homo sapiens* had a social organization composed of small groups of hunter-gatherers. This type of social organization has characterized much of our evolutionary history for millions of years up to ten

thousand years ago, until the birth of agriculture and the tending of livestock that dramatically changed man's relationship with the environment and modified the physiognomy of groups became more numerous thus giving life to the first urban nuclei. The processes behind evolution are slow and gradual. The evolutionary time in which genetic mutations occur and are manifested by significant changes in our cognitive architecture acted slowly in thousands of generations. The immediate consequence of this reasoning is that five thousand years, namely the lapse of time that separates us from the birth of agriculture and the beginning of modern social organization, is too short a time for the occurrence of any change in our psychological mechanisms. Evolutionary psychologists, therefore, believe that to fully understand the reasons behind the birth of certain psychological adjustments it is necessary to understand the selective pressures presented by the environment of evolutionary adaptedness of the Pleistocene period. According to the theorizing of EP, in reality, the environment in which we are immersed is fraught with much fewer differences than we think, at least from a psychological point of view. Human beings lived in groups, that while smaller than those in which humans presently live, the social dimension still represents a common shared trait. The sociality of human beings carries with it the need to relate not only to individuals of our sex but also those of the opposite sex. What does it mean to say that a certain type of behavior, such as a particular reproductive mode or manifestation of aggression in defense, is an adaptation? Saying that a behavior is an adaptation is to argue that the particular form of behavior was produced by selection because it performed more efficiently in a given function than the alternatives (Symons, 1992). All psychological processes that characterize the human mind have provided an advantage in evolutionary terms for our ancestors. The existence of this advantage would explain the current presence of certain brain structures and functions. Only the use of the theory of natural selection ensures a proper and correct explanation of all the mental faculties we have and of the skills that we normally practice. The appeal to natural selection may be sufficient to explain what makes us who we are. Anything that makes us human, our capacity for perception, our actions, language, thought, emotion, is just the way our evolutionary history and the mode of action of natural selection is manifested.

### **Ancestral evolutionary scenarios**

There are a number of key issues arising from biology that define EP (Cosmides, Tooby, 2005) and which are used to understand how the human mind is made. Underlying this perspective is the finding that the brain is a system based on the laws of physics and chemistry. Its main function is to process information, and in this sense at least is similar to that of a computer.

The brain, made up by organic matter and not silicone, elaborates the information coming from the environment, generates and gives rise to behaviors that are appropriate to environmental circumstances. Neural circuits were se-

lected by natural selection to deal with problems our ancestors had during their evolutionary history. Each brain circuit is specialized for solving a particular adaptive problem. Most adaptive problems have to do with the survival of an individual and its reproductive success. Adaptive problems to which the EP refers to are those faced by our ancestors in the evolutionary adaptation to the Pleistocene, but this does not mean that our mind-brain system is unable to identify the best solutions to the problems that modern man is faced with. Cosmides and Tooby (1997) affirm: "Obviously, we are able to solve problems that no hunter-gatherer ever had to solve - we can learn math, drive cars, use computers. Our ability to solve other kinds of problems is a side-effect or by-product of circuits that were designed to solve adaptive problems. For example, when our ancestors became bipedal - when they started walking on two legs instead of four - they had to develop a very good sense of balance. And we have very intricate mechanisms in our inner ear that allow us to achieve our excellent sense of balance. Now the fact that we can balance well on two legs while moving means that we can do other things besides walk - it means we can skateboard or ride the waves on a surfboard. But hunter-gatherer ancestors were not tunnelling through curls in the primordial soup. The fact that we can surf and skateboard are mere by-products of adaptations designed for balancing while walking on two legs".

According to another principle of EP, consciousness is considered as the tip of of an iceberg. Namely, that most of the things that happen in our mind does not produce the feeling of awareness. Our conscious experience can make a significant contribution to the study of cognitive processes, and it may suggest new hypotheses or highlight a particular aspect of the investigation. Human beings are able to open their eyes and feel the outside world, observe the vividness of colors and feel three-dimensional objects. But this kind of operation, although apparently simple and straightforward (it is enough, in fact, to open the eyes in order to see), is actually extremely complex, because it implies a series of specialized neural circuits for each flow of information that allows us to see the things in the world (analysis of shape, size, distance and motion of objects), to recognize a familiar face from someone who is not familiar, and so on. With the words of Cosmides and Tooby:

To find someone beautiful, to fall in love, to feel jealous - all can seem as simple and automatic and effortless as opening your eyes and seeing. So simple that it seems like there is nothing much to explain. But these activities feel effortless only because there is a vast array of complex neural circuitry supporting and regulating them (*ibid.*)

EP is taken as a model to explain many behaviors that characterize the human species. These include aggression and violence deployed in defense of territory or of the family, the complex nature of the sexual life of humans, mating, marriage, sexual preference, parental care, family, social cohesion, conflict between parents and children, jealousy, romantic love, altruism, the formation of inter-

personal ties, their duration and a long series of behaviors exhibited by humans (Trivers, 1971, 1972, Axelrod and Hamilton, 1981; Axelrod, 1984; Buss, 1991, 1999, Symons, 1992).

