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A Gender-related Interpretation of Human Reproductive Behavior

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ABSTRACT

Background: This paper explores the evolutionary origins of human mating behavior. By reviewing the behavior of other primates and our ancestors, we try to hypothesize how human mating behavior has evolved into contemporary patterns.

Purpose: We observe growing concern about couple relationships and acts of gender-oriented harassment and violence. As psychoanalysts, our patients frequently express anguish and confusion about their sentimental life. We also encounter cases of intra-couple violence and related emotional suffering. Understanding the evolutionary contribution to our behaviors and impulses can help address some of these issues.

Methods: We analyze current knowledge on the origins of our species to argue whether human ancestors were high- or low-competition species. We then hypothesize about the evolution of human mating behavior in relation to the introduction of bipedalism and the growth of cranial volume. We interpret contemporary human mating behaviors in light of our phylogenesis. We also present a mathematical approach to mating in an attempt to forge an objective approach to these highly sensitive arguments.

Results: We propose that the transition to bipedalism caused humans to evolve rapidly from a medium-competition to a low-competition species due to the immaturity of their newborns. We posit that since this evolution occurred over a relatively short period on an evolutionary scale, it left vestiges of our medium-competition past in our collective subconscious. We conjecture that this understanding may shed some light on the issues we witness in couple relationships, contributing to their interpretation. From the psychoanalytic standpoint, this offers an intriguing perspective on addressing problematic attitudes and the resulting suffering at the personal and social levels.

Keywords

Human mating behavior, Couple violence, Rape, Human evolution, Feminism, Toxic masculinity, Mathematical modeling of mating.

Two short stories

On a café terrace. They are young and quite beautiful. It's summer, and she is, as it should be, in a revealing attire. He wears classic jeans and a polo shirt, elegant without too much effort; he has the *physique du rôle*. Two half-coups of ice cream on the small round aluminum bar table, like a sign of a lack of desire and a sense of boredom in the air. Evidently, the flames of their initial passion have dimmed. He seems nervous, manfully aggressive. She looks jaded. They don't talk to each other and look at the people who pass by. Or rather, he follows the girls with his eyes "at mid-height" without paying too much attention to what she might think. She turns her gaze away from the men who insistently stare at her.

Sometimes quicker, sometimes slower, giving herself time for a brief reflection. Sometimes, with a strong air of annoyance and an expression that says, "What does this guy want?", sometimes less so. She evaluates her chances, considers her choice.

End of a great love. She is devastated. It must be true because more than one friend told her she had seen them kiss her boyfriend and "that one," who was also her friend until now anyway. Traitor. Jerk. Rage. When he asked her out on a date, she remembers not believing her ears, in fact, not understanding anything anymore. The coolest boy in high school, desired by all girls. Oh, the joy of seeing hateful jealousy in other girls' eyes when they were dating. Yes, yes, she had heard stories, that he was unfaithful, a philanderer, not at all romantic. She had seen that he didn't treat his girlfriends that well. And this story of the slap to one of his exes, surely a lie to take revenge for the fact that he had let her down. But he was so manly, above the others, dominant. And she had really hoped for a long story like in novels. And maybe a house, a family. A thousand dreams. Why not? It must exist, right? Sure, she hadn't dared to talk to him about it, but the fact that he had asked her out, along with his passion and desire for her, must have meant something. It is also true that he never spoke of love, but men are like that you have to understand them. And now, here she is in the ranks of the exes, whom she had looked down on until yesterday. And what a figure with her best friend, who had been in a relationship for a year, and without any problems. With this insignificant boy, good at school, yes, but for the rest... What could she find for him? She had almost pitied her. But now she was the one watching couples hold hands with a knot in her throat.

Banal stories, like a thousand others. Heartaches that pass perhaps when we are young. But the same stories, a few years later, can become tragic, especially if there is a marriage to be undone, even worse if there are children. In our work as psychoanalysts, we often find ourselves confronted with suffering in the couple. In many of these stories, we notice a hiatus between what we really need in a couple and what we look for in the other, consciously and unconsciously.

The current Zeitgeist¹

If we look at our closer cousins in the animal kingdom, we have very few hints of "couple problems." Even in Primates, with whom we have common ancestors, things seem more "natural."

These are sensitive arguments, so let us be clear on two fundamental points. If we express comparative opinions, we do so from the standpoint of ethics rather than morals. A moral presupposes an entity superior to the Being that is to say, what exists and also presupposes judgments between Good and Evil as defined by this superior entity. It is irrevocable and immutable. The only room for maneuver is God's merci. Ethics does not presuppose an external point of reference nor knows judgment or Good and Evil, but only beneficial and harmful. It is an evaluation we can discuss, review, and modify. The reader could ask: beneficial and harmful in relation to what? Well, that, too, is part of what we should agree upon. Or decide that we disagree. As Nietzsche says in the last sentence of *Ecce Homo*, "Dionysus against the Crucified." [1]. We do not make any judgments. At the limit, we say what is beneficial and harmful for us. To be discussed.

The second point to be clarified is that when we put forward the hypothesis that an attitude or behavior is "natural," in no case, only by virtue of that, do we consider it good or justify its author. The false equivalence between Good and Natural is intellectually dangerous. Take murder, for example. Nothing is more natural if, by natural, we mean something that we find in all cultures and eras. If we take Good and Natural as equivalent, we either consider murder to be unnatural which is absurd or we consider it good, which is ethically unacceptable. Or again, it is natural for man to dwell in caves; should we return there?

The unease about couple relationships in our Western society is there. The historical evolutionary function of the couple is to perpetuate the species by trying, in the process, to maximize the contribution of the couple's genes. This function is in crisis. The demographic decline in Europe is evident, and immigration does not compensate for it. In 2021, there was a decrease in the population of 0.6‰ in Europe, resulting from a "natural" balance of -2.6‰ and an immigration contribution of 1.9‰ [2]. It is quite challenging to estimate the negative contribution of elective abortions, so we must take these figures with great caution. If we limit ourselves only to elective abortions for unwanted pregnancies in Europe and North America, according to this source [3], on average, between 2015 and 2019, the number is 8.5‰ of the population. It is clear that in Western countries, there is not, or no longer, a ferocious desire to perpetuate our genes.

The marriage institution also seems to be in crisis, with the global divorce rate increasing by 251.8% since 1960 to reach 48% of marriages in 2022 [4]. The number of marriages is also rapidly decreasing [5]. In both married and unmarried couples, there is a growing trend of not having children for several reasons [6]. Economic constraints and studies among other things are pushing women to have children later in life, with a reduction in the number of children per woman. In the European Union, from 2013 to 2022, the average age of mothers at the birth of their first child increased from 30.3 to 31.1 years [7]. There is also a growing rejection of traditional gender roles and identities, further eroding the birth rate. This fact may be a sign of liberation due to the deconstruction of the categories created by the patriarchal-Caucasian-westerncapitalist power structure. It may also result from a loss of reference points due to the acceleration of neo-capitalist social evolution. Or it could simply be a sign of the deterioration of the economic and psychological conditions (hope for the future) of certain layers of society. Indeed, the long-observed trend of educated women having fewer children has recently been reversed [8]. As psychoanalysts, we have to deal with suffering related to these phenomena.

¹ A German term meaning "spirit of the time." It refers to the prevailing cultural, intellectual, ethical, and political climate, mood, or spirit of a particular period in history as influenced by the ideas and beliefs of the time.

