Joseph Jordania
The University of Melbourne

Sexual Selection or Natural Selection?
New Look on the Evolution of Human Morphology, Behavior and Art

ABSTRACT

The author of the article argues that, contrary to Charles Darwin's assertion, sexual selection played only a marginal role in the early evolution of the Homo sapiens. Natural selection through the mechanisms of predator control is suggested to be the central reason behind the crucial evolutionary changes of human morphology (appearance of longer legs, head hair, eyebrows, low male voice, reduction of canines) and behavior (bipedalism, singing, dancing, painting).

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In his classic book "The Descent of Man" Charles Darwin argued that sexual selection was no less of an important driving force behind the evolution of living organisms than natural selection. Despite the unique position of Charles Darwin in a scholarly world, this view was not shared by a number of scholars including Alfred Wallace, the co-discoverer of the principles of evolution, as well as scholars of the following generations (see, for example, the introduction by Moore & Desmond for the 2004 edition of "The Descent of Man"). At least several important evolutionary changes in humans and animal species, that were considered by Darwin to be as a result of sexual selection (like human skin color, the stripes of a tiger or the sounds of a rattlesnake), are today believed to have been formed under the pressure of natural selection.

On the other hand, when it comes to the origins of energetically costly and ostensibly non-adaptive human activities such as singing and dancing, the idea of sexual selection is still very popular (see for example, Miller, 2000). Miller, arguably the most ardent and influential contemporary proponent of sexual selection in human evolution, argues that not only the arts, but even the development of the human languages and the evolution of higher intelligence are the result of the sexual selection process (Miller, 2000a).

The author of this article suggests that one of the possible reasons why Darwin attributed such an extraordinary importance to sexual selection in human evolution was because Darwin virtually neglected the mechanisms of predator control by early hominids (apart from passing mention of the use of stones and clubs by our ancestors. Darwin, 2004: 72, 628). I believe that many features of human behavior and morphology can be clarified if we pay attention to this important factor of human evolution.

How were the early hominids escaping the claws of large predators on the open grasslands of the African savannah, primarily from lions and their ancestral forms? On what mechanisms could they rely on during the vulnerable night-time sleep? Quite

amazingly, virtually no scholar after Darwin attempted to answer these unanswered questions either, continuing the neglect of this crucial factor of the evolution of our species. Adriaan Kortlandt in a experiment-based article suggested that early hominids were possibly using thorny branches to fend of lions (1980), and Hart and Sussman dedicated a book to the critique of the "man the hunter" hypothesis, suggesting that early hominids were virtually defenseless against the prehistoric predators, and their best chance for survival was to climb a tree (Hart and Sussman, 2006). Here we show that in the search of security, our hominid ancestors developed a complex strategic system of defence, based on a whole set of morphological and behavioral changes.

It is crucial to remember that the early hominids had no usual means of defence from predators, unlike other living species: they could not run fast to escape predators, had no big canines, horns or poison, were extremely visible with their upright posture, and very noisy as well (being the only terrestrial singing species. Jordania, 2009); Humans are also several times weaker physically than any other primate of a corresponding size, and their naked soft skin cannot withstand even a relatively modest predator offence that many other primates' hides can endure.

According to the suggested model, the total absence of a traditional means of defence in early hominids was amply compensated by the new strategic defense system of AVID (Audio-Visual Intimidating Display).

I suggest that hominid **primary defense** was based on the principle of aposematic[1] display and included a large number of elements:

The **audio** element of the AVID system was based on a principle of "make as loud, as united and as intimidating a sound as possible". This was achieved by combining the sound of a big group of hominids, developing singing in dissonant intervals (so called "Beau Geste" effect[2]), developing a uniquely human rhythmic unity in singing, using drumming, stomping and also developing an unusually low male voice (for detailed discussion of the audio element of AVID see Jordania, 2009).

