

Is War in Our Genes?

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Abstract

In this theoretical review article, it is discussed whether there is something in the genetic make-up of human beings that makes warfare inevitable. It is based on research from the fields of anthropology, ethology, and psychology. The Aggressive Drive Theory, proposed separately by Freud and Lorenz, suggested that aggression is an innate drive, and wars are therefore difficult to avoid. This theory is today considered refuted. The Demonic Males Theory, proposed by Wrangham and Peterson, based on field research showing that warlike behavior exists among chimpanzees, suggests that human and chimpanzee males have a propensity for violence that facilitates warfare. This theory has also received criticism. Warfare seems to have existed already during the hunter-gatherer stage in human history but became considerably more frequent when humans invented agriculture and started building cities. Summing up, it appears that the potential for war is indeed in our genes, but there is no evidence suggesting that there is anything in our genes making warfare inevitable.

Keywords: war, genes, aggressive drive theory, demonic males theory, selfish gene theory, hunter-gatherers, chimpanzees, Seville Statement on Violence

The Aggressive Drive Theory

At the end of WWII, the only explanation for the holocaust and war in general -- humankind had at that time experienced two world wars within a short time span -- seemed to be that humans must be aggressive by nature, and that aggression is an innate drive. This view was put forward already by Sigmund Freud in the beginning of the 20th century.

The most well-known proponents of this theory, the *aggressive drive theory* (or: aggressive instinct theory), psychoanalyst Sigmund Freud and ethologist Konrad Lorenz, both wrote in German, and they used the word *Trieb*, which literally should be translated as "drive". When Freud's work was translated into English, the translators incorrectly chose the word "instinct" instead of drive, and they referred to

it as an “aggressive instinct”. This mistake has caused considerable confusion. The closest way to describe what *Trieb* really means is that it implies an innate (Latin *in natus*: present at birth) drive, functioning in accordance with the so-called *reservoir model*; Montagu (1976, p. 92) referred to it as the “*hydraulic model*”). The drive is triggered by primarily internal stimuli rather than external, in the same way as in the cases of the hunger, thirst, and sexual drives (today, they would perhaps rather be described as homeostatic drives). The internal pressure plays a more central role than external stimulation, and it determines the strength of the drive, although external stimuli contribute. The reservoir model suggests that, in the same way as a reservoir slowly is being filled with water, increasing the pressure in the tank, the force of the drive increases continuously over time, if the need is not fulfilled. The longer the time since the last fulfillment, the greater the pressure. If the theory is correct and aggression really is an innate drive in the suggested sense, then being aggressive would bring pleasure, and humans would feel an ever-increasing urge towards being aggressive, also without external frustration, if they do not get an outlet for the drive. The pressure would sooner or later force each one of us to carry out acts of aggression.

Freud originally stated that there existed only one basic drive in humans, the libido or *Eros*, from which other motivation is derived (Freud, 1910/1940). Later, after experiencing the horrors of World War I, he concluded that there also must exist a destructive force within humans, a drive which he labeled *Thanatos* after the Greek god of death (Freud, 1920/1948). The English-language literature has labeled this drive the death instinct (should be drive). Due to this fact, Freud held the rather pessimistic view that warfare cannot be avoided.

A circumstance little known or at least seldom described in the literature is that Freud opined that the death drive, *Thanatos*, is primarily self-destructive and directed inwards at individuals themselves, and that outward aggression only is a channeled derivation from it. *Eros* and *Thanatos* symbolized to him the ongoing struggle between the wish for life and the wish for death, within everyone. Subsequent psychoanalysts after Freud found the idea of an innate self-destructive drive farfetched, and Hartmann et al. (1949) suggested that there is, indeed, a drive toward destruction within humans, but the primary direction of this drive is outward aggression, not inward self-destruction. This viewpoint has been commonly accepted within psychoanalysis ever since. Thus, the notion of an innate aggressive drive stems, in a strict sense, from Hartmann et al., not from Freud.