The media have a very ambiguous attitude towards changing roles. On the one hand, we observe a welcome evolution toward more DEI², even if we can suspect some of these actions of "politically correct whitewashing." On the other hand, at the cost of introducing some "diverse" elements, the "classical" roles are reinforced almost to a paroxysm [9,10]. It is enough to consider the evolution of the actors' physique and their ever more marked adherence to gendered ideals of beauty, far from the average population. Think about the last movie or series you watched where most of the actors didn't seem like they had just walked off a beauty pageant stage or finished a fitness training session. There are plenty of testimonies from actresses initially refused by major studios because they were "not beautiful enough" [11], and the list includes Selena Gomez, Winona Ryder, and Meryl Streep. It is a double message that "superficially" appeals to our new social and conscious sensitivity but that, under this cover, repeats the old archetypes, which, obviously, still have a good hold on our unconscious.

One might wonder what is truly happening and why society appears to be evolving and embracing new norms, while traditional roles continue to exert a strong allure beyond our conscious beliefs and behaviors.

An Overview

If you are shown two adult skulls of the same mammal species, one belonging to a female and the other to a male, much can be deduced about their sexual behavior from their relative size. Indeed, if the male's skull is much larger than the female's, we can conclude that there is a very marked sexual dimorphism. The males will, therefore, be very muscular and aggressive, which almost certainly implies competition between them to conquer the females. In this case, the females will be attracted by the males' physical strength and ability to dominate other males in more or less ritualized fights. In this case, we speak of "strong competition" or "high tournament" [12-14].

These males will usually have multiple female partners in the mating season. During this time, they will not be able to ensure the "loyalty" of the female. Females will try to mate with the highest-ranking male but also with lower-ranking ones to maximize their chances of maternity [15] and to allow sperm competition to take place [16,17]. Paternity will be uncertain; therefore, males will not use energy to help the female with the young, and the female will raise them alone [18]. If a female loses her young, she becomes fertile again. Therefore, it is beneficial for any female to stay away from males while raising her young, as they may have an incentive to kill the offspring to impregnate her with their own genes.

Since the male will have several partners, the important thing is that the female can carry and raise their young even if it may endanger her life or her ability to reproduce in the future. In any case, he will have other females who will reach maturity in the next season. In this sense, females are "expendable." However, to perpetuate their genes, they are "fighting back" against an aggressive fetus. Mother-fetus conflict is well documented in highly competitive species [19,20]. The evolutionary struggle between mother and fetus for resource allocation concerns the fetus demanding nutrients and energy, often beyond what is optimal for maternal health, causing physiological stress or complications. The fetus can release hormones that alter maternal physiology to increase resources, such as hCG in humans, which can cause gestational diabetes or hypertension. The substantial maternal investment in the young exacerbates the conflict between the needs of the current offsprings and the maternal possibility of having other pregnancies [21,22].

Since the male is much stronger than the female, if he "wins" his rights over her by fighting with other males, the sexual intercourse is sometimes brutal to the point where - in anthropomorphic terms - we could call it rape [23].

In species with "low competition" (or "low tournament"), it is the opposite. Sexual dimorphism is less pronounced or absent, and often, females are somewhat larger than males. There is less testosterone in males of low-competition species [24-26] and hardly any competition between them, resulting in a more even distribution of breeding opportunities. Twins are frequent. Females are attracted to partners who are more like themselves than their opposites and look for traits in males better suited to equal roles in the parent unit. In these species, the pair's female can sometimes "get bored" and abandon the partner and offspring to find another partner.

In the mating season, females delay mating, expecting to be "wooed" first, allowing the potential mates to prove they are dedicated and consistent, and will care for the offsprings. To test the parental instincts of a suitor, some female birds may feign clumsiness to observe how the prospective mate reacts, whether he will feed them as he would chicks with the worms he has caught. The male and female are constantly together, so the male has good reason to believe that the offspring are his. As a result, males often have a greater involvement in parental care. Usually, they form stable couples. Mother-fetal conflict is reduced because the female must be able to have several reproductive seasons with the same male to maximize the probability of passing on their genes. Fidelity is not in the monogamy "contract," and several studies on animals that form stable or even lifelong couples have shown "escapades" of two partners [27,28].

What about us?

Our closest relatives are the great apes (taxonomic family Hominids): orangutans, gorillas, chimpanzees, and bonobos. These species are considered moderately to highly competitive for access to females.

Dominant male orangutans patrol large territories and mate with receptive females they encounter. Fights between males can occur but are not systematic. Orangutans are semi-solitary, with limited social interactions outside of breeding periods.

² Diversity, Equity and Inclusion.

Gorillas live in groups led by a dominant male (silverback) who monopolizes access to the group's females. Fights for dominance can be intense. They form stable family groups with a dominant male, several females, and their offspring.

Chimpanzees live in communities with complex hierarchies. Males form coalitions to access females, and fights can occur, although cooperation is also common. They form fission-fusion societies where groups form and dissolve frequently, with significant but not exclusive competition for females.

Bonobos live in social groups where social relationships are often based on cooperation rather than competition. Sexual interactions play a significant role in maintaining social cohesion, and conflicts are usually resolved peacefully. Bonobos live in matriarchal groups where females occupy dominant positions, and social bonds are often strengthened through activities such as reciprocal grooming and food sharing.

In sum, although these species show competitive behaviors for females, none fully fit the strict definition of highly competitive species, which often involves extreme competition and frequent fights with significant gaps in reproductive success between males. There is considerable variation between gorillas, which exhibit open competition between dominant males and "harems" of females, and bonobos, which differ from other great apes for less intense social competition and a social structure based more on cooperation and empathy. In any case, complex social interactions and varied group structures moderate competitive behaviors in these great apes.

There is an open debate among anthropologists, evolutionary biologists, and psychologists about whether humans are a highly competitive species [29-32]. This debate focuses on the extent and nature of sexual selection and competition between males to access females in human evolutionary history. While highly competitive species generally exhibit significant sexual dimorphism, in humans, sexual dimorphism is present but moderate. Men are usually taller and more muscular than women, but the difference is not as pronounced as in some highly competitive species such as gorillas and far from the paroxysm of other species such as the southern elephant seal where a male weighs up to 4 tons while females weigh around 900 kg.

Highly competitive species often have polygynous reproductive systems, where a few dominant males appropriate the majority of reproductive opportunities. Humans exhibit a range of reproductive systems, from monogamy to polygyny. From the ethnographic point of view, more than 80% of cultures are polygamous [33]. Yet only ~2% of the human population lives in polygamic families, suggesting a mixture of low to moderate competition. Even in some cultures that allow polygamy, the majority of marriages are monogamous. Just to complicate the picture, in some highly competitive species, de *jure* polygyny does not exclude *de facto polyandry* [34]. In some primates, such as chimpanzees and bonobos, females mate with multiple males [35]. This behavior

has several advantages, allowing females to counter the risk of an infertile alpha male, put themselves under the "protection" of several males, and select the most viable spermatozoa through intense sperm competition [36].

Highly competitive species generally show low paternal investment, with males investing more in competition for mates than caring for offspring. Humans typically have a high paternal investment, with humans often participating in the education of children, which is characteristic of species with low competition. To this, we must add the effect of behavioral and cultural factors. Human reproductive systems and sexual selection pressures are heavily influenced by cultural practices and social norms, making it difficult to compare with other species directly.

How did we get here?

Deciding, based on current human behavior, whether man is a highly competitive species or not is quite difficult. Cultural and social change has been so rapid that the tracks are muddled.

We propose that we take a different approach to the issue. We know that between 7 and 4 million years ago, there were primates who could be our ancestors and who had not yet reached the upright position. The information we have about their sexual dimorphism is uncertain because we only have incomplete skeletons. Three of our ancestors that were still, at least partially, arboreal are the *Ardipithecus Ramidus* (4.4 million years old), the *Ardipithecus Kadabba* (5.8 to 5.2 million years old), and the *Australopithecus Afarensis* (3.9 to 2.9 million years old).