The **visual** element of the system of AVID was based on the principle: "look as tall, as big, as unusual and as intimidating as possible". This was achieved by the following morphological and behavioral changes:

Bipedalism. Many animals use the so called "bipedal threat" in critical situations in order to look taller and more intimidating. The idea that the origins of human bipedalism might be connected to the desire to intimidate opponents was proposed a few decades ago (see, for example, Livingstone, 1962; or Jablonski & Chaplin, 1993). I suggest that hominids turned the occasional "bipedal threat" into the powerful element of aposematic display, used *constantly* in their locomotion;

Longer legs. Although humans are one of the slowest running animals among the terrestrial species (most herbivores and predators in the African Savannah can run at

[1] Aposematic display – clear display of visual, audio, or olfactory signs (like the rattle of the rattlesnake, stripes of the skunk) to warn the predators that the pray has a strong secondary defence, or the prey is unpalatable (like brilliant coloring of many unpalatable insects. Ruxton et al, 004: 82-114). Different strategy of the primary defense is *crypsis*, which is based on the principle "be unseen, be unheard." The aim of *crypsis* is to avoid detection by predators (Ruxton et al., 2004:7-25), contrary to aposematism, where species try to be as noticeable as possible.

[2] Beau Geste effect – when vocal signals of few individuals create an audio effect of a much bigger group. Singing in dissonant harmonies can create such an effect.

about 60 km/h compared to the top human speed of only 36 km/h), we have one of the longest legs among land animals, and longer legs than any primate. Amazingly, even the best human athletes, with their long legs and impressive running techniques run much slower, than chimpanzees with their awkward four-limb locomotion techniques. At the same time, longer legs would be definitely advantageous for early hominids in order to look taller and more intimidating to predators;

Long head hair. It was suggested that human head hair was primarily designed by evolution to protect the human head skin from the intense UV light (Jablonski, 2006). Desmond Morris suggested that overgrown head hair was a species-specific morphological sign for the hominids (Morris, 2008:21-22). At the same time we must confess that the necessity to cover a naked patch of skin on the hominid head would hardly require such an amount of hair (untrimmed human hair grows about 1.5 metres, after this every individual hair falls out and the new one starts growing). Also, a species with such a unique method of locomotion (bipedalism) would hardly require any additional means for a visible species-specific morphological sign, and evolution, as we know it, is extremely economical. Instead, I suggest, the huge and most likely tightly coiled "Afro" style hair would have been a very effective addition in making the hominid body look taller in order to intimidate opponents.

Bigger body size and decreased body strength. The idea that the increased body size in hominids primarily had a function of visual intimidation, and was not a result of the increased body power, is corroborated by the well known fact, that human physical power is several times less that the power of our closest primate relatives. Scholars often use men's physical strength (in comparison with women) as a hard evidence of the direct physical competitiveness between males[3], forgetting that in case of direct intrasexual contest it is hard to explain the drastic decrease of the physical strength in human males. It is obvious, that in case of direct physical contest (male to male combat), the strength of human males would increase[4].

Aposematic (warning) display gives the predator a sign (with bright colors on the body, specific smells, sounds, or a demonstratively slow motion) that the intended prey is not profitable for a predator to attack. A slowly walking and very visible skunk is one of the best known examples of aposematic display. Slowly moving and colorful poisonous snakes are also in this category. As a rule, a species which employs aposematic display as a primary defense strategy must have a powerful secondary defense (Ruxton at al., 2004).

[3] See, for example, "Certainly, size, strength, speed, and aggression in men correlate with physical competitive ability, and manipulations that increase these variables lead to greater physical prowess" (Puts, 2010:162).

[4] Although I suggest that cooperation was prevalent in hominid groups, it is also an irrefutable fact, that human males are generally more aggressive than females. To explain this fact I propose to view the phenomenon of human intra-group aggression in historical perspective. I suggest that male intrasexual aggressiveness is a result of a "dicplaced aggression": millions of the years of cooperative aggression towards African predators and competitors formed aggressive behavior in males, and later, when the external factor of aggression mostly disappeared, male aggression found outlet into intragroup aggression (let us remember, that males are aggressive not only towards other males, like this is a case among wolves, but towards females and children as well).