Ethologist Konrad Lorenz also suggested the existence of an innate aggressive drive in his book *On Aggression* (1966), a book that reached such fame that he received the Nobel prize in medicine, together with Tinbergen, in 1973. The exact translation of the German original name, *Das Sogenannte Böse* (Lorenz, 1963) would be “*The So-called Evil*,” revealing Lorenz’s viewpoint that aggression is not necessarily bad, but aggression serves evolution. It is obvious from Lorenz’s presentation that he thought

this drive to function in accordance with the previously mentioned reservoir model. Lorenz (1966) suggested that the best way for humankind to avoid violence is to find vicarious outlets for this drive, such as the viewing of aggressive sports. Although he did not use the word catharsis per se, it is clear from the text that he thought the *catharsis theory* to be correct; that viewers of violent sports or films would get a vicarious catharsis or outlet for their aggressive drive, which in that way would be reduced (for a description of the principle of catharsis, see Feshbach, 1955). The question of whether watching violent films reduces or increases aggression, or has no effect at all, has been thoroughly investigated and the findings are overwhelmingly in favor of the notion that watching violent films tend to increase aggression rather than decrease it, according to a report by the Media Violence Commission of the International Society for Research on Aggression (Krahé, 2012). That is, the catharsis theory gets virtually no support at all. It is worth noting that Russell (1993, p. 101) wrote that "a variety of surveys reveal that a majority of North Americans [*at that time, 1993*], perhaps as many as two-thirds, subscribe to some form of cathartic belief." This belief is in stark contrast to research findings.

Phillips (1983) conducted a study of whether intense television coverage of heavy-weight championship boxing fights had any impact on U.S. national homicide statistics. Using a time-series analysis, he tracked changes in the number of homicides in the days leading up to and following the fights. The results were strongly against what would have been predicted by the catharsis hypothesis. Homicides rose significantly in the days following the fights, peaking after a 3-day lag.

The aggressive drive theory, with its derivation the catharsis hypothesis, should thus be regarded as refuted; the need to aggress is not an innate drive comparable to hunger, thirst, or sex, functioning in accordance with the reservoir model. If that were the case, each one of us would feel, even without external stimuli or frustration, an ever-increasing drive to become aggressive, perhaps a need to go out and hit someone about once a week, to have the drive fulfilled. This is certainly not the case.

Having said that, there is no denying that aggression is a common behavior among humans, as in other animals. Aggression has a neurological basis. Throughout evolutionary history, interpersonal aggression has played a role in the fulfillment of other drives, whether innate or conditioned. Subhuman primates show both territorial and hierarchical behavior (Tinbergen, 1951). Also humans display territorial behavior, and aggression is useful and sometimes even necessary in the defense of one's territory. This fact may facilitate feuds and war.

In prehistoric times, individuals who were not able to learn and use aggressive behavior may not have been able to survive and procreate. Mammals living in social groups, including humans, have dominance hierarchies or "pecking orders" (Tinbergen, 1951). Males have their own specific hierarchies, and females have theirs. Aggression in school classes mostly occurs within the same sex, boys fighting with

other boys, and girls having conflicts with other girls (Björkqvist, 2018). If an individual is low in the same-sex hierarchy of a tribe or society, that individual will have difficulties to find a mate. The studies by Goodall (1991) on chimpanzees living in the wild present descriptions of violence between chimpanzees due to hierarchical disputes. Hierarchical orders exist also among humans. Individuals of the same sex will tend to compete over mating partners. When the dominance hierarchy within a group is known and accepted, there is little overt aggression; when the order is disputed, aggression increases. The conclusion that must be drawn is that aggression is not an innate drive functioning in accordance with the reservoir model, but it may aid in the fulfilling of other drives. The use of aggression may especially have been useful to attain vital resources especially in periods and geographical areas where resources have been scarce and need to be fought about.

If it seems correct to claim that the potential (which is not the same as a propensity or predisposition) for war is in our genes, the same goes for peace. Humans clearly have the capacity to cooperate with others and behave altruistically. This too must have had evolutionary value. There is anthropological evidence showing that there have existed, and to some extent still exist, peaceful societies in which violence and homicides are very rare: for instance the Rotuman islanders, the Batek, the Semai, the !Kung, the Paliyan, and the Ladakhi (Bonta, 1997; Fabbro, 1978; Kemp & Fry, 2004).