Evidence suggests low sexual dimorphism in *Ardipithecus Ramidus* [37,38]. This would indicate a less hierarchical social lifestyle and the presence of reproductive strategies different from those observed in some modern primate species. Regarding *Ardipithecus Kadabba*, we have indications of low sexual dimorphism [39,40]. Sexual dimorphism seems more pronounced in *Australopithecus Afarensis* [41,42]. We can think that, from the point of view of sexual behavior, our distant ancestors were in the same register as today's primates, not really races with strong competition, but with a dominant male and a "harem" of females. In this case, paternal investment was probably low, and the choice of partner was linked to male dominance.

The assumption of the upright position and speech development has characterized human evolution. The introduction of speech revolutionized human evolution by facilitating precise and rapid communication, strengthening social ties, and allowing cultural transmission. It has enriched abstract thinking and inner dialogue, accelerating innovation and creativity. Speech has also allowed for complex social organization and rapid adaptation to environmental changes. It promoted the coevolution of the brain and language, increasing human cognitive abilities [43,44].

There are indications that speech development has been detrimental at least partially to other abilities, such as visual memory [45]. This interpretation is known as the "cognitive trade-off hypothesis" [46].

Another effect of this evolution was the increase in cranial volume from \sim 500 cm3 of *Australopithecus Afarensis* (\sim 3-4 million years ago) to 1200-1800 cm3 of Neanderthals (10,000 years ago) to 1200-1400 cm3 today [47] with a consequent increase in the newborn skull size and a lengthening of the juvenile period.

The other "compromise" was the transition to the upright or bipedal position. Bipedalism, or the ability to move on two legs, has been a crucial step in human evolution, bringing several significant evolutionary benefits [48,49]. First, bipedalism freed up hands for activities such as tool-making, exploring the environment, and manipulating objects, promoting cultural and technological development. Second, it provided a better panoramic view of the environment, improving predator detection and foraging. In addition, bipedalism has saved energy during long-distance travel, thus promoting hunting, foraging, and migration to new habitats. Standing also reduced direct sun exposure, aiding in thermoregulation and allowing adaptation to a wide range of climates. Finally, bipedalism facilitated social communication, allowing gestures and visual signals to convey information and emotions between individuals. However, there have also been collateral effects that have required somatic and behavioral "adjustments." With the transition to bipedalism, the human pelvis evolved to support the body's weight effectively and allow for stable locomotion. As a result, the sacroiliac joints became more rigid. This change could only be partially compensated by the evolution of the pelvis towards a wider and more oval shape to facilitate the baby's passage during delivery [49-52]. The increase in cranial volume has worsened this problem. We must add that gestation is very expensive in terms of energy. Therefore, there is an adaptive balance between the child's maturity at birth and the duration of gestation. Humans already have a pregnancy relative to their weight, which is 150% longer than the average primate [53,54]. The combination of a stiffer pelvis and a larger skull created an obstetric dilemma, where it became necessary for human babies to be born at a more immature stage of development than in other primates to pass through the pelvic canal. This has made babies extremely dependent on parental care for their survival and postnatal development. This immaturity at birth, often referred to as "altricial birth," is directly related to the evolutionary constraints imposed by bipedalism and brain evolution.

The evolution towards bipedalism was "relatively" rapid, 2-3 million years. So, a small number of species (*Denisovans, Neanderthals,* and *Homo Sapiens*) found themselves with a reproductive strategy inherited from their family (*Hominids*) unsuited to their recent evolution. A low-competition reproductive strategy would have been more appropriate to the new physiological reality of these species. However, this would have meant a complete "reengineering" of the species, likely requiring a very long evolutionary process, during which they would have been at a significant evolutionary disadvantage. The solution has not been to become a low-competition species but to adapt reproductive behaviors to this new reality.

A Strange Mix

The first problem to solve was to increase the father's participation in the rearing of infants because the mother alone put the survival of the offspring at risk. It was, therefore, necessary to "transform" a medium-competition polygamous structure with dominant males into a structure where males could be more present. The female had to "convince" the male to stay with her. To do this, she "hid" her rut (fertile ovulation period) and increased her sexual availability. Indeed, because of the standing position, the female vulva is less visible than that of other primates. Noticeable changes do not announce women's ovulation as in primates, where the vulva is visible, swelling, and changing color [55]. Several scholars agree that this has two consequences. By hiding the rut (ovulation period) [56-58], the human female becomes more available, and the male has less need to "look elsewhere." In addition, ignorance of the state of fertility of his mate encourages the male to stay close to her, to guarantee her fidelity, and to be able to mate with her as often as possible. This behavior helps ensure the paternity of the offspring, which will require a lot of time and energy from both partners [59].

Regarding family structure in humans, we observe both polygamy and monogamy. While the majority of cultures practice polygyny (one man having multiple wives), the majority of the human population practices monogamy. Polyandry (one woman having multiple husbands) is marginally present. This contrast between cultural prevalence and population distribution may suggest an evolutionary shift towards monogamy [60-62]. A remnant of the medium competition era of human ancestors may be patriarchy. In this structure, males are dominant, and stable couples are common, as male collaboration is necessary for raising children [63]. Most societies are patriarchal, even matrilinear ones, while real matriarchy is rare.

Pair-bonding also helps to reduce aggression and competition between males, facilitating the building of communities [49] and increasing the chances for all males to reproduce. We note that man is one of the physically weakest animals relative to his size that nature has produced. Its survival depends heavily on its technological capabilities and the ability to create cohesive communities. Pair-bonding reduces conflict between males for access to females, leading to increased social stability [64] and the formation of more cohesive and less violent social groups. While males have less need to fight for mates, they can direct their energy to beneficial community activities, such as collective hunting and defense against predators and other tribes. In a pair-bonding system, males are more invested in protecting and raising their offspring, which increases the chances of survival for children. It also reduces infanticide, which is often linked to competition between males [65]. While in polygamous systems, competition between males for access to females can be intense, pair-bonding can lead to increased competition between females for access to a male partner. While it was not so difficult to enter the "harem" of a dominant male, now a single female will mate with the "alpha male"; therefore, the bond must subsist independently on the woman's rut condition. This new situation may have led to

the development of secondary sexual characteristics in human females as a seduction strategy to signal a healthy body well adapted to reproduction. Features such as breast development [66] and waist-to-hip ratio [67] are considered signals of fertility and reproductive health, making them attractive to potential partners [68]. These characteristics could also be "costly signals" [69], like the peacock's tail [70]. In short, they lead the male to (unconsciously) think: "If a female can afford to accumulate so much useless, even handicapping tissue due to the increase in weight, she must be exceptional." The evolutionary reason that led the feminine ideal in the West to move from Rubens' Three Graces [71] to the "angels" of Victoria's Secret [72] is widely debated [73,74]. Moreover, there are strong indications of a discrepancy between the ideals of beauty portrayed in the media and the criteria of male choice, which appear to be more "stable and traditional" in practice, if not always in rhetoric [75]. As in other low-competition species, females sometimes face a trade-off between good genes and investment and end up in relationships with males who may be caring partners but may not possess the best quality genes for offspring. As we said above, females sometimes search for another mate in species with low competition. Apparently, human females are more likely to look for better genes elsewhere without abandoning the couple [62].