Secondary defense of early hominids. In my earlier publications (Jordania, 2006, 2009) I suggested that the early hominid secondary defense consisted of two crucial elements: (1) throwing stones at the predators, and (2) going into a specific psychological state, which I called the "battle trance."

Throwing objects: Hunting vs. Defense throwing. Calvin suggested that throwing objects played a crucial role in human evolution (Calvin 1993). For Calvin, throwing was primarily used by early hominids for hunting. I suggested that throwing was primarily used as a defense in order to keep a predator far from undesirable physical contact with a hominid body. "Defense throwing" has several important advantages over "hunting throwing": (1) It is much easier to aim at an object when it is running towards you rather than running away from you, (2) the distance for the throw is much shorter in defense throwing, (3) as the distance is much shorter, a thrower can use much heavier rocks, can even throw very heavy rocks with both hands, and (4) when you are throwing a rock at an attacking animal, the speed of the attacking predator is actually augmenting the speed of the flying rock. So in defense throwing we have much better aiming, much shorter distance, are able to use heavier rocks, and hit at a higher speed. The result: much more deadly power of the hit with a big chance to damage the skull of an attacking animal.

The psychological factor in defense. It is not easy to wait for the attacking lion, with only a piece of rock in your hand, to approach you until it is at a comfortable throwing distance with deadly power. The terrifying sight of an attacking lion can easily rush the prey into a panic stricken and unorganized escape. To withstand this terrifying moment I suggest that early hominids developed special neurological mechanisms, and these mechanisms became crucial to hominid defense system.

The central element of the AVID system was going into a very specific, altered state of consciousness which I call the "battle trance" (Jordania 2011). This state may occur in contemporary humans in extremely stressful situations like combat during the war, or when their children or loved ones are under attack. In this state individuals lose their sense of pain (analgesia), lose their sense of fear (we could call this state "aphobia"), lose all their natural instincts of self-survival and they are ready to launch themselves to the much stronger opposition with total dedication to the point of sacrificing themselves.

Military commanders had always been dreaming for an army of such totally dedicated warriors, and without knowing the evolutionary mechanisms, but only from practical experience, they started using (and still use) some of those practical means to induce the battle trance that was developed in the course of human evolutionary history by the powerful forces of natural selection:

Repetitive rhythm. I suggested, that rhythmically united sound was primarily used to create a powerful neurological bond between early hominids to reach "collective identity" (see below). The secret of total commitment of hominids to the interests of their "pack" during a confrontation with lions, through loud rhythmic drumming and stomping, was re-discovered by military leaders in the 16th century. From this time on virtually every army uses long army drills as the most potent means of turning new recruits into dedicated soldiers, and also to induce a trance-like state in their soldiers before going into battle (McNeill, 1995);

Listening to loud music. Another potent means to induce a state of trance in ancient and contemporary humans and make them totally dedicated to the interests of the group is listening to loud and of course rhythmically precise music. According to a recent study, listening and singing along with aggressive heavy rock music is still an important part of the psychological preparation for American soldiers for combat situations in the Vietnam, Afghanistan, and Iraq wars (Pieslak, 2009).

Vigorous dancing. A long dance session is still another potent means for humans to go into an altered state of consciousness, when humans lose their sense of self. Rhythmic and threatening movements of early hominids in the state of "battle trance" is probably the direct ancestor of the universally human desire to dance, and the reason of human predilection to go into the trance-like state in some religious rites (for example, in ritualized long dance sessions of Brazilian Candomle. Omari-Tunkara, 2005). There is also plenty of ethnographic evidence that tribes from across the world engage into specific group dancing sessions before they launch themselves into the military sessions (or hunting).