The Seville Statement on Violence

The belief that human beings are inevitably predisposed to warfare is so widespread that scientists repeatedly have found it necessary to speak out against it. Anthropologist Margaret Mead (1940) wrote, on the brink of WWII, an essay titled "*Warfare is only an invention, not a biological necessity.*" The most ambitious attempt to refute the "*aggression is an innate drive and war is therefore inevitable*" hypothesis is the Seville Statement on Violence (1986/1989). In May 1986, 20 scholars from different countries, representing a variety of disciplines - psychology, neuroscience, biology - gathered in Seville, Spain, to draft the Seville Statement on Violence. In it, they challenged several alleged biological findings that have been used as a justification for violence and warfare. In the opening paragraph, the signatories state that they consider it their responsibility to address these assumptions because they have contributed to an unnecessary atmosphere of pessimism in our time. Central paragraphs of the Seville Statement all begin with the words: "It is scientifically incorrect ... ", and continue with arguments against common misconceptions concerning humankind's alleged predisposition for warfare. In the statement, it is suggested that it is scientifically incorrect to claim that war is genetically programmed into human nature. Genes provide only a developmental potential, which can be actualized in conjunction with the ecological and social environment. It is also scientifically incorrect to claim that war is caused by "instinct," or any such motivation. Likewise, it is, according to the signatories, scientifically incorrect to claim

that humans have a "violent brain," and that we have inherited a tendency to make war from our animal ancestors. Although fighting is widespread within different animal species, only few cases of destructive intraspecies group violence have been reported (according to the statement). A disturbing circumstance of which the signatories could not have been aware of is that only a few years later, Jane Goodall, who spent years studying groups of chimpanzees living in the wild, reported warlike conflicts between groups of chimpanzees, including systematic ambushing ending in killings of members of rival groups (Goodall, 1991).

Warfare is, according to the statement, a peculiar human phenomenon that does not occur in other animals. The fact that warfare is frequent among humans, the statement suggests, indicates that war is a product of human culture; language, tools, and technology have made warfare possible. War is, however, not inevitable; there are cultures that have not engaged in warfare, whereas others have had wars frequently. Furthermore, there are cultures which have engaged in warfare frequently during certain periods, although they have been living in peace with their neighbors at other times (Seville Statement on Violence, 1986/1989).

The Demonic Male Hypothesis

The Seville Statement on Violence had hardly been published before evidence which seemed to refute one of its central pillars became known. Jane Goodall (1991) observed warlike behavior among the chimpanzees she studied in the wild in Gombe. This fact contradicted the Seville Statement's claim that destructive intraspecies group violence does not exist among subhuman species.

Richard Wrangham, a younger collaborator of Jane Goodall, published in 1996, together with Dale Peterson, the highly influential, but also controversial, book *Demonic Males: Apes and the Origins of Human Violence* (Wrangham & Peterson, 1996). In the book, they describe the warlike behavior of male chimpanzees in Gombe National Park in Tanzania. Jane Goodall started observing chimpanzees in the wild in the park 1963, and Richard Wrangham arrived there in 1970. In 1971, there was a rift in the community of chimpanzees which split up in two groups, the original northern one (Kasakela) and the southern breakaway group (Kahama). Soon after the split, warlike animosity broke out between the males of the two groups (which also included females). It was above all the Kasakela males who attacked the Kahama males. They started patrolling the borders between the territories of the two groups, and if they found a lone male member of the other group, they simply killed him. It was not only a question of defending their territory, they were also making raids well into the neighboring group's territory. In 1977, the Kasakela had killed all the seven males of the Kahama group (and a female); the remaining females transferred over to the Kasakela group, and the Kahama group ceased to exist.

Similar warlike behavior has been observed in other places in Africa where chimpanzees in the wild are being studied; for instance, in Tanzania's Mahale

Mountains National Park, and in Kibale Forest in Uganda (Wrangham & Peterson, 1996). When males from neighboring groups meet, they seem to make a quick estimation of whether a fight can be successful or not. The party with fewer males generally retreats. If not, they will be attacked (Wilson et al., 2001). Chimpanzee males in captivity have also been observed killing other males (Verbeek, 2013).

The killings tend to be quite brutal. Ethologist Martin Müller (see article by O'Connell, 2004) described a murder he witnessed 1998 in Uganda as follows. While walking in the forest, he heard screams and the sound of something being pounded at. He ran through the forest towards the noise; then he saw ten chimpanzees who had captured and were killing another one.

