

# Sexual selection and human evolution theories



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Miller, G. F. A review of sexual selection and human evolution: How mate choice shaped human nature

“ Natural selection shapes species to adapt to their environments and arises from individual differences in survival ability- cannot favour ornamental traits that decrease survivorship”. However, it is not sufficient to account for male traits such as peacock’s tail that do not enhance survivorship but rather jeopardize it. Darwin argued that in species with sexual reproduction traits that improved one’s chances in mate competition were selected for regardless of their negative effects for survival. Furthermore, Darwin emphasized the importance of female choice and male competition within the sexual selection because the former evokes the latter. However, Darwin does not investigate the origins of female preference (Ridley, M).

Sexual selection was neglected for a long time because it implied the major evolutionary importance of female choice and it was not well accepted by the contemporaries of Darwin.

Darwin: evolution is differential reproduction rather than differential reproduction. Novel concept. Hard to do mathematical analysis.

Alfred Russell Wallace who wrote about natural selection at the same time with Darwin believed that exaggerated male ornaments and traits did not have an adaptive purpose and did not result from female choice but from good health and genes that allowed males to spend resources on display. He suggested that females are under stronger natural selection to have less ornamentation to avoid attention from predators because they spend lot of time near their offspring (Miller, 2000).

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Fisher (1930) believed that mate selection criteria were biological and thus, under natural selection. He suggested that male sexual ornaments served as indicators of high fitness and good genetic quality and would be selected by females (Miller, 2000). Furthermore, he coined the term runaway sexual selection, which suggests an evolutionary feedback mechanism where female preferences reinforce and perpetuate the traits selected for in males. In the case of runaway selection females choose to mate with males who display a certain trait, subsequently, it will be passed on to the offspring who will then have the trait that makes them more attractive mates. This ultimately leads to phenomenon such as peacock's tail. In Fisher's model the male trait was not deleterious at the start but with females preferring a particular characteristic it passed its optimum cost-benefit ratio, and ultimately, costly traits arise as the outcome of runaway sexual selection (Ridley).

Zahavi.

Trivers (1972) was the first to explain the different intensity of sexual selection in males and females through unequal amount of parental investment. The production of gametes is more costly and time-consuming than that of sperm. Also, females invest more resources into offspring, therefore, they must be choosy and by mating with high-quality male they enhance the quality of their offspring. Since the number of available females limits male reproduction success males have to court and compete for the females. Trivers suggested that the level of competition among males is correlated with the imbalance of parental investment. For example, there is a great difference in body size between male and female elephant seals

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where one male can guard 40 females, resulting in strong male-male competition. (Le Boeuf, 1974). Trivers theory can be applied to bird species like phalaropes and wading birds where it is the females who are bigger, more colourful and aggressive compete with each other for males and males take care of the offspring (Jenni, 1974).

Importance of sexual selection theory: it was disregarded for the most part of 20th century and many science and humanities subjects were advanced without taking sexual selection into account, thus, many theories may need to be revised.

Ridley, M., 1993, Evolution, Ch12 Adaptations in sexual reproduction

Traits that reduce survivorship are deleterious and are mainly present in males as secondary sexual characteristics that are not actually necessary for reproduction; however, they may give an advantage in mate competition with other males. The most famous example of secondary sexual characteristics is peacock's tail but also colourful plumage of birds, big antlers in elks etc. Although these traits are costly they have not been eliminated by natural selection. Darwin's sexual selection theory suggests that the disadvantages in having elaborate secondary sexual characteristics are evened out because they convey a benefit in gaining access to females and increasing reproductive success.

Darwin distributes sexual selection into two categories: male competition and female choice.

Darwin argued that secondary sexual characteristics would be more developed in polygamous species where typically one male mates with several females because the selection for male traits that enhance reproduction will be greater. He provided evidence for sexual selection by comparing polygamous and monogamous species and showed that in the former males tend to have brighter colouring, ornaments and larger bodies whereas in the latter males and females differ less.

Another theory that tries to explain mate choice criteria is Zahavi's handicap theory (Zahavi, 1975). According to this, only males with good genes can survive with a handicapping trait, such as peacock's tail and females will prefer to mate with them. Selection will favour males with handicap traits if their good genes outweigh the cost of the trait. The high cost of handicapping character makes it an honest indicator of male's quality. In his model the preferred male trait was costly to begin with and the expense did not change as the trait became more desired in females.