Face and body painting. Painting faces and bodies before going into battle (or hunting) is another virtually universal feature of human cultures, and I suggest that face and body painting could also have helped early hominids to go into an altered state of consciousness in order to stand their ground against the deadly predators without feeling fear and pain. Although the tangible evidence of hominid singing or dancing could not survive in archeological records, at least some traces of the use of coloring substances have been found. Red ochre was used by our ancestors at least over 230 000 years ago, and black manganese dioxite was used by Neanderthals (McBrearty & Brooks, 2000). As no signs of painting on external objects have been found, scholars propose that our distant ancestors were painting their own bodies (Barham, 2002; Mithen, 2005:230).

Using clothes. The use of animal hides or other objects in order to look bigger and more intimidating would be very logical in the earliest stages of hominid behavior. Very much like face and body painting, a new external look triggers in humans the feel of a different identity, thus contributing to the transition into a different state of mind. The recent suggestion that human lice (which can only live in human clothes) originated more than 3 million years ago, also point to the possibility that clothes were used by our ancestors millions of years ago (Wade, 2007). As our ancestors still lived under the hot African Sun at that time, it is more likely that clothes initially had functions of visual display and psychological transformation, rather than the function of protection from cold and other environmental factors. Protection from cold might have become a leading factor for using clothing much later, after our ancestors migrated from hot Africa to other, colder environmental conditions.

Reaching collective identity. All the above mentioned factors, including rhythmically united loud group singing together with vigorous threatening body movements, face and body painting and the use of different clothes had a function to transform hominids' mental state into the "battle trance", where they did not feel pain or fear and were dedicated to the group's interest with the most zealous, religious devotion. This kind of total dedication to the group's interest was in the best interests not only of the group, but of each individual in the long run as well.

With the intimidating look, fearless behavior, loud group sound and the "firepower" of the close-range rock throwing, early hominids became not only difficult to

hunt, but also superb competitors in scavenging opportunities, even being able to chase away the lions and scavenge their kill.

Cannibalism as a survival strategy of early hominids. Archaeological and paleoanthropological evidence strongly suggests that our ancestors practiced cannibalism (White, 2001). In my opinion the primary function of cannibalism was predator control. For a carnivore predator, the killing of the prey is not the final aim of a hunt, eating is. Even when one of the strongest African herbivores, buffaloes, come to the rescue of their fellow member from the lion's fangs, if the attacked animal is seriously injured during the attack it will become a lion's dinner in few hours. Hunting and eating hominids was much more complex for lions. Although slow and visible hominids were badly equipped to hunt and kill prey themselves, they were superb intimidators as a group. Therefore, in the case of a fatal attack by a lion or another predator (which was not very rare in the African savannah) hominids could collectively attack lions in order to reclaim the bodies of their killed fellows. After reclaiming the dead bodies, they would cannibalise them, most likely in a ritualized manner. This was not a noble and crazy bravery, but an important strategic policy, because this behavior would make predators to realize the difficulties of dieting on hominids. It is widely known, that a group of unarmed noisy humans can chase away even a hungry men-eating tiger (or lion) from its prey, so it is possible to propose that a hominid-killer lion would most likely retreat without a fight when it was facing the well-organized, dedicated and stone-wielding hominid group.

Before our ancestors learnt other means to dispose of dead bodies of their fellow members, cannibalising bodies must have been an important and widespread practice. Humans even evolved a special gene (M129V), protecting against specific cannibalism-related prion disease. "The discovery of this genetic resistance, which shows signs of having spread as a result of natural selection, supports the physical evidence for cannibalism" (Roach, 2003). The belief that consuming someone's flesh gives one strength and other moral virtues of the deceased (both human and animal) is well known across the cultures. Karl Vogt even suggested that Catholic Mass can be a relic of cannibalism (cited from Moore & Desmond, 2004:XLIX).