"The pounding that they were doing was on his body. The front of the chimpanzee was covered with 30 or 40 puncture wounds and lacerations, the ribs were sticking up out of the rib cage because they had beaten his chest so hard. They had ripped his trachea out, they had removed his testicles, they had torn off toenails and fingernails. It was clear that some of the males had held him down, while the others attacked." (O'Connell, 2004).

Wrangham (2004) writes that between 1963, when Jane Goodall first began observing the chimpanzees in Gombe, and 2002, a total of about 145 data-years of observation were collected across five long-term sites. During that time, forty-six killings were observed or suspected. When the number of chimpanzees in each community is taken into account, it yields a median death rate from intergroup aggression of 140 per 100,000, which rises to 356 per 100,000 if suspected cases are included (Wilson & Wrangham, 2003). Wrangham (2004) writes that he, Keeley, and Wilson assembled war death rates from thirty-two independent human societies, twelve communities of hunter-gatherers and twenty farming communities. For hunter-gatherers, the annual war death rate averaged 165 per 100,000, about the same as the confirmed intergroup killing rate for chimpanzees. For agricultural communities, the toll rose to a staggering 595 per 100,000.

Wrangham's conclusion is that there is something about chimpanzee and human males that makes them have a propensity for killing and warfare; hence the title of Wrangham's and Peterson's (1996) book, *The Demonic Males*. This propensity does not seem to exist to the same extent among females. In the US, for instance, men are nine times more likely than women to commit homicide (Wrangham & Peterson, 1996). Leaning on Wrangham's work, O'Connell (2004) writes: "Research into the aggressive behaviour of male chimpanzees, our closest biological ally, suggests that the urge to go to war is in our DNA and that only women can stop it."

Wrangham's argument seems intriguing; however, there is a serious counterargument. Chimpanzees and bonobos share equally much (98.5%) of their genes with humans and, thus, they are equally closely related to us (Prüfer et al., 2012). In fact, we are so closely related to each other that Jared Diamond (1992)

referred to humans, a bit provocatively, as the “third chimpanzee”. However, the social life of bonobos is extremely different from that of both chimpanzees and humans.

The bonobos were identified as a separate species from the chimpanzees by Ernst Schwarz in 1928. They are more slender than regular chimpanzees, and they have black faces and pink lips. While chimpanzee groups are patriarchal, bonobos are matriarchal. There is very little violence among the bonobos, and sex is often used as a method of conflict resolution and bonding, therefore the bonobos are often said to follow the “make-love-not-war” principle. Females frequently engage in sex with each other, by genito-genital rubbing (de Waal, 1997). In terms of genetic closeness, it is not clear why human social behavior should be more chimp-like than bonobo-like.

Lee and Harley (2012) have speculated that the proposed greater tendency to killing and warfare in males than females occurs because the fight-or-flight response (Cannon, 1915) is stronger in males. They suggest that males and females differ in their physiological response to stress, where males exhibit a heightened sympathetic response to stress compared to females. Referring to work by Taylor et al. (2000), they propose that the classic fight-or-flight response to stress is adaptive for males, whilst females engage in a “tend-and-befriend” response to stress. They suggest that the Y-chromosome gene, SRY (sex-determining region on the Y chromosome), provides a genetic basis for the heightened sympathetic reactivity to stress and thus a predominance of the fight-flight response in males.

Lee et al. (2018) looked for changes in the regulation of a gene called ADRA2C that decrease the activity of the sympathetic nervous system, which regulates the fight-or-flight-response. They analyzed genomes, transcriptomes, which are the entire set of genes expressed in a cell, and epigenomes, which are composed of the array of compounds that can bind to DNA and affect how genes are expressed, from humans, chimpanzees and other primates. The researchers discovered that humans and chimpanzees acquired genetic and accompanying epigenetic changes that decrease ADRA2C expression, thus increasing the fight-or-flight response. These changes were missing in the other primates they investigated, macaques and some bonobos. This finding supports the idea that the fight-or-flight response may be involved in the greater potential for warfare in human and chimpanzee males.

