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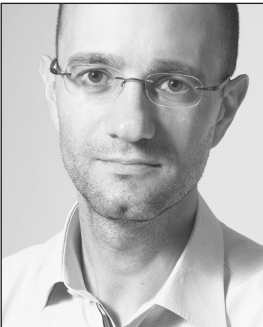
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# From Tribes to States

## Evolutionary aspects of complex societies



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Social complexity has increased substantially as humans evolved from foraging hunter-gatherers to living in nation states. Tracking this ascent of complexity, biological anthropology can shed light on some of the underlying forces driving human behavior. Considering the contemporary leap in complexity due to the digital revolution, an understanding of historical trends and the evolutionary mechanisms of human cooperation, violence and mating allows a profound assessment of current developments.

### 1. TRIBES AND COMPLEX SOCIETIES

No family, no tribe, no state or empire would exist if its members did not cooperate. In the course of history the forms of cooperation have certainly changed, as have the reasons for cooperation. In fact, the major shifts in cooperation took place 70,000, 10,000, 200 and 20 years ago. With the cognitive revolution, 70,000 years ago, humans first started to think and speak in ways similar to those of today. This development marked the onset of culture, laying the foundation for art, religion, trade and more complex social interactions (Harari 2015, 32–36). The agricultural revolution, which began approximately 10,000 years ago, significantly changed the circumstances for cooperation, as foragers turned into farmers and humans began to settle into larger communities. Before, hunters and gatherers roamed in small groups, hardly larger than 150 persons most of whom were closely related. Beginning with the agricultural revolution and particularly since the industrial revolution, ap-

proximately 200 years ago, people started living in communities with a significantly larger number of unrelated persons. Hence, any kind of social organization would have to be built on some type of collaborative myth – a narrative linking cohabitants into some form of community; these communities are based on fictitious tales that turn into reality through collective belief. Over the course of history these unifying myths – comprising gods, nations, laws and money – increased cooperation among unrelated individuals within an imaginary order (Harari 2015, 134–150). It has also been argued that, due to the agglomeration of more individuals in villages and cities during our more “recent” evolution in the last 10,000 years, religion evolved, namely from “small animistic gods” that only marginally enforced moral behavior to “big watchful and punishing gods” (Norenzayan et al. 2016). The emergence of big gods could have been the consequence of settlement in larger units where the control over norm-violating behavior would be difficult if not impossible. In turn, the “evolution”

of watchful gods may have helped to ensure pro-social and cooperative behavior.

This raises the question with whom we cooperate and why? Evolutionary biology allows for a seemingly paradox answer: cooperation is based on self-interest. Until the 1960s, evolutionary biologists did not fully understand why we cooperate extensively within families. At that time, William Hamilton came up with a simple but brilliant theoretical concept why we cooperate among kin (Hamilton 1964), a concept that not only holds true for humans, but across species: Kin cooperation is based on genetic relatedness. We share 50 % of our genes with our children and also 50 % with our full-siblings, while we share only 25 % of our genes with the children of our siblings and 0.125 % with the children of the children of our siblings. As the genetic share decreases with genealogical relatedness, help among kin tends to decrease correspondingly. This is referred to as “inclusive fitness or kin selection” and explains why caring for your relatives is only superficially “altruistic” but in fact “genetically selfish”. Overall, kin selection is the strongest form of cooperation. Nonetheless, the number of individuals with whom someone is able to cooperate is limited because the number of closer kin is limited. During our evolution we mostly cooperated with genetically related individuals, as life took place in groups presumably not larger than 150 individuals (Dunbar 1993). Mutual help and collaboration thus ensured a gene transfer to the next generation. This had a reinforcing effect, as those individuals that engaged in kin cooperation were more likely to raise children and pass on their genes to the next generations, spreading cooperative behavior. In contrast, those not engaging in kin cooperation more likely had only a limited number of children or remained childless.