The incidence of unattributed paternity, where the presumed father is not the biological one, varies considerably across studies and populations. Estimates typically range from 1% to 3%, although some studies have reported rates of up to 10% or more in certain populations or under specific conditions [76,77]. Interestingly, this strategy may be suboptimal in that the rate of unattributed paternity is higher some studies report up to 30% [78] in couples where the father doubts the fidelity of his partner. In this case, the father's commitment to the children is reduced [78-80]. Within the couple, pair-bonding allows for a more efficient division of labor between the sexes, with males being able to contribute more directly to hunting and defense while females focus on gathering resources and raising children. The increase in the energy cost of the child is often cited as a possible cause of the accrued meat content in the diet of our ancestors [81,82]. Some authors link this increase in dietary requirements to the development of "expensive tissues," i.e., the intestine and the brain [83]. This further pushed the separation of roles and the specialization of males as big-game hunters. In addition, it provided an "outlet" for the aggressiveness of the young as an alternative to the fight between them to attract the females, allowing them to show both that they are "genetically superior" and that they will be good "fathers" capable of providing for the needs of the couple [84-86]. In this context, one may wonder why hunters choose to pursue "big game," which is difficult and even dangerous and can only be caught perhaps once a week, rather than seeking out small game that can be obtained more regularly with less effort and risk. One possible reason could be to enhance one's attractiveness as a partner through "heroic" actions [87,88].

Stable and lasting relationships facilitate the transmission of epigenetics and cultural knowledge and skills. Children benefit from learning in a stable home environment, crucial for

developing complex social behaviors and technologies. Thanks to the reduction of competition between males [89], pairbonding couples form stronger bonds with other couples and families, expanding social networks and facilitating cooperation on a larger scale. This promotes the formation of larger, more organized tribes and communities. If our species survived, it means that this strategy worked, and quite well. But it still looks like "evolutive tinkering." We are "eleventh-hour converts" who have not transformed our deep nature as a species. We have added a series of corrective measures [90] that exploited our essential characteristics to create a new reproductive and social structure. It is our opinion that the previous behavioral patterns are still there in the collective subconscious and that they influence our behavior. This profound behavior change occurred in a short period on an evolutionary scale, less than a million years. The internal conflicts and contradictions of this evolutionarily unprecedented situation are perhaps one of the reasons for our "unhappiness" and our inability to build peaceful, stable, and rational societies.

The transition from a species with moderate competition to one emphasizing low-competition collaboration has been uneven across cultures and over time. Some cultures still practice or tolerate polygyny. The patriarchal system remains prevalent globally despite criticism and deconstruction in the Western world. Family living arrangements vary: some cultures practice neolocal residence, where the new family establishes its own home, while others practice patrilocal residence, where couples live near or with the husband's family. Modern urban societies typically favor nuclear families and neolocal residence. This evolutionary process continues to unfold before us [91,92].

In fact, this evolutionary choice was a "niche" and high-risk strategy. The first hominid to have taken this route seems to have been Homo Erectus, which lived in Africa two million years ago [93]. From there, there were three major evolutionary "experiments" that differentiated without losing the possibility of mating. Homo Sapiens appeared in Africa about 300,000 years ago, and it began migrating out of Africa about 70,000 to 100,000 years ago. Neanderthals lived mainly in Europe and Western Asia. They existed from about 400,000 years ago to about 40,000 years ago. It is estimated that Denisovans, identified primarily from bone and tooth fragments found in the Denisova Cave in Siberia, lived between 200,000 and 50,000 years ago [94,95]. After leaving Africa, these three species were found in Europe about 70,000 to 40,000 years ago. Archaeological and genetic evidence shows these interactions included cultural exchange and hybridization [96,97]. The fact that Homo Sapiens survived, in part, through hybridization with Denisovans and Neanderthals can be interpreted as the result of intense evolutionary pressure. It seems that these three species sought to differentiate themselves, to finally remix and thus optimize their chances of survival [95.98]. The adaptive success of this operation is undeniable. But, in a sense, it has created its own challenges. Society is evolving at an increasing pace, and we are constantly trying to adapt to ourselves with the "means at hand," making it challenging to consolidate our

behavior.

The vestiges of the old regime are still there, and sexual dimorphism is still marked [99,101]. Our species seems to have all the hallmarks of an evolutionary history of males fighting for mates. For example, men have, on average, 60% more muscle mass than women, even 75% more in the upper body, and these differences in musculature translate into significant differences in strength between the sexes [102]. Men, especially young men, have a strong tendency towards physical competition, partially sublimated in sport. From the beginning of development, boys are more physically aggressive than girls, often with outbursts of violence [103-106]. A global study on homicides by the United Nations Office on Drugs and Crime found that men account for "on average 95% of all people convicted of homicide in 53 countries" and 79% of victims [107]. If we add wars, men are much more likely to kill each other than women are to kill each other. The homicide rate in the population is out of all proportion to all that we could find intra-species in animals. If we consider armed conflicts, it is estimated that there were between 160 and 200 million deaths due to wars in the 20th century [108], almost all caused by young males.

It seems evident that we had an evolutionary history in which our male ancestors gained mating opportunities through the use or the threat of force. Other vestiges of the "old regime" are still present. Women's cycle became hidden, but some studies confirm that women's physical characteristics, voices, and smells may become more attractive to men during the fertile phase of their cycle [109,110].

Women's partner preferences also change during the cycle, so they have sexual fantasies about more dominant and masculine men during the fertile part of the cycle. Other studies tell us that women preferred a more masculine and dominant voice [111], especially at the fertile point of the cycle and only for a one-time sexual relationship rather than a long-term committed relationship [112,113].

The Current Situation

The Two Stories Revisited

Let's go back to our two little stories for a moment. In the first one, Monsieur dreams of being an alpha male from before the transition to bipedalism and mating with as many females as he can. It's true that in a context where women could raise children independently, this could be an effective strategy to pass on his genes. But we moved on from there a few million years ago. For our ancestors, this strategy would have been sub-optimal because raising a human child required the collaboration of two parents. This strategy is even more anachronistic today, given the use of contraception and the fact that most unwanted pregnancies end in abortion. So, this would prove to be a poor reproductive choice. In the meantime, Monsieur gives Madame plenty of time to consider whether she might not have a better option before committing one of her 400 precious eggs³ to her companion. Madame is aware of the importance of de *jure*, if not *de facto* monogamy, in maximizing the transmission of her genes in the best conditions, and she carefully weighs her chances. The limit of her strategy is that the number of "good matches" to which she has access is not infinite and, just like her charm, will decrease over time. Mathematically, this is known as "the dynamic secretary problem" or "optimal dynamic stop problem" [114,115]. In this context, the gloomy atmosphere is not very surprising.

In the second story, Madame has been dazzled by an aggressive and dominant alpha male, but she forgot to consider the "good father" aspect, which is indeed more difficult to evaluate. This time, it was she who used an outdated archetype while hoping that the rest was "par for the course." The competition between females did the rest. In this context, Monsieur uses his "conquests" to assert his status as an alpha, somewhat "at a loss" because he is not going to build a harem to which he has exclusive access. However, this way, he can broaden his choice of a more permanent partner. It is for him that the "secretary's problem" will arise at a certain point. As for Madame's friend with her "good boy" partner, in our society, the "alpha" features may have changed, and intellectual performance should be included in the mix because it can be relevant in obtaining a privileged social status, an important condition for having more children in better conditions. Indeed, a theory considers the development of intellectual faculties as a result of natural selection favoring individuals with larger brains in primates [116]. Her friend was probably sensitive to this evolutionarily more "modern" aspect, apparently with good results.