Besides the suggested gender differences regarding the fight-or-flight response, human males are also larger and physically stronger than females and have higher levels of testosterone; these factors are beneficial in both big-game hunting and warfare.

Were the Hunter-Gatherers Peaceful?

Wrangham and Peterson (1996) made another claim that has stirred perhaps even more controversy. They suggested that humans during the hunter-gatherer (forager)

period were more aggressive than subsequent humans. They referred to, among others, a review by Ember (1978); she conducted a global assessment of war-making among hunter-gatherer societies and found that 64% of them engaged in warfare every two years, 26% fought less often, and only 10% were considered to fight wars rarely or never (Ember, 1978). These are relatively high figures.

Wrangham and Peterson also referred to the research by anthropologist Napoleon Chagnon. He conducted field studies among the Yanomamö indians in the Amazonas, who called themselves *waiteri*, the fierce people. He borrowed the term for the title of his classic work, *Yanomamö: The fierce people* (Chagnon, 1968). He found them to be extremely aggressive; according to him, 44% of males estimated to be 25 or older had participated in the killing of someone, approximately 30% of adult male deaths were due to violence, and nearly 70% of all adults over an estimated 40 years of age had lost a close genetic relative due to violence (Chagnon, 1968; 1988, 2013).

Some agree with Wrangham's and Peterson's view. Keeley (1996) argues, in his book *War before Civilization*, based on data from nine archeological cases, that the prehistoric death toll from warfare ranged from somewhere between 7% and 40%. Pinker (2011) combined data concerning prehistoric death tolls from a total of 21 cases. He estimated an average war death toll of 15%.

However, these data have been questioned by many, perhaps by the majority of anthropologists. Keeley's conclusions have been criticized by for instance Pearson (2005) and Thorpe (2005). Pinker's figures have been criticized and re-analyzed by Ferguson (2013). Sponsel (1998) finds Chagnon's data exaggerated. The more accepted view among anthropologists today seems to be that warfare was less common during the hunter-gatherer period than during the subsequent agricultural period. This seems to be in accordance with common sense; being nomadic, hunter-gatherers have the option to move when they have a conflict about resources with another tribe. Once you have an agricultural community, you have settled down, and you are more likely to fight and less likely to give in and move away. Instead, you build fortifications to defend yourself when attacked.

This view does not imply that hunter-gatherers did not have wars with other tribes; even the most die-hard advocate for the "*peaceful hunter-gatherer hypothesis*" would hardly claim that they lived in some kind of Garden of Eden. Still, Keeley (1996) accused archeologists and anthropologists for "having neo-Rousseauian tendencies" and "artificially pacifying the past" (see Ferguson, 2013). The debate between the two camps has at times been quite heated [for an example, see Chagnon's (2013) book *Noble savages: My life among two dangerous tribes - the Yanomamö and the anthropologists*].

Fry and Söderberg (2013) investigated lethal aggression among 21 mobile forager (hunter-gatherer) bands, the data were acquired from the standard cross-cultural sample of anthropology. More than half of the lethal aggression events were

perpetrated by lone individuals, not groups, and almost two-thirds resulted from accidents, interfamilial disputes, within-group executions, or interpersonal motives such as competition about a particular woman. Most cases were classified as homicides, while cases related to feuds or warfare were few. The findings gave support to the view that war among at least modern hunter-gatherers is rare.

There is also archeological evidence from skeletons of Nafutian hunter-gatherers from the Middle East, living between 12,800 and 10,500 years ago, indicating lack of evidence for warfare; of a total of 370 skeletons, only two showed any sign of trauma, and there was none to suggest military action. In contrast, after agriculture appeared, archeological evidence of war is abundant at sites all over the world (Ferguson, 2003). Accordingly, warfare must have reached a much higher level after humans settled down and started farming.

However, Mirazon Lahr et al. (2016) published a study confirming the fact that warfare did indeed exist among prehistoric hunter-gatherers. At Nataruk, west of Lake Turkana in Kenya, they found 27 skeletons that showed clear evidence of having been killed in warfare about 10,000 years ago. At least some of the victims had their hands bound before they were killed. There were eight males and eight females, with five adults of unknown gender, and partial remains of six children. The skeletons had not been placed in graves, but they were well preserved after being submerged in a now dried lagoon. The victims showed extreme blunt-force trauma to crania and cheekbones, broken hands, knees, and ribs, and arrow lesions to the neck. The killers had been using weapons including clubs of various sizes, and a combination of close-proximity weapons such as knives, and distance weapons such as bows and arrows (Gorman, 2016; Handwerk, 2016; Mirazon Lahr, 2016).