Source: Harari 2015<sup>1</sup>

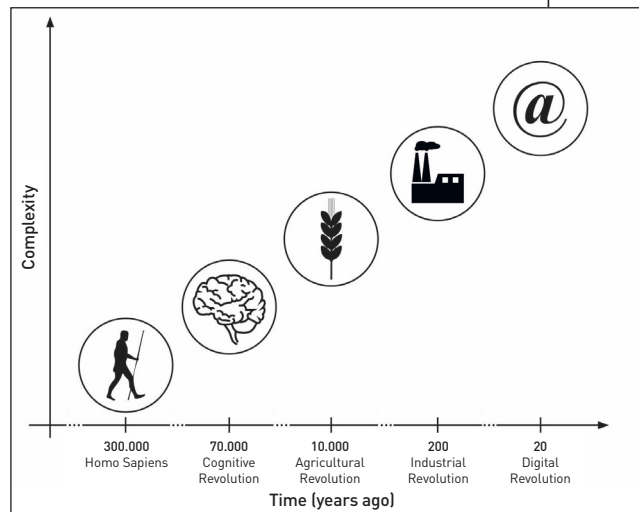


Abb. 1: The ascent of complexity

Examining forms of cooperation involving more individuals than merely a limited number of kin reveals different mechanisms. Although this might be a weaker form of cooperation, based on a reciprocal exchange between individuals, there are many good reasons to cooperate with genetically unrelated individuals. The concept of cooperation among non-kin was introduced by Robert Trivers as “reciprocal altruism”. Reciprocal altruism means that you give something to an unrelated person and you expect to get something in return, not necessarily immediately, but certainly at some point in time (Trivers 1971). This mutual exchange is not necessarily limited to material goods but may also have an emotional component (e.g. friendship, solidarity). Note that reciprocal exchange also occurs among kin; in kin groups we find both kin selection and reciprocal exchange, the lines being blurred. For people living in urban settlements, cooperation among kin is often not possible, leaving them to rely largely on reciprocal exchange. To ensure reciprocal exchange over a longer period of time, two prerequisites need to be met: Individuals must interact more than once (Mesterton-Gibbons/Dugatkin 1992) and there has to be some form of punishment

for individuals who violate common rules (Fehr/Gächter 2002). The latter is referred to as “altruistic punishment”; individuals punishing other individuals for unfair behavior. Despite substantial variation in cooperation and punishment depending on the culture and size of a society, economic experiments around the world have demonstrated that punishment for cheaters exists in all investigated cultures (Marlowe et al. 2008). Interestingly, the level of punishment and trust differs in various cultures, and in some cases kin cooperation overrules reciprocal exchange.

For reciprocal exchange to spread in human populations, it had to have an evolutionary advantage. The data suggest that there is indeed a reproductive advantage in reciprocal exchange: people who engage, for instance, in voluntary work (e.g. men as fire fighters) profit reproductively because they have more offspring (Fieder/Huber 2012). This also holds true for men in tribal societies: men who share more meat after big-game hunting increase their social status and become more attractive mates (Gurven 2004). In tribal societies, kin selection plays a dominant role, but food sharing is a strong indicator of reciprocal exchange. The mechanism of how this works is referred to as costly signaling (Zahavi 1991): the willingness to engage in risky behavior for to the benefit of the group – be it as a fire fighter or in big-game hunting.

In contemporary urban environments the difference to tribal societies becomes obvious. While in rural areas kin cooperation is still prevalent, big cities require a constant cooperation with “genetic strangers”. Particularly the industrial revolution with its immanent urbanization led to a massive disintegration of familial bonds. The traditional functions of families and communities were taken over by states and markets; family members were replaced with policemen, social workers, teachers

and officials (Harari 2015, 433–440). This was also a prerequisite for modern nation states, as the monopoly on the use of force shifted from tribes to state bureaucracies. This was only possible when reciprocal exchange overtook kin selection as the decisive bond (the latter might in fact still be stronger, but in numerical terms the former has become dominant due to large-scale urbanization). This weakening of tribal structures and families allowed for the ascent of larger and more complex social structures, as the Leviathan thrives on individuals not on tribes (see below).

## 2. THE GENETICS OF PRO-SOCIAL BEHAVIOR

Examining the evolution of cooperation calls for considering both the impact of culture as well as the “biological transfer”, the genetic impact on our behavior. Accordingly, our behavior, emotions and attitudes are not merely only learned, and we are not born as “blank slates” (Pinker 2002), but we also have a “hardwired basis”. This basis is – in concurrence with cultural and environmental factors – responsible for the differences among us. Research suggests that behavior, attitudes and feelings such as empathy, altruism, sense of equity, love, trust but also economic behavior and politics have to some extent a genetic (and/or epigenetic) basis. Although we are only starting to better understand epigenetics (the regulation of gene expression that can be modified by environmental influences), much more is known about the genetic basis of behavior (Ebstein et al. 2010). Importantly, the overwhelming characteristics of our personality, behavior and emotions are neither solely genetic nor solely cultural/environmental (with epigenetics providing a link between them). The debate on nature vs. nurture has been overcome: the majority of studies on behavioral genetics found genetic influences (a predisposition) as

well as environmental influences (Plomin et al. 2013). The share of the genetic component and the cultural/environmental component varies according to the trait being investigated (for the genetic component from app. 20 % to 70 %; reviewed in Ebstein 2010). Only a very rare number of behavioral characteristics feature a direct connection between a specific gene and a certain behavior. Most of our behavior is influenced by many genes (polygenic). Accordingly, the genetic basis of our behavior is characterized by complex interactions among genes (most of them not yet determined). A lot of knowledge about the genetic basis of our behavior stems from “twin studies” (recently the heritability of a trait can also be directly investigated based on DNA data) and particularly from the investigation of similarities between monozygotic twins (almost 100 % genetically identical), dizygotic twins (genetically not more similar than “normal” siblings) and simple siblings. Studies on twins separated shortly after birth proved to be particularly helpful.