What these two vignettes want to suggest is our hypothesis that the sexual behavior of human beings comes, at least in part, from a relatively rapid and radical evolutionary adjustment that took place between 1 and 2 million years ago. This adjustment was necessary to ensure the survival of a bipedal species with a large brain. But, precisely because of the large brain, the social structure of this species has continued to evolve at an increasing rate, requiring continuous subsequent adjustments. If we can say so, our capacity for reflexive meta-analysis has accelerated the evolutionary process because it has led us to deconstruct these concepts in an attempt to "rebuild" once again new structures based on abstract notions of inclusivity and equality. Although ethically justified, no one should be surprised at the confusion this is causing. From a psychoanalytic point of view, we have two different sets, or better layers, of archetypes that define our reproductive mechanisms: those related to pair-bonding and low-competition and those related to an older structure, and perhaps more deeply rooted in our collective subconscious, which is one of strong competition, male dominance, and polygamy. The remnants of this second structure are at the root of several problems we encounter as psychoanalysts and at the societal level.

Young Girls in Bloom

To start with a "light" question, the big problem of teenage males (and not only) is why women dress in a way that arouses desire without necessarily signaling sexual availability. In modern terms, we could describe the "evolutionary" and often unconscious average of one egg per menstrual cycle.

³ During the reproductive period (approximately from puberty to menopause), a woman ovulates about 400 to 500 times, releasing an

motivation for this feminine behavior as: "to marry well." For the same reason, they must avoid having sex "before marriage," i.e., bearing children before securing a partner who can participate in taking care of the children. A woman has a limited number of opportunities to reproduce, and therefore, she must wisely manage her chances. The more "attractive" she is, the wider her choice. All this is now largely anachronistic. Contraception, sexual liberation, and the practical possibility of women taking care of their children on their own, especially if they have a favorable economic situation, have completely "muddied the waters." Moreover, this behavior has become maladaptive because a woman who accepts sex with effective contraception can show the possible partner an aspect that can make her even more desirable as a companion without taking reproductive risks.

Boys Will Be Boys

A much more serious problem is that of male aggressiveness in an increasingly "normative" society. Before we embark on this thorny argument, we want to state that, in the ethical sense explained in the introduction, we consider it "beneficial" that women and men have not only the same rights and duties but also the same opportunities. In the same way, we consider any form of prevarication from one individual to another to be absolutely "harmful."

The issue of "toxic masculinity" is widely discussed [117-121]. The question is often presented as follows. Men are aggressive and emotionally repressed. They tend to express their masculinity with risky behaviors and extreme sports. The inevitable corollary of this tendency is an attitude of denigration and objectification of women, which leads to all kinds of violent behavior, social discrimination, and harassment of women, up to and including physical violence and rape. This attitude is called "toxic masculinity". Most of the solutions proposed focus on changing young boys, educating them about the dangers of toxic masculinity. In particular, it is proposed to encourage and value models of masculinity that show vulnerability, empathy, and cooperation. At the same time, the aim is to implement violence prevention programs and mental health interventions specifically designed for men.

There are two basic assumptions in this discourse. The first is that masculinity *in itself* is inferior to femininity as an attitude towards life since it inevitably leads to anti-social and unethical behaviors. Note that we should define "masculinity," "femininity," and "inferior," but we will take the risk of relying on the common understanding of these terms. The second is that masculinity as a category is a consequence of patriarchy and the socialization of sexual roles and that it is possible to "deconstruct" it [122,123] and recompose a new one. Somehow, men "in the state of nature" before their "rehabilitation" are considered evil, sick, and dangerous, and they can improve only by acquiring more "feminine" traits.

In our opinion, several points make this discourse ineffective and dangerous. First, gender differences in behavior and psychology are not consistent in all cultures. While some differences are universal, others vary greatly depending on the cultural background. The exaltation of masculine qualities such as strength, risk-taking, and physical courage does not imply a culture of violence against women. There are cultures including the one in which the authors grew up where "manliness" is considered a positive value and, at the same time, violence against women is seen not only as a severe degeneration but precisely as a lack of virility. This vision of masculinity is called "chivalrous masculinity" [117]. One may think that this is only a romantic ideal, but there are many examples of men who have sacrificed their lives to protect women. This fact is episodically but eloquently illustrated by the Titanic disaster in 1912, where the overall survival rate for women was 73%, while for men was only 21%.

To see masculinity only as a social construct that comes from patriarchy is to resolve the "nature-nurture" question totally on the "nurture" side. It also means denying biological differences between the sexes and evolutionary factors [124]. Moreover, in a way, it is to shift the problem without really confronting it. If masculinity and femininity come from patriarchy and the socialization of gender roles, where do patriarchy and socialization of gender roles come from? As we tried to explain above, we believe that certain archetypes of "masculinity" are deeply rooted in us (men or women that we are), and simply denying or stigmatizing them is useless or even counterproductive. While cultural factors are important, we believe they do not fully explain the origins of gender differences. Evolutionary biology may help to understand why specific gender differences exist and how they manifest themselves in different cultural contexts.

Several studies contradict the myth that aggression is a male prerogative. One example is the high level of online emotional violence (cyber-harassment) exerted by women [125] and physical violence by women in intimate relationships [126,127]. While there is no doubt that there are more homicides of women than men in relationships, a study by the Center for Disease Control for the years 2016/2017 [128] found that 32.5% of women and 24.6% of men had experienced severe physical violence in their lives by their partners in heterosexual couples. These data are not corrected for the fact that men are more reluctant to admit to having been victims of violence in an intimate relationship.

We often hear that if there were only women in power, there would be no more wars. A study by the National Bureau of Economic Research [129] tells us that between 1480 and 1913, queens of Europe were 27% more likely than kings to wage war and conquer new territories during their reign. The last nation in the European Union to take military action outside the framework of the UN or NATO was the United Kingdom under Margaret Thatcher's government with the reconquest of the Malvinas-Falklands in 1982. It is also true that several studies show that women are less in favor of war than men [130,131], but the difference, although significant, is slight. Other studies find that women approve of wars for different reasons than men, but not to a lesser extent [132]. In any case, the Manichean separation between peaceful/

feminine-violent/masculine does not find confirmation in reality. Feminine and masculine are closely intertwined. If the masculine is so toxic, can the feminine be free of all sin? All easy jokes aside, we should reflect that women are mainly responsible for children's education, especially in the first formative years. From a purely social constructivist perspective, we have to allow for the fact that mothers, victims of social and patriarchal pressure, have no choice but to perpetrate the existing power structure. But this would be tantamount to denying them any capacity to act or "agency" [90] a regrettable conclusion for a discourse that claims to be feminist. Moreover, men are not all-powerful monsters, and women retain considerable - if often "unofficial" - power inside and outside the house. But if we admit an evolutionary subconscious contribution to these structures, we understand more clearly why change is so difficult and must be "negotiated" with our nature. This process requires collaboration between the sexes and, probably, much time to find acceptable solutions.

In modern society, women, as well as men, are subject to the double social and internal/archetypal pressure of having to correspond to traditional models, such as beauty or motherhood for women and strength, risk-taking, and protection for men. The media, well aware of the enormous power of these archetypes, continue to accentuate them and to accentuate their divergence subliminally or explicitly, mainly for commercial reasons.

In a sense, women and men are "prisoners" of these archetypes. One of the objectives of the feminist movement has been to liberate women and allow them to be "something else" than what is dictated to them by these archetypes. This evolution is undoubtedly good for women and valuable to society as a whole, which can benefit from the full contribution of its "better half."