Otterbein (2004), in the book *How War Began*, has suggested that there were in fact two periods during human history when warfare significantly increased. The first one appeared around two million years ago, and the second around five thousand years ago. Early humans started hunting big game around two million years ago, and for that purpose, they organized themselves into larger groups, clans or tribes, rather than staying in smaller family-like groups consisting of an alpha-male, females and children, as the case is with most other great apes. Thus, tribal societies appeared. The hunting of big game required a relatively large group of males, well-organized and with weapons such as spears and clubs. While hunting, they must inevitably have encountered other similar tribes, and conflicts arose about hunting grounds and other resources. The same weapons and similar tactics could be used when fighting other tribes as when hunting large game. Otterbein's argument is based on speculation, but it seems relatively well-founded.

The other period when warfare significantly increased, according to Otterbein, was around 5,000 BCE when agriculture became common, and the first cities appeared.

This fact appears to be accepted by all, and it is also based on clear archeological evidence (Ferguson, 2003).

The Genesis of Morality

The point in time when humans organized themselves into tribes and started hunting big game was important for other reasons as well. According to Boehm (1999, 2012), the new social organization required the creation and acceptance of social norms of behavior. If not earlier in evolutionary history, the alpha male society had to be replaced with a more egalitarian and rule-based one; a dictatorial alpha-male would not stand a chance if the other males ganged up against him. The new social order was probably hierarchical, but it had moral codes and tribal laws deciding what is right and wrong.

A society with norms of behavior needs mechanisms to enforce these norms. Free riders, who do not want to do their part of the work, will be punished. Too aggressive individuals, who disturb and upset the balance within the group, have to be ostracized or even killed. According to Boehm (1999, 2012) such mechanisms of social control can range from moderate (criticism, scolding) to strong (expulsion from the group, or ostracism) to ultimate (capital punishment). There will be not only external social control mechanisms but also internal ones. The moral code has to be internalized, and thus, a sense of morality and a conscience will be evolutionary encouraged. This process constitutes the origin of human morality.

In his book *The Goodness Paradox*, Wrangham (2020) agrees with Boehm's view. He writes that the introduction of capital punishment probably facilitated increased peacefulness in humans because the most aggressive individuals were killed; at the same time, the organization into larger groups facilitated warfare. Therefore, he describes this period as characterized by the goodness paradox. Aggression within the group decreased, while aggression between groups increased.

This view is in alignment with the *selfish gene theory* (Dawkins, 1976), which nowadays appears to be generally accepted. Dawkins modified Darwin's theory of evolution and suggested that it is not about survival of the fittest *individual*; instead, he suggested that the basic unit of evolution is the *gene*. Genes which have the greatest chances of survival in a certain environment will do so. The selfish gene theory suggest that individuals will show altruistic behavior towards genetically close individuals who carry the same genes ("*gene altruism*"). At the same time, they might show xenophobic or agonistic behavior towards same-sex individuals from out-groups who carry other, competing genes. They would be less likely to be agonistic towards out-group individuals of the opposite sex, as these would enrich the gene pool of the tribe. The same tendencies could be expected to be observable in modern humans as well.

Conclusive Remarks

Summing up, as the evidence stands today, it appears that the potential for war is indeed in our genes; however, at least according to this review, there is no evidence suggesting that there is anything in our genes making warfare *inevitable*. It also appears clear that warfare has existed a long time, already at the hunter-gatherer period, but it became considerably more common during the agricultural period. The development of modern technology has further increased the human capacity to kill others.