In behavioral genetics, “cooperative behavior” has often been referred to as “pro-social behavior” (a more ambiguous, but also broader term). Twin studies on self-reported pro-social behavior (self-reported altruism and empathy), for instance, found heritability from 56–72 % depending on the study (Ebstein et al. 2010; Rushton 2004). This shows that more than 50 % of this self-reported pro-social behavior seems to be inherited (genetically or epigenetically). Interestingly, although heritability estimates depend on the type of measurement, twin studies suggest that not only pro-social behavior seems to be inherited, but also to some extent our political orientation<sup>2</sup> (reviewed in Ebstein et al. 2010).

So far the impact on cooperative behavior is known only for some genes. Numerous

studies have shown that two evolutionary-conserved hormones, oxytocin and vasopressin, play an important role in our social behavior (ibid.). Oxytocin has been shown to influence maternal behavior: trust, generosity, empathy, eye contact, face memory, and a reduction of anxiety (Insel 2010). Vasopressin may affect pair-bonding behavior and the emotional response to stress (Goodson/Thompson 2010; Thompson et al. 2006). In all mammalian species from rodents to humans, these two hormones are chemically the same, but the level (depending in the circumstances) and the binding on the receptor (depending on the genetically determined structure of the receptor) differ amongst individuals. The amount of money someone offers in an economic game or the importance of social values depend on differences in the DNA sequence encoding for the oxytocin receptor gene (Israel et al. 2009). Comparable findings have been reported for the vasopressin receptor gene (Ebstein et al. 2010). We are, however, only in the initial stages of discovering the association of genetics with behavior and, in fact, many other genes are also thought to be linked to pro-social behavior (Primes/Fieder 2017). Gene/behavior associations go beyond pro-social behavior to include aggression (Ferguson 2010; Milles/Carey 1997). These findings have some potentially disturbing implications and may lead to rather dystopic future scenarios comparable to the science fiction classic “Minority Report”: Possibly, in the future, we might be able to detect – based on genetic and epigenetic information – who might be more cooperative and who might be more violent. Although we are currently far from being able to detect cooperation and violence genetically, we should be prepared for the ethical and legal dimensions of this issue in the future. The knowledge that our behavior, feelings and attitudes also have a genetic (and epige-

netic) basis leads to the realization that we are able to influence individuals by social learning and education, but that a part of our behavior will always be beyond social control.

### 3. EVOLUTIONARY ROOTS OF VIOLENCE

Not all our behavior is cooperative. Human behavior also includes “anti-social behavior”: aggression, rage and sometimes even deadly violence. Clearly, aggression and rage cannot be compared to large-scale lethal forms of violence such as war. But, when examining the evolutionary roots of violence, the principal mechanisms are comparable to some extent.

Today, many people in Western societies have a hard time explaining violent behavior. This is generally a good sign, indicating that, overall, we are not confronted with violence on a daily basis. It could also be argued that we are firmly rooted in the philosophy of Rousseau, whose thinking strongly influenced the social sciences. Rousseau viewed violence as a kind of pathological behavior, a behavior that emerged as an undesirable byproduct of civilization (Rousseau 1755). This take on aggression and violence is frequently recounted as follows: In principal we are a very peaceful species that evolved in peaceful, non-authoritarian families and tribes, but civilization, male-dominated hierarchies and oppression turned us into violent creatures (reviewed in Pinker 2011). Accordingly, it has also been assumed that our closest evolutionary relatives, the chimpanzees, live together peacefully. Jane Goodall, however, made a diverging discovery: When individuals of different chimpanzee groups met, the outcome could be lethal, particularly for the smaller group (Goodall 1986). There is evidence that this kind of behavior is far from pathological (Wrangham 1999), as it offers the