But there is also a pleasure and a sense of identity when we can respond freely to these archetypes, that is to say, to the call of our unconscious. Few women do not feel joy in becoming mothers. A woman who dresses elegantly can rejoice in her image. The size of the cosmetics and fashion market is proof of this. In this sense, society encourages them and is empathetic. Men are under the same external/internal pressure for the archetypes that concern them, but society is becoming very unempathetic towards them, and their situation is complex. Society continues to offer them Rambo [133] and Batman [134], John Wick [135], and Band of Brothers [136], but at the same time, it shows little empathy towards the archetypes and impulses that underlie these models, classified as "toxic." In parallel with this subliminal message pushed to paroxysm, the "official" discourse is that, since it is the socio-economical paternalistic power structure that generates the traditional categories of masculine and feminine, it is enough to "deconstruct" and redefine the definition of masculinity to solve the problem [137].

It is as if a child were a blank sheet of paper, and everything is

learned and nothing innate. Skinner⁴ and Coué⁵ would be vindicated. This project of reprogramming society has worrying aspects of childish omnipotence dreams, magical thinking, and dystopian "normalization". Behind the suave vision of an eradication of men's "toxic" violence, there is a worrying desire for control and standardization. Men shall be "reprogrammed" on how to express their sentiments, what the right way to be empathetic is, what and how to experience feelings, and what dreams to dream of.

Except that this does not change anything about the unconscious that has formed over millions of years of evolution and has such an influence on our behavior. The result is that young males find themselves in a state of constant arousal because of the media, video games, and the double social message, with archetypal impulses that no longer have a socially acceptable outlet, and that they do not learn to manage constructively. This situation leads to existential confusion and, very often, clinical depression [138], decreased self-esteem [139], loss of identity, a sense of guilt, lack of confidence in the future, antisocial behavior, and growing insecurity in relationships.

By considering traditional male impulses and models as "unacceptable" and to be replaced, we encourage their repression instead of teaching boys how to manage them constructively. So, we also renounce giving them a positive ethic of masculinity in the name of a better future where they will no longer feel these impulses once. Unsurprisingly, it becomes extremely dangerous. Every good psychoanalyst knows what the fate of repressed feelings is: they keep coming back to haunt us. When there is no longer a "boy's class" where you learn what to do with aggressiveness, you do anything or nothing at all. The lack of a framework drives crazy. The Oedipal process of confrontation with the father is also impaired because there is no longer any hope of a positive outcome in the identification with the father's masculinity, which is also blamed and stigmatized. Boys can no longer manage their primary fantasies of violence and are crushed by guilt. The reality is perceived as very complicated, and even sublimation becomes difficult.

Society is in the process of operating a collective and divisive projective identification towards men, who risk becoming what they are accused of being. The field is left dangerously open to any kind of identitarian and authoritarian recuperation. It is enough to

⁴ Burrhus Skinner, an influential American psychologist, developed operant conditioning, focusing on reinforcement and punishment in shaping behavior. He controversially argued that everything is acquired, and nothing is innate. Critics claim that behaviorism's excesses, like oversimplifying human behavior and neglecting internal mental processes, limit understanding of complex human experiences and cognitive functions.

⁵ Émile Coué, a French psychologist and pharmacist, pioneered the use of autosuggestion, emphasizing the power of positive thinking and self-affirmation. He believed that repeated suggestions could cure ailments and improve well-being. However, critics argue that Coué's approach oversimplifies psychological issues, ignoring deeper mental processes and the complexity of human behavior and mental health.

offer young men a simple universe with good and bad guys, where they can be "real men," according to what the leader tells us. We know very well how it ends.

Rape

The problem of rape is linked to the previous one of "toxic masculinity." In a polygamous animal society where the alpha male gains the right over the females in the group after the fight with the other males, his power over the harem is "natural." The question of consent does not arise, and probably talking about rape could be undue anthropomorphizing, even if we observe, in some cases, forced copulation by the male. Copulating with all the hard-won females who can care for the children independently is an adaptive strategy for gene propagation. In this sense, copulation without too much regard for consent is in our past but belongs to an archaic version of our mating behavior. Conversely, the pair-bonding couple depends on a form of "consent," as partners choose each other through a "courtship" ritual. In this context, rape has no place because beyond any ethical consideration it is not an adaptive behavior.

In the human species, non consensual intercourse is, therefore, a behavior that comes from a period of medium competition, unadapted for reproduction in couples that have to collaborate in raising the children. In our society, it is entirely ineffective in propagating the rapist's genes because most pregnancies generated by rape end in abortion, and the consequences on the woman's wellbeing are so devastating that her ability to care for the offspring can be seriously compromised. Moreover, in the majority of cases, rapists are not "alpha males" carrying genes of "higher" value. A serious discussion about the epidemiology and pathology of rape is beyond the scope of this work, as there is enormous cultural and social variability. In general, we think we are not entirely wrong when we say that those responsible for rape are carriers of one or more psychiatric illnesses, social maladjustment, post-traumatic stress disorder (PTSD) or substance abuse.

This archaic origin of disregard for consent becomes even more evident if we consider the mass rapes that take place in wars. This behavior is a clear reminder of the period of intense competition, in which the winner acquires the females of the defeated male. It is interesting to note that, if this statement is true, our unconscious is less racist than our conscious because it seems ready to use a population often presented by war propaganda as inferior, and in any case defeated, to propagate our genes. There is the question of arranged or forced marriages, which complicates this framework because they are monogamous couples, but the will and interest of the clan form them. This typically human "innovation" is due to the complexity of human social structures, which use marriage to create social cohesion between families or preserve property. Another interesting aspect that we will not treat here is the question of male-on-male rape as a sign of dominance and a mean to humiliate the adversary in war situations. Unfortunately, the effects of sexual abuse on the victim are particularly severe. If we refer to Lacan, trauma is a shattering event that exposes the subject to an unbearable reality that is impossible to symbolize. It

marks an invasion of reality, disrupting the symbolic and linguistic order. This shock creates a rupture in the subjective experience, confronting the subject with excessive pleasure that is difficult to integrate and give meaning to.

We know that one of the most painful consequences of trauma is the tendency of the victim to feel guilty. This sentiment may seem absurd, but, in a sense, it is a coping strategy. The victim of a trauma feels powerless in the face of fate, and this is unbearable. By attributing responsibility for the event to herself ("it was my fault, and so next time I can avoid it"), she reintegrates the traumatic experience into the realm of the symbolic and regains a form of "control" over reality. Or at least she tries because it begs the question of whether the cure is not worse than the disease in this case.

If our hypothesis is correct, we come from an ancestral period of reproduction where for the woman to accept the dominant male was an "adaptive" behavior. It is well documented that a large percentage of women have sexual fantasies of rape [140-144]. Several raped women confessed to experiencing physical and psychological pleasure during the rape, often accompanied by orgasms [145-147]. Some studies suggest that rapists instinctively prefer women during their ovulation period [148] and that the pregnancy rate is higher in non-consensual versus consensual intercourse [149-152]. There are also discussions about how a stressful situation can cause a woman to ovulate [153,154]. These facts could be "relics" of our medium-competition past, now anachronistic, maladaptive, and ethically abhorrent, but still somewhere in our collective subconscious.

The evolution towards pair-bonding has led women to compete for the male's attention and thus to develop "seduction" strategies to attract him. As we said above, this is not necessarily related to the woman's openness to having sex, especially right away and with anyone!

The combination of these three factors has grave consequences for women who are victims of rape. The feeling of guilt generated by trauma is "rooted" in "unconscious" elements that justify and reinforce it. Social pressure does the rest. Victims, therefore, suffer a double or triple penalty. Maybe that's why the consequences of rape are so profound and difficult to repair. Taking these factors into account could help in the treatment of victims.