Starvation, cultural norms and insanity are usually known as the reasons for cannibalism, but I suggest that the central reason for the long-term and widespread practice of cannibalism among hominids and early humans was predator control.

Humans and lions: parallel evolution? Evolution of humans and lions has several strikingly similar features, and I want to suggest that these two species, as competitors and arch enemies for several million years on African savannah, had a profound reciprocal influence on the morphological and behavioral evolution of each other. This was an evolutionary "arms race," where the development of one morphological and behavioral feature by one species was triggering the response from the other species. Here is the list of the evolutionary similarities between these two species: (1) both humans and lions evolved in the open grasslands of savannah in Africa, within the similar timelines: first ancestral forms of both species appeared more than 5 million years ago, and more contemporary forms of both species were formed during the last 2-1 million years; (2) both humans and lions are social animals (this feature is not unique among primates, but is unique among cats); (3) both humans and lions have one very unusual and effective intimidating morphological feature in common: long hair on their

heads (as a mane on lions), which is unique among both primates and cats[5]; (4) both humans and lions have low and very loud voices which they effectively use for the intimidation of their competitors[6]. Humans obtained an upper hand in this "arms race" after developing rhythmically coordinated loud group singing & drumming; (5) both humans and lions went out of Africa and went to different regions of the World in the same historical period (about 2 million years ago); (6) humans and lions were the two most widespread large terrestrial mammals during the Late Pleistocene (100,000-10,000 years ago); and the most importantly, (7) the geographies of the Late Pleistocene period's distribution of both humans and lions coincide virtually completely (Africa, most of Eurasia, and North America. See Turner & Anto'n, 1997). Even the contemporary theories of the evolution of humans and lions have significant similarities: very much like two most popular theories of the origins of Homo sapiens (multiregional evolutionary model and the single origin replacement model), scholars studying the evolution of lions are also grouped behind two models, where one group of scholars maintains that regional varieties of the lions had a successful uninterrupted transformation into the modern groups (Hemmer, 1974), and the other group of scholars claims that a single population of lions from Africa later replaced all the local populations in Africa and southwestern Europe (Barnett, et al. 2006).

Contrary to the traditional view, according to which migrating humans followed the migrations of herbivores, I propose that humans were actually following the lions, and that for millions of years the main strategy used for obtaining food by our ancestors was to chase away lions and scavenge their kill. That's why so many important elements such social lifestyle, intimidating strategies, and the range of distribution of humans and lions coincide.

Another important and mostly neglected factor of human evolution is the mechanisms of **nighttime defense** of the early hominids. I suggest that early hominids used the following strategies: (1) **Evening AVID display** – before going to sleep hominids could organize a long and loud singing-dancing-drumming display, very much like contemporary chimpanzees and some native Africans do (Kortlandt, 1973:14), warning nearby predators about the size of their group and the cohesiveness of the group (Hagen & Bryant, 2003); (2) **Eyespots on a human face** – big cats prefer to attack when their prey cannot see them, that's why cheap plastic masks of a human face tied to the a back of one's head are effective in deterring the attacks of the man-eating tigers in the

[5] Here we should remember, that unlike humans, where both men and women have long head hair, in lions only males have mane. The absence of mane in lionesses could be explained by the fact that lionesses do most of the hunting and large manes would interfere in this crucial activity (it is widely known that although males with big manes are better at intimidating competitors and fighting, they are very poor hunters). According to the more traditional view, the absence of mane in lionesses might be pointing to the role of male lion's mane in sexual selection. Lion's mane can combine both of these functions: sexual selection (through intimidation and defense from competing males) and natural selection (the same intimidation and defense from the competing hominids and the hyenas).