winner of the conflict additional resources and therefore increases fertility. In humans it has also been documented that our tribal ancestors had not been peaceful creatures and that it was in fact the process of civilization that made us much less violent. Approximately 100 years before Rousseau, Thomas Hobbes had a visionary idea on the pacification of humans (Hobbes 1651): he suggested the idea of a “Leviathan”, represented by the almighty state and its institutions. Anthropology has proven Hobbes to be right. Tribal societies are extraordinarily violent; particularly young men living in traditional societies faced a very high risk of becoming seriously injured or killed by ritualized war, revenge, ambush and homicide. Steven Pinker made an extraordinary contribution by collecting the available data, and his overall results are dramatic: In tribal societies the percentage of individuals who died due to violence ranges from 60 % (some North American indigenous tribes) down to 5 % (Aborigines in North Australia). In comparison, in the most peaceful societies that ever existed – the democracies of Western Europe – only one in 100,000 individuals dies of a violent cause. Not only was homicide relatively common among tribal societies, but also the ways of killing were often horrifying, frequently involving brutal forms of torture (Pinker 2011). This astonishing relationship also holds true for the 20<sup>th</sup> century with its two world wars, genocide and mass killings, if the number of casualties is seen as a percentage of the population. It can thus be concluded that the low levels of violence and the successful pacification of societies in Western Europe are one, if not the biggest, accomplishment of Western civilization. From the viewpoint of evolutionary anthropology the question remains: Why are we violent? Is there any “evolutionary payoff” for violence? In *Leviathan*, Thomas Hobbes (Hobbes 1651)

named three incentives to commit violence (reviewed in Pinker 2011): Competition (i.e. for resources), uncertainty (a potential enemy might strike first) and thirst for fame. Furthermore, crime statistics show one constant pattern: most criminal acts, particularly violent crimes, are perpetrated by young men.

Understanding this phenomenon requires examining the evolutionary basics of mating, which is an important cause of male violence (not the only one but presumably the most important). In the case of sexual reproduction, evolution ended up with an asymmetric investment for reproduction: usually the females of all species directly invest more resources into reproduction (Bateman 1947). Accordingly, women can have only a limited number of progeny, whereas men can theoretically have a nearly endless number of children. The consequence of these investment differentials between men and women is that females are the choosier sex. Correspondingly, women choose men with a higher social status (Buss 1989) – a partner who is able to provide resources for her and her offspring. The definition of social status may vary, but in contemporary societies men with a low educational background and/or low income have a higher risk of remaining unmarried and therefore childless or ending up with fewer children. This pattern has been found in traditional societies (Chagnon 1990; Irons 1979; Borgerhoff Mulder 1988; Voland 1990) as well as in modern societies (Fieder et al. 2005; Fieder/Huber 2007; Hopcroft 2006; Hopcroft 2015; Nettel/Pollet 2008; Fieder et al. 2011; Barthold et al. 2012), as men of low status are selected less frequently into marriage or cohabitation. Accordingly, social status and the access to resources are essential for young men to be attractive for women. In our modern societies, gaining status usually does not involve violence, but in tribal

societies violence occurred much more frequently and thus played a more important role for men to gain status. Napoleon Chagnon documented status-gaining effects based on the example of the Yanomanees in tropical rain forests in South America (Chagnon 1988): About 30 % of the adult Yanomanees die a violent death, with blood revenge being responsible for a high share on these deaths. In tribal societies, committing an assault is apparently the most common form of intergroup violence; of course provoking the respective revenge (Daly/Wilson 1988). Men who killed also gained in social status and, after a ritual cleaning; they received the title “unokai”. Those receiving the title unokai became more attractive for women and as a consequence they had – on average – more children. In evolutionary terms, violence thus paid off because it led to higher social status. At the same time, violence also reduces the second incentive for violence, “uncertainty”, as other tribes are less likely to attack more violent tribes. To summarize, aggression and violence (particularly male aggression) may be explained from an evolutionary perspective by status seeking, the acquisition of resources, as well as a violent reaction to a potential violent threat. Hence the male drive for status within a group and additional resources could be an incentive to commit violence. Accordingly, when states manage to ensure that violence leads to a loss of social status and resources, this reduces the level of violence.

There is compelling evidence from twin studies that individual variation in aggression and antisocial behavior also has a genetic basis. A meta-analysis of twin and adoption studies suggests that about 56 % of the variation in antisocial behavior is genetically (epigenetically) influenced (Ferguson 2010), and aggression seems to be about 50 % genetically (epigenetically)

influenced (Milles/Carey 1997). According to these results, particular genes seem to be associated with aggressive and anti-social behavior. Particularly MAOA (Monoamine Oxidase A) has been popularized as the warrior gene (Lea/Chambers 2007) and therefore attracted considerable media attention, although the evidence for a single gene being significantly associated with aggressive behavior is relatively weak (Vassos et al. 2014). Violent behavior is a rather complex trait, presumably influenced by many genetic loci (polygenetic as most traits).