Discussion

We have painted a broad picture in which we hypothesize that our reproductive behavior results from a rapid evolution under strong evolutionary pressure from a structure with medium competition similar to that of our *hominid* cousins to a pair-bonding structure. According to this hypothesis, the structure of low-competition pairs did not replace the medium-competition structure but was superimposed, layered, on it. From an evolutionary point of view, the result has been convincing: we are here, and if we manage not to destroy our planet, from the point of view of the species' survival, the future seems reasonably assured.

The fact remains that there are "remnants" of our mediumcompetition past that offer opportunities for improvement because, with the development of our society, they are becoming increasingly anachronistic and troublesome. Despite substantial collaboration between males and females in the construction of society, we have a predominantly patriarchal social structure where females have been excluded from positions of authority and limited in their decision-making and autonomy over their lives. This does not mean they did not have power, but it was an "intimate" power, not a "public" one. In addition, this "asymmetry" excluded them from many social functions, with an unnecessary loss of valuable contributions to society. Ethically, this is unacceptable. The historical merit of the feminist movement has been to highlight this "asymmetry," identify some of its causes, and begin the process of correcting it. Perhaps by necessity, the feminist movement has not focused on the biological and evolutionary/adaptive underpinnings contributing to this "asymmetry," least this provide a possible "natural" justification for the status quo.

The only accepted causes were those coming from social constructivist structuralism⁶. It was, and still is, a "combat" position, understandable but tainted by a dogmatic stance. Its limitation is that a clear view of a problem's concomitant causes makes it easier to solve it. From our point of view, admitting biological and evolutionary origins to the current situation is not the same as justifying it. As we explained at the beginning, considering what is natural as Good and Immutable is a moral position: one does not touch the order of things created by Nature. Ethically, however, even if there are evolutionary and biological reasons for the female condition, it is well worth seeing how to change it because this will benefit all of us.

In effect, one might wonder if this ideological position of feminism is related to the discrepancy noted by some researchers between the movement's effectiveness in advancing society and the difficulties experienced by some feminists in translating their principles into their couples' relationships [159-163].

A serious problem is the level of aggressiveness of our species. Given the change in the social structure of reproduction, this aggressiveness has had adverse effects. Ethically, we can say that if we could do it without continuous wars, it would be a good idea. We note in passing that with the discovery of nuclear weapons, we came close to exterminating ourselves [164]. We also note that one of the consequences of the transition to a pair-bonding reproduction model has been intense competition between women, with the aggressiveness that goes with it. What to do? Modeled on the previous question, and mainly as a consequence of the feminist movement, this level of aggressiveness is often attributed to the "structure" of our society, and, as with patriarchy, men are blamed for their supposed "toxic masculinity." As we said above, this seems to be a cleavage where the feminist movement has operated a projective identification to free women from their share of aggressiveness by attributing it entirely to men. From a Jungian perspective, the male archetype animus [165] is an integral part of the female psyche. This theory would justify the cleavage/ projection interpretation as an attempt to free oneself from any trace of patriarchy by getting rid of the "male in me."

It is our opinion that in the case of patriarchy, the constructivist structural component was preponderant and the evolutionary biological substrate less critical. Measures such as opening all studies and professions to women, the right to vote, legislation ensuring legal parity, raising awareness of feminist societal issues, and affirmative action have led to a great leap forward in correcting patriarchal asymmetry.

In the case of aggressiveness, the evolutionary/biological component is, in our opinion, preponderant, and it is not enough to "teach men to cry" or "lecture" them, to move forward on this question. Aggression, male and female, is in our genes, and repressing or denying it only makes the problem worse. As psychoanalysts, we know that aggressiveness can be sublimated or directed toward positive patterns of behavior or activities. It is most likely thanks to sublimated aggression that we are writing these lines on a laptop computer. We believe that instead of denying or denigrating masculine archetypes, we should propose positive masculine models based on strength, courage, protection, and respect, that is, a model of "chivalrous" masculinity that can give pride to males and at the same time be a positive element in the social construction. Respect for women and their consent is a cornerstone of this notion. To sublimate feminine aggressivity (or their animus in Jungian's terms), we could talk about "chivalrous femininity." The entertainment industry is proposing such female roles, starting with the iconic Ellen Ripley of the Alien series [166-169] to Hermione Granger in Harry Potter [170] and Lara Croft [171].

As for "risky" activities, which require strength, dexterity, and courage, education and mentoring are possible without denying nature. Instead of driving dangerously on the road, you can run a car on a track. If you are looking for adrenaline, skydiving, climbing, mountaineering, diving, and so on can offer it without moderation. And if it is really physical contact that is sought, combat sports are there. This vision must not be normative, not to fall back into harmful stereotypes but must be able to offer models of positive masculinity as a reference. The task is not impossible. We have a vast iconography on the subject, from Lancelot [172] to T'Challa in Black Panther [173] or Gerry Lane in World War Z [174]. It is enough to use them in the right way.

We could be told that all this already exists. It is true, but what

⁶ Constructivist structuralism is a social theory that combines structuralism and constructivism. Structuralism, initiated by thinkers such as Claude Lévi-Strauss [155], analyzes the underlying structures of cultures and societies. Constructivism, represented by authors such as Jean Piaget [156] and enriched by Lev Vygotskij [157] and Alexei Leontiev [158] insists on the active role of individuals in the construction of their social reality. Together, this approach examines how social structures influence behaviors and perceptions, while recognizing that individuals, through their interactions and interpretations, participate in the formation and transformation of these structures.

is missing is integrating it into an organic societal discourse to elaborate an image of "positive masculinity" that can channel the impulses of the masculine archetype in a socially constructive and personally fulfilling direction. Fighting against archetypes is not only a wasted effort but also dangerous because if society does not channel them through established community rituals, they can be destructive for the individual and susceptible to various forms of social and political exploitation. We are all born with archetypes, it is up to society to provide us with "the manual" for their constructive use. From a Jungian perspective, this is true for men but also for women, to give a positive and fulfilling identification to their "animus"⁷ without being forced to repress or project it. After the struggle which, it is true, is not yet over we should think of "the peace of the brave" between genders.

These "manly" models should not be specific to a sexual orientation. We can be strong, protective, courteous, and courageous regardless of who we love and how we love, irrespective of our biology. According to Jung, everyone has an animus, i.e., a masculine principle [165,175].

The delicate junction is precisely not to exclude women from these "virile" roles but also to offer alternative models that are not only focused on physical strength but also sublimation, such as artists or scientists (as observed in artistophiles and sapiophiles). It is essential to encourage socially positive and constructive identifications of our archetypes because they are a source of considerable moral and intellectual energy if used well, and we need them to face the challenges ahead. To stigmatize all masculinity as negative is to chase away the natural... Dividing us will not help women and men. In an attempt to escape prejudices and the subjective treatment of couple problems, scientific approaches to the mechanisms of attraction in animal mating and seduction in the constitution of the human couple have been proposed, and we will briefly describe two mathematical models below.

Mathematical Approach to Mating Mating Model in Animals

Mating is preceded by a courtship phase in animals, generally orchestrated by the male. Let us take the example of the peacock and its female. One of the elements of courtship is the peacock's wheel, a phenomenon based on the implantation, with great precision, of the feathers composing the wheel on the posterior dorsal part of the male. It is clear that random implantation prohibits the erection of the wheel without anarchic overlapping, and the transmission of the genetic characteristics that allow the wheel is crucial for the species' survival. This transmission is based on the common segregation of two antagonistic morphogens, which must be found together in the male. The mathematical study [176-178] of the expression of these two characteristics has shown that a regular Turing structure can appear with a very small interval of values for the ratio between the diffusion coefficients, on the back of the animal, of the two antagonistic morphogens, an activator (resp. inhibitor), the BMP-7 with concentration u (resp. BMP-2 with concentration v). Concentrations u and v of the morphogens and density n of migrant primordial cells of the feathers (feather primordia density) follow the non-linear reaction-diffusion system of equations (1):

$$\frac{\partial n}{\partial t} = D_n \Delta n \cdot \nabla (\chi n \nabla u) + bn(1-n), \\ \frac{\partial u}{\partial t} = D_u \Delta u + f(u,v), \\ \frac{\partial v}{\partial t} = D_v$$
(1)

with $f(u,v) = c_1 nu^2/(1+v) - k_u u$ and $g(u,v) = c_2 nu^2 - k_v v$, and with Neumann boundary conditions for n, u and v.