[6] Only men have a low voice. In this context it is extremely interesting to recall the well-known to choir directors' fact, that female voice range is not just higher than male voice range, but it is *exactly an octave higher*. I suggest the reason for this is the specific nature of octave harmonies. Sounds, created by two contrasting high and low pitches (mostly octaves), are the most effective in creating an intimidating, suspenseful and aggressive sound. For this reason composers often use wide octave sounds in horror movies, and rock musicians routinely use octave doubling of the rock riffs (by the lead guitar and the bass guitar) in order to create an aggressive and heavy sound of the heavy rock style.

Sundarbans marshes (Jackson, 2003:78-80). I suggest that eyebrows (arched upwards) and eyelashes (arched downwards) form quite good oval "eyespots" on a sleeping human face. Therefore, seeing "eyespots" on sleeping human faces could deter the attack of lions at night, contributing to the formation of this conspicuous facial morphological feature in our ancestors[7]; (3) **Smell** of human body – Hominids used a whole set of visual and audio aposematic signals during the day, and it is plausible that during the nighttime they used olfactory aposematic signal as well: a strong smell emitted by a human body (particularly from the hair-covered parts of the human body, like armpits and genitals). With the renowned power of all human secretive glands, and without a shower literally for millions of years, this must have been quite a powerful olfactory sign to all prowling carnivores (who try to approach their potential prey against the wind) with even the faintest sense of smell.

In conclusion: I suggest that central driving force of human evolution was a complex defence system of Audio-Visual Intimidating Display (AVID). This system allowed early hominids to control predators, and provided them with protein rich food via so called "aggressive scavenging" (Blumenschine, 1986). As a revolutionary new **non-contact system of defence**, AVID allowed our ancestors, over millions of the years of evolution, to lose their canines, bodily hair, reduced their physical strength and also the resulting fatalities from inter-group violence. The art of the inner transformation and the reaching of the altered state of consciousness became the crucial element of this new revolutionary system of defense (laying foundations of human arts, religion and rituals). We know today that many wonderful human inventions were primarily invented for military purposes (like internet, GPS, or digital photography), so I hope readers will not be too shocked to hear that the strong emotions that human arts elicit from us might be the result of millions of years of struggle for survival in the African savannah.

Despite the fact that my model might provide explanation to many morphological and behavioral features that are usually explained through sexual selection, with the help of natural selection, I by no means reject the importance of sexual selection for the explanation of a few other morphological and behavioral characteristics of our species[8].

But I do suggest that natural selection, through the neglected so far factor of defence from predators, was the decisive factor of evolution of the most of the

[7] There are two alternative hypotheses on the function of the eyebrows: (1) older and generally better known in popular culture suggestion is that eyebrows have been formed to prevent sweat flowing from the forehead into the eyes (this suggestion has been dismissed by Morris as ineffective, Morris, 2008). (2) Eyebrows also had been suggested to be an effective means of communicating moods between humans (Morris, 2008). Although eyebrows are definitely effective in communicating moods, this hypothesis still does not offer as much direct benefit to the bearer of the eyebrows as the suggestion that eyebrows were providing night-time security to sleeping hominids, so I suggest that security was the primary function of eyebrows, and communicating moods was a secondary function. Later, after increasing security standards, the mood-communication function of the eyebrows became leading.

[8] In a recent article on subject, Puts (2010) clearly distinguishes two different mechanisms of sexual selection: (1) female choice and (2) intrasexual competition through intimidation and direct contest, and suggests that the importance of the mechanisms of "mate choice" is greatly exaggerated in the existing literature (Puts, 2010). Although I suggest that the primary subjects of hominid intimidation were external forces (predators, other hominid groups), there certainly is a possibility that hominids (particularly males) were using the same intimidation strategies during the inter-group conflicts as well.

morphological and behavioral characteristics of our species. The central aim of this article is to provoke further scholarly interest towards hominid defence mechanisms.

Every new suggestion needs time. Most of the ideas presented in this article are new. Only future careful examinations of all the conflicting hypotheses on human evolution will be able to clarify whether the forces of sexual selection or the forces of natural selection are behind the crucial morphological and behavioral changes in human evolution.

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