References

- [1] Björkqvist, K. (2018). Gender differences in aggression. *Current Opinion in Psychology*, 19, 30-42. <https://doi.org/10.1016/j.copsyc.2017.03.030>
- [2] Boehm, C. (1999). *Hierarchy in the forest: The evolution of egalitarian behavior*. Harvard University Press.
- [3] Boehm, C. (2012). *Moral origins: The evolution of virtue, altruism, and shame*. Basic Books.
- [4] Bonta, B. (1997). Cooperation and competition in peaceful societies. *Psychological Bulletin*, 121(2), 299-318.
- [5] Cannon, W. B. (1915). *Bodily changes in pain, hunger, fear, and rage*. Appleton-Century-Crofts.
- [6] Chagnon, N. A. (1968). *Yanomamö: The fierce people*. Holt, Rinehart, & Winston.
- [7] Chagnon, N. A. (1988). Life histories, blood revenge, and warfare in a tribal population. *Science*, 239(4843), 985-992.
- [8] Chagnon, N. A. (2013). *Noble savages: My life among two dangerous tribes – the Yanomamö and the anthropologists*. Simon & Schuster.
- [9] de Waal, F. B. M. (1997). *Bonobo: The forgotten ape*. University of California Press.
- [10] Diamond, J. (1992). *The third chimpanzee: The evolution and future of the human animal*. HarperPerennial.
- [11] Ember, C. R. (1978). Myths about hunter-gatherers. *Ethnology*, 17(4), 239-448.
- [12] Fabbro, D. (1978). Peaceful societies: An introduction. *Journal of Peace Research*, 15(1), 67-83. <https://doi.org/10.1177/002234337801500106>
- [13] Ferguson, R. B. (2003). The birth of war. *Natural History*, 112(6), 28-35.
- [14] Ferguson, R. B. (2013). Pinker's list: Exaggerating prehistoric war mortality. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 112-131). Oxford University Press.
- [15] Feschbach, S. (1955). The drive-reducing function of fantasy behavior. *Journal of Abnormal and Social Psychology*, 50(1), 3-12. <https://doi.org/10.1037/h0042214>
- [16] Freud, S. (1920/1940). *Gesammelte Werke [Collected works] (Vol. 13)*. Imago.
- [17] Freud, S. (1930/1948). *Gesammelte Werke [Collected works] (Vol. 14)*. Imago.

- [18] Fry, D. P., & Söderberg, P. (2013). Lethal aggression in mobile forager bands and implications for the origins of war. *Science*, 341, 270-272.
- [19] Goodall, J. (1991). *Through a window: 30 years with the chimpanzees of Gombe*. Houghton Mifflin.
- [20] Gorman, J. (2016, Jan. 20). Prehistoric massacre hints at war among hunter-gatherers. *The New York Times*.
- [21] Handwerk, B. (2016, Jan. 20). An ancient, brutal massacre may be the earliest evidence of war. *Smithsonian Magazine*.
- [22] Hartmann, H., Kris, E., & Loewenstein, R. (1949). Notes on the theory of aggression. *Psychoanalytic Study of the Child*, 3, 9-36.
<https://doi.org/10.1080/00797308.1947.11823076>
- [23] Keeley, L. H. (1996). *War before civilization: The myth of the peaceful savage*. Oxford University Press.
- [24] Kemp, G., & Fry, D. P. (2004). *Keeping the peace: Conflict resolution and peaceful societies around the world*. Routledge.
- [25] Krahé, B. (2012). Report of the Media Violence Commission. *Aggressive Behavior*, 38(5), 335-341.
- [26] Lee, J., & Harley, V. R. (2012). The male fight-flight response: A result of SRY regulation of catecholamines? *Bioessays*, 34, 454-457. <https://doi.org/10.1002/bies.201100159>
- [27] Lee, K. S., Chatterjee, P., Choi, E.-Y., Sung, M. K., Oh, J., Won, H., Park, S.-M., Kim, Y.-J., Yi, S. V., & Choi, J. K. (2018). Selection on the regulation of sympathetic nervous activity in humans and chimpanzees. *PLOS Genetics*, 14(4), e1007311.
<https://doi.org/10.1371/journal.pgen.1007311>
- [28] Lorenz, K. (1963). *Das Sogenannte Böse: Zur Naturgeschichte der Aggression [The so-called evil. On the natural science of aggression]*. Borotha Schöler-Verlag.
- [29] Lorenz, K. (1966). *On aggression*. Harcourt, Brace & World.
- [30] Mirazon Lahr, M., Rivera, F., Power, R. K., Mounier, A., Copsey, B., Crivellaro, F., Edung, J. E., Maillo Fernandez, J. M., Kiarie, C., Lawrence, J., Leakey, A., Mbua, E., Miller, H., Muigai, A., Mukhongo, D. M., Van Baelen, A., Wood, R., Schwenninger, J.-L., Grün, R., Achyuthan, H., Wilshaw, A., & Foley, R. A. (2016). Inter-group violence among early Holocene hunter-gatherers of West Turkana, Kenya. *Nature*, 529, 394-398.
- [31] Montagu, A. (1976). *The nature of human aggression*. Oxford University Press.
- [32] O'Connell, S. (2004, Jan. 07). Apes of war ... is it in our genes? *Telegraph*.
<https://www.telegraph.co.uk/news/science/science-news/3317461/Apes-of-war...-is-it-in-our-genes.html>
- [33] Otterbein, K. F. (2004). *How war began*. Texas A&M University Press.
- [34] Pearson, M. P. (2005). Warfare, violence and slavery in later prehistory: An introduction. In M. P. Pearson & I. J. N. Thorpe (Eds.), *Warfare, violence and*