Archer, J, Lloyd, B, 2002, Sex and gender, Ch 3 Origins

Sexual selection entails female choice and females should choose mates according to their ability to provide the female and her offspring with resources and protection.

Buss (1989) studied human mate preferences in 37 cultures and concluded that there is a strong trend for females valuing mates with greater financial capacity, ambition and sense of entrepreneurship. Archer and Lloyd suggest that this is consistent with Trivers's theory where females are interested in

finding a partner who would be able to invest more parental care into offspring by providing resources.

Males preferred physical attractiveness and youth, which are traits correlated with reproductive capacity (Buss, 1989).

Miller, G. F., 2000, *The mating mind: How sexual choice shaped the evolution of human nature*

Darwin became interested in different animal ornamentation that he encountered on his around-the-world-trip on the board of the Beagle. In 1871 he published *The descent of man, and selection in relation to sex* where amongst other topics he wrote about sexual selection. “ Sexual selection shapes each sex in relation to the other sex”.

Many of Darwin’s ideas were attacked but after a century it was rediscovered.

Dawkins, R., 1989, *The selfish gene, Battle of the sexes*

One of the main female strategies of reproduction is that instead of expecting help from the male to raise the offspring the female prefers good genes instead. If a female can detect good quality males by using visual cues than her offspring will receive on better genetic material. By doing so the likelihood of her genes to survive increases too.

Emlen, S. T., Oring, L. W., 1977, *Ecology, sexual selection and the evolution of mating systems*

Environmental factors affect the development of mating systems and ultimately the intensity of sexual selection. "Fitness is a measure for individual's reproductive success in relation to that of other individuals". Male reproductive success is limited by the access to females, whereas female reproductive success is determined by the available resources. Subsequently, if females limit the reproduction of males then the competition and sexual selection will intensify in males. The ability of a male to protect territory or other resources attracts more females and causes differences in the mating success of other males. The presence of polygamous and monogamous mating systems depends on environmental factors such as the availability of receptive mates and the distribution of resources in time and space, which affects their defensibility. Polygamy is more common in species where one sex does not invest parental care, and thus, can spend time and energy on defending resources and competing for mates.

Emlen and Oring (1977) suggest that sexual selection is stronger in polygamous species than in monogamous species. They point out that the more one sex manages to monopolize resources the stronger becomes sexual selection and the more likely is the development of polygamous mating system.

Moreover, the mating system can differ between populations of the same species due to variations in environmental setting, population structure and density, amount and distribution of resources that all change the potential of monopolization.

Andersson, M., Iwasa, Y., 1996, Sexual selection

“ Sexual selection occurs through competition over mates, which is also the underlying factor of different mechanisms of sexual selection”. Andersson and Iwasa (1996) list these different mechanisms: firstly, female and male choice of mate that has been demonstrated in numerous studies acts to favour traits that attract mates from the opposite sex; secondly, contests that can take the form of direct fighting and favour traits such as large body size, physical stamina, weaponry and other characteristics that enhance fighting ability in the competing sex; thirdly, endurance rivalry that promotes traits to retain reproductive activeness for longer to increase the possibility of mating. Furthermore, they also suggest scramble competition that promotes traits that help in finding the mate before others, such as earlier maturation or better locomotion skills. In addition, other mechanisms are infanticide, coercion and sperm competition. As Andersson and Iwasa (1996) point out, the majority of research has concerned mate choice and mate competition, whereas other mechanisms of sexual selection remain poorly examined.

Owens and Thompson (1994) suggest that optimal mate choice is a trade-off between the number of mates and their quality. They argue that both males and females can be picky; however, the selection will be greater in the sex with higher reproductive rate.

Bateman's gradient explains the differential intensity of sexual selection in males and females. In his studies with *Drosophila*, Bateman showed that sexual selection is typically stronger in males because the number of



offspring fathered by a male increases proportionally with the number of males, whereas the number of offspring remains the same for the female regardless of the amount of males she mates.

Male secondary sexual characteristics may become more pronounced if they increase their reproductive success, although if it reduces the overall viability. The costs of these characteristics include higher threat of predation; large bodies pose higher energetic demands and increase the likelihood of starvation during the growth period; competition may lead to injuries and death. Thus, the extent of secondary sexual characteristics is limited by their costliness and by sexual selection itself if one favoured trait starts to compromise another selected trait.

Sexual selection affects the genetic make-up of the offspring and thus, is an important factor in evolution. It is currently very difficult to discriminate between the different mechanisms of sexual selection and their importance.