EP attempts to account for any behavior performed by individuals or social groups. However, the factor in common to all explanations is to consider each pattern as an adaptation to the ancestral environment. EP, in a word, applies the principles of Darwinian natural selection to the study of the human mind. Its main thesis, as we noted above, is that the brain (and therefore the mind) evolved to solve specific problems that our hunter-gatherer ancestors encountered during the Pleistocene, some ten thousand years ago. This assertion has important consequences on a good definition of "mind". Indeed, it is conceived as a species-specific set of instincts that have allowed our ancestors to survive and reproduce. This idea gives rise to a universal conception of human nature that stands in sharp contrast to the idea of all social scientists who see the human mind as a tabula rasa that is shaped and takes shape through the processes of socialization and learning. Any explanation of mental phenomena appears to be motivated by an internal challenge. In a naturalist, even if not reductionist, account of mental states, the relevant challenge may be represented by an attempt to overcome the mind-body dualism in a line of continuity between science and philosophy. For the intelligent design theorists, the challenge is, however, that of finding an alternative explanation for the origin of life. In an evolutionary explanation of the changes of phenotypes we find this challenge in an attempt to offer adaptationist accounts of how organisms, species or groups of individuals come to be what they are. We can refer to explanations of phenomena, which contain an evolutionary approach, with the phrase "adaptive summaries". Similar reports have a common feature: a particular trait (which is called "adaptation") is the result of the direct action of natural selection that has contributed to inclusive fitness of the species that possesses it. But a defining trait as an adaptation is not a traditional prerogative of a particular characteristic possessed by an organism. We need evidence that a particular trait has evolved during the course of its history so to go better than other traits, and so that the change involves an increase in fitness (West-Eberhard, 2002).

The main evidence that militates in favour of the plausibility of the identification between adaptation and trait is genetic. Another one highlights whether the feature affects the reproductive success of the holders. Even if this condition is satisfied, the possibility that it is matters of an adaptation is more robust. But it is still not enough. We have to ask whether it is possible to develop a mechanistic account of that trait, that is, an explanation of how it can actively contribute to the reproductive success of a species.

Another option for researchers is represented by so-called "natural experiments", i.e., observations within populations that possess the change in question. The purpose of comparative studies is to identify a possible link between strokes with variations from the original tract

and reproductive success. We can establish whether changing environmental conditions and varying a trait, leads to variation in reproductive success. If the change of the two components produces a decrease in reproductive success, that trait can be considered as an adaptation.

### **Pleistocene brains and twenty-second century minds**

Courtship plays a major role in the history of human evolution. The complete understanding of the mechanisms employed by sexual selection is complicated. You can trace, in fact, a starting point from which the path of understanding seems to be more promising than that taken by relying, for example, on the popular ideas about prehistory, too fanciful to highlight the importance of sexual selection in the evolution of our mental abilities. Our ancestors, like other animals, faced sexual conflicts stemming from social relations with other group members. That is what happens today and this makes the challenges presented by sexual conflicts similar challenges to those our ancestors encountered in our evolutionary past. We fall in love and feel the upset of jealousy or passion, we suffer when our love stories end or we create lasting bonds exclusively for taking care of children. It happens that we are terribly attracted by the beauty of a face, the kindness and caring of another human being, the magnitude of a body or a sense of humor. These represent a small fraction of the sexual tastes that characterize human creatures, but if these sexual preferences contribute to the establishment of a human nature that evolved gradually ever since our ancestors began to experience the same feelings. It would be wrong to compare our social conventions, our habits and our sexual tastes on the world that preceded ours, but at least we believe it is proper to refer to our basic emotions in order to find similarities with our ancestors. It would be very difficult to trace the selective pressures that have characterized the ancestral environment and identify difficult challenges for the survival adaptations that have shaped our psychological and mental states, challenges that now have radically changed. If we look within our mind it is possible to see parallels between the indicators of fitness guiding mate choice and cognitive skills. The fundamental difference is that mental qualities are not directly visible as are the proportion of a body or the depth of two dark eyes, but may be detected indirectly, through behavior and, in the case of sexual attraction, through courtship.