- slavery in prehistory: Proceedings of a Prehistoric Society conference at Sheffield University, BAR International Series, 1374, 19-33.
- [35] Pinker, S. (2011). *The better angels of our nature: Why violence has declined*. Viking.
- [36] Phillips, D. P. (1983). The impact of mass media violence on U.S. homicides. *American Sociological Review*, 48(4), 560-568.
- [37] Prüfer, K., Munch, K., Hellman, I., Akagi, K., Miller, J. R., Walenz, B., Koren, S., Sutton, G., Kodira, C., Winer, R., Knight, J. R., Mullikin, J. C., Meader, S. J., Ponting, C. P., Lunter, G., Higashino, S., Hobolth, A., Dutheil, J., Karakoç, E., Alkan, C., Sajjadian, S., Catacchio, C. R., Ventura, M., Marques-Bonet, T.,... Pääbo, S. (2012). The bonobo genome compared with the chimpanzee and human genomes. *Nature*, 486(7404), 527-531.
- [38] Russell, G. W. (1993). Violent sports entertainment and the promise of catharsis. *Medienpsychologie*, 5(2), 101-105.
- [39] Sponsel, L. E. (1998). Yanomami: An arena of conflict and aggression in the Amazon. *Aggressive Behavior*, 24(2), 97-122.
- [40] Taylor, S. E., Klein, L. C., Lewis, B. P., Gruenewald, T. L., Gurung, R. A. R., & Updegraff, J. A. (2000). Biobehavioral responses to stress in females: Tend-and-befriend, not fight-or-flight. *Psychological Review*, 107(3), 411-429. <https://doi.org/10.1037/0033-295X.107.3.411>
- [41] Thorpe, I. J. N. (2005). The ancient origins of warfare and violence. In M. P. Pearson & I. J. N. Thorpe (Eds.), *Warfare, violence and slavery in prehistory: Proceedings of a Prehistoric Society conference at Sheffield University*, BAR International Series, 1374, 1-18.
- [42] Tinbergen, N. (1951). *The study of instinct*. Clarendon Press.
- [43] Verbeek, P. (2013). An ethological perspective on war and peace. In D. P. Fry (Ed.), *War, peace, and human nature: The convergence of evolutionary and cultural views* (pp. 54-77). Oxford University Press.
- [44] Wilson, M. L., & Hauser, M. D., & Wrangham, R. W. (2001). Does participation in intergroup conflict depend on numerical assessment, range location, or rank for wild chimpanzees? *Animal Behaviour*, 61(6), 1203-1216.
- [45] Wilson, M. L., & Wrangham, R. W. (2003). Intergroup relations in chimpanzees. *Annual Review of Anthropology*, 32, 363-392.
- [46] Wrangham, R. (2004). Killer species. *Dædalus*, Fall 2004, 25-35.
- [47] Wrangham, R. (2020). *The goodness paradox: How evolution made us both more and less violent*. Profile Books.
- [48] Wrangham, R., & Peterson, D. (1996). *Demonic males: Apes and the origins of human violence*. Houghton Mifflin.