Figure 1 shows that a small variation in the ratio between the viscosities of BMP-3 and BMP-6 is sufficient to strongly influence the concentrations of morphogens on the Turing patterns corresponding to the simulation of the system (1), the effective ratio being equal to 0.6. In this case, the implementation of the feathers allows a rapid erection, causing an effective attraction of the female.

Marriage Model in Humans

In humans, sexual behavior is difficult to explain by genetics. Although frequently polygamous in primitive societies, humans tend to adopt monogamous pair behavior often in response to partner scarcity [179], but not entirely because there exists a residual percentage of 1 to 3% with an upper limit of 5% in [180] of children do not have the apparent monogamous father (a phenomenon called misattributed paternity) in modern societies. The hominoids closest to humans, in order chimpanzees, gorillas, and orangutans, have very different behaviors, ranging from group fission-fusion behavior for chimpanzees [181] to solitary males in orangutans, including monogamy in gibbons [182] and polygamy in gorillas [183]. Their sexuality is essentially controlled by the rise and fall of hormones in the course of the ovarian cycle [184] and by sexual olfactive and visual selection [182]. This control exists in humans as with all other primates [185,186], but many other psychological, social, and economic determinants influence human sexual behavior in a complex entanglement that is difficult to study, as described above.

Because of this difficulty in finding a biological rationale for human sexual behaviors, some scientists have turned to mathematical modeling. For example, Gottman and Murray [187] found that the influence a couple has on each other is the most important factor. The Murray-Gottman mathematical model of marriage describes the mechanisms that regulate the positive-to-negative affect ratio to predict marital stability or divorce. This model formalizes marital interaction using a nonlinear equation using two influence functions, one for each partner and also adds terms

⁷ In Jung's psychology, the anima and the animus are archetypes representing the feminine and masculine aspects present in the unconscious of each individual. Anima, in humans, embodies emotional sensitivity, intuition and creativity. The animus, in women, symbolizes rationality, assertiveness and critical thinking. Integrating these archetypes is essential for individuation, the process of self-realization. The anima and animus influence the relationships and perceptions of the opposite sex, often projected onto others. Recognizing and incorporating these projections helps balance the masculine and feminine aspects of the personality, thus promoting a harmonious psyche.



Figure 1: a) Poor implantation or ineffective erection and indifference of the female; b) Good erection of the peacock wheel; c) Interest of the female then aroused. Numerical simulation of equations (1): d) D_u/D_v ratio = 0.04; e) D_u/D_v ratio = 0.05; f) D_u/D_v ratio = 0.06; g) Partial development of feather primordia; h) Almost complete development of feather primordia; i) complete effective development of feather primordia.

for dynamic corrections such as negative affect repair and positive affect attenuation. Unlike animal attraction, which is based on morphogens and hormones, attraction, indifference, and repulsion in a human couple have educational and social bases, which can take precedence over biological factors. In the Gottman-Murray approach, the sequence seduction-disinterest-aversion is based on two opposing forces. This mathematical model is based on the rate of change of the Gottman-Levenson variables. These variables consist of two sums of three terms: a constant (m for the man and w for his wife) related to the intrinsic value that each partner brings to the couple interaction (related to his proper mood when alone), plus an autoregressive term related to the past of each partner and the influence a partner has on the rate of change of the other's mood. If at time t, the quantitative Gottman-Levenson mood variable of the man is represented by M(t), r_{M} represents the parameter of emotional inertia caused by the presence of his wife $(r_M M(t))$ is the change of the man's mood due to the simple presence of his wife), and $I_{WM}(W(t))$ the influence exerted by the mood W(t) of his wife at time t. Reciprocally, r_w represents the parameter of emotional inertia caused by the presence of her man $(r_w W(t)$ is the change of the wife's mood due to the simple presence of her man), and $I_{MW}(M(t))$ is the influence exerted by the mood M(t) of her man at time t. The discrete difference equations (2) ruling the dynamics of W(t) and M(t) are as follows:

$$W(t+1) = w + r_{W}W(t) + I_{MW}(M(t))$$

$$M(t+1) = m + r_{M}M(t) + I_{WM}(W(t))$$
(2)

All the parameters w, m, r_w , and r_M are estimated from data recorded during the dialogue between the psychologist and the couple. The constants w and m are related to the initial uninfluenced level of positivity minus the negativity that the idiosyncrasy of each partner brings to the interaction. They reflect the past history of each partner's personality (i.e., their modal affectivity). The autoregressive parameters r's then reflect a partner's immediate influence on the other due to his simple presence. The I's are the influence functions, constituting the nonlinear part of equations (2). For example, $I_{MW}(M(t))$ represents the influence a man in mood state M(t) exerts on his wife at time t. It can be represented by a polynomial whose form depends on the societal context in which the partners have been educated or on the family context in which they inherited a parental model. This dispatching of the Gottman-Levenson variables into "influenced" and "uninfluenced" behaviors and the dynamical model representing their evolution constitutes the basic mechanism for successfully predicting marital stability or dissolution [188].

Conclusions

In this work, based on current paleontological and ethnological knowledge, we have advanced a hypothesis on the development of the human reproductive structure from moderate competition to pair-bonding. We hypothesized that this was an adaptive response to the shift to bipedalism and cranial volume increase, resulting in immature offsprings occurring in a relatively short time interval on an evolutionary scale. In our view, this evolution has left us with "two layers" of overlapping archetypes that interfere with our reproductive activity and social structure.

The speed of the evolution of our society contributes certain aspects that are still "in transition" to this structure and creates a malaise, among other things, in couple relationships, which is probably one of the causes of the crisis of the family and the decrease in the birth rate in so-called advanced societies.

Feminism has driven significant social and ideological advances toward a more inclusive and egalitarian society. It has also stimulated an in-depth reflection on traditional categories and the opportunity for their deconstruction. One of the main topics of feminist criticism has been the structure of patriarchy, considered responsible for the female condition and an instrument of domination. This view has led to the formulation of the concept of "toxic masculinity," referring to the traditional "masculine mystique," which is supposed to be at the basis of the patriarchal structure and physical and moral violence against women. However, to say that all masculinity is harmful is a dangerous logical shortcut. We are seeing a crisis in the very concept of masculinity, with consequences for the self-esteem and well-being of young men. This crisis is also impacting their behavior and mental health.

Our hypothesis proposes to consider masculinity as an archetype that cannot be suppressed or repressed without severe pathological consequences at the personal level and for society as a whole. From a Jungian perspective, this is true for both men and women. The masculine archetype, like all archetypes, is twofold. On the one hand, there is what is called "toxic masculinity," perhaps the ghost of the clan leader of the time of medium competition. The other pole is Lancelot, Prince Charming, "chivalrous masculinity". The "toxic" pole is indeed a danger to the future of our society, and we see it every day. But one must not one cannot in any case throw away (repress) the entire archetype. If we, as a society, do not integrate the whole archetype by valuing the right pole, we may well succumb to the other.

Disclaimer

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