Geoffrey Miller (2000) attributes to sexual selection a major role in shaping the human mind. According to the evolutionary psychologist, the mind just as much of it produced culture (language, art, poetry, music) would be the product of adaptations that evolved due to the competition taking place during courtship, in order to be successful and finally be selected. And if the human mind were our curvy peacock's tail? This is Miller's question. Women, highly selective due to the fact that what is at stake is the care and safety of their children, have detoured their preferences concentrating on creative, intelligent and powerful males. Miller expresses his dislike of the psychology of the twentieth century. Being disturbed and intimidated

by sexual selection, in fact, psychology does not consider the possibility that sexual selection may have contributed in influencing the way, expensive and complicated, the choice of mating partners and thus evolutionary behavior and the transformation of human societies. The evolutionary psychologists leverage to build similar arguments on several issues. The evolutionary psychologists like universality and also the ease with which a behavior is done right, acquired, learned only to be used. This enables them to invoke the presence of mental modules, the result of evolution, to explain a particular behavior. This then is inserted into an invariant genetic program, which is universal in the sense that is shared by all. But if on the one hand, the ease and amazing speed with which one learns a particular behavior may indicate the presence of specific neural mechanisms fruit of selection pressures on the other hand, it seems necessary for a complete analysis, taking into examination the dynamics and complexity of socio-cultural evolution. If indeed cultural traits are transmitted in a way similar to genetic ones, all this should have, inevitably, also been reflected on sexual selection, which instead is claimed to be influenced by cultural factors. It should also be reflected in the choices of suitable mating partners or life companions, in the ways in which societies are built and social bonds are formed. The rhythm of cultural evolution, of which our species does not have exclusive rights could explain the many idiosyncrasies present in the behavior and preferences of individuals against a background of shared invariant and universal elements, at least in appearance.

### Adapted words

Charles Darwin in *The Origin of species* assigned great importance to sexual selection, arguing that language, in its gradual development, was the subject of sexual selection, recognizing in it features of an adaptation that we could call unusual (such as intelligence or morality). The dispute that has followed concerning language and its origins has ignited the minds of many scholars and fueled the debate about whether language is innate or is instead a product of learning. Noam Chomsky has vigorously fought this battle against the tenets of social science supporting that language depends on an innate genetic ability.

Verbal language is a communication system far more complex than other modes of communication. It has strong referential concepts expressed through language that are capable of building worlds. Similar findings have been the main causes of the perception of language within the community of scholars, as something mysterious, like something that appeared suddenly in the course of our history. For a long time arguments concerning the evolution of language were banned and the idea that a similar phenomenon could be investigated and argued according to the processes that drive the evolution of the natural world were considered to be of no help in understanding the complex nature of language. Chomsky was one of the main protagonists of this theoretical trend. According to

Chomsky, the complex nature of language is that it can be understood only through a formal and abstract approach such as the paradigm of generative grammar. This theoretical position puts out the possibility of a piecemeal approach to the study of language and the ability to use the theory of evolution to get close to understanding it. Steven Pinker and Paul Bloom, two well-known pupils of Chomsky, in an article entitled "Natural Language and Natural Selection", renewed the debate on the origin of language, stating that it is precisely the theory of evolution that presents the key to explaining the complexity of language. A fascinating hypothesis on why language is a biological adaptation is that which considers it an important feature in courtship. Precisely for this reason it would have been subject to sexual selection (Miller, 2001). A good part of courtship has a verbal nature. Promises, confessions, stories, statements, requests for appointments are all linguistic phenomena. In order to woo, find the right words, find the right tone of voice and the appropriate arguments you need to employ language. Even the young mathematician Alan Turing utilized the courtship form to create his imitation game in "Computing Machinery and Intelligence" (Turing, 1950) with the aim of finding an answer to a simple question, but only in appearance: Can machines think? Turing processes and proposes a way to determine this, in the shape of a game that has as its subject three protagonists: a man, a woman and an interrogator. The man and woman are together in one room, in another place is the interrogator and communication is allowed through the use of the typewriter. The ultimate goal of the interrogator is to identify if on the other side there is a man or a woman. The interesting part concerns what would happen if in the man's place a computer was put that could simulate the communicative capabilities of a human? The thing to emphasize in this context is that the only point of contact between man and machine communication is language. If your computer is capable of expressing a wide range of linguistic behavior appropriate to the specific circumstances it can be considered intelligent. Among the behaviors to be exhibited, Turing insert kindness, the use of appropriate words, and autobiographical information. The importance of transferring to whoever stands in front of us autobiographical information, coating therefore, the conversation with a personal and private patina, the expression of shared interests, the use of kindness and humor, are all ingredients typically found in the courtship rituals of human beings. It is significant that one way in which demonstrating the presence of a real human passed through a linguistic courtship, a mode of expression that reveals the complex nature of language and the presence within it of cognitive abilities. Turing asks: "Can machines think?", and we might answer: "Maybe, if it could get a date on a Saturday evening".

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