#### 4. COMPLEXITY AND ITS DRIVERS

Over the course of history, social complexity has steadily increased – from foraging tribes to globalized megacities. Clearly, many factors drive complexity, but two of them seem to be particularly important: mating and violence. In both cases it is do or die, as the drive for genetic fitness (survival and reproduction) is amongst the strongest agents driving human behavior. Therefore, changing patterns in mating and violence equally affect individual lives and the social fabric.

Humans are generally a pair-bonding species, but men and women have different mating preferences and those mating preferences impact society (reviewed in Schahbasi/Fieder 2017). Divorce rates, for example, depend highly on the level of economic interdependence. In fact, divorce rates could be an indicator for female independence because there is a correlation between economic independence and an increase in divorce rates, while a higher level of economic interdependence is associated with lower divorce rates (Fisher 2016, 88–89). In hunter-gatherer societies, hierarchies were only modest: these small tribal agglomerations of humans did not re-

quire complex social organization and thus remained rather egalitarian. Individuals depended strongly on each other (of course children and the elderly more than others), and men and women had different tasks and responsibilities, but they were equally important for survival. The agricultural revolution changed the level of social complexity substantially. As the production of food increased, so did population growth (Hawks et al. 2007; Clark 2008). This, in turn, led to an increase in the division of labor (Clark 2008), social hierarchy and consequently to a limited number of individuals at the top of this hierarchy (Scheidl 2006; Betzig 1986). These individuals were mostly – but not exclusively – men, who were now in control of both male and female subordinates (Scheidl 2006; Betzig 1986). Thus, agriculture also marked the onset of widespread social subordination (although this cannot be generalized) as well as an increase in inequality between men and women.

The industrial revolution, in contrast, reversed this trend because it reduced economic interdependence (Clark 2008; Pinker 2011). Particularly women gained more independence by acquiring financial resources through work. As this process coincided with urbanization – reducing the social control of family and community – it led, yet again, to a more egalitarian lifestyle that also resulted in higher divorce rates.

Regarding violence, Ian Morris (Morris 2015) provides the counterintuitive argument that warfare has in fact made humanity safer and more prosperous. War resulted in larger, more structured societies, reducing the individual risk of violent death (*ibid.*, 7). As the compiled data indicates, violent deaths have steeply declined, which Morris attributes to the constraining force of modern states and their monopoly on the



use of force (comparable to the arguments of Pinker 2011). As entities grew larger over history, the containment of violence was a means of maintaining control, which concurrently served as a pacifier. It can thus be argued that larger societies with “bigger states” allowed for a more peaceful and prosperous life (Morris 2015, 9).<sup>3</sup>

Although mating and violence are certainly at the core of human behavior, there are clearly numerous forces changing the web of social complexity. There is no determinate path of history, and shining a light on our evolutionary past does not provide a road map for the future. It does, however, sharpen the eye towards trends and potential developments (and how to possibly react to them). Most certainly, things look different when seen from the perspective of comprehensive history than they do in a contemporary snapshot. We are currently witnessing many new trends impacting social complexity, be it the unprecedented

Source: Morris 2015

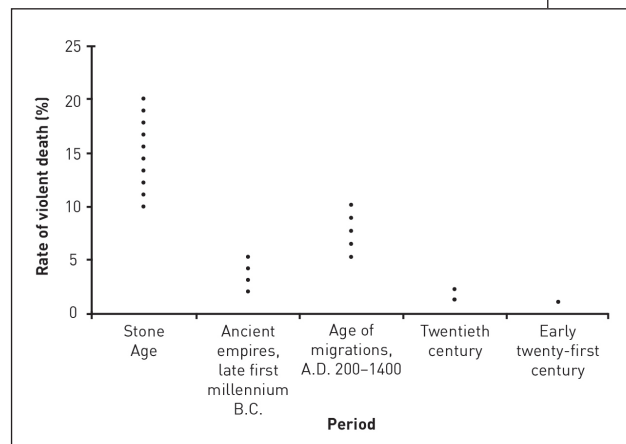


Abb. 2: Rates of violent death

scale of economic, financial and cultural globalization, large-scale transcontinental migration, the widespread usage of the internet, the availability of smart phones, the application of big data analytics, etc. All these have yet to play out and we do not know where this – or any Black Swan – will take us. Time will tell.<sup>4</sup>

<sup>1</sup> This graph displays the increase of complexity over the course of human history in a symbolic manner, as the increase was not linear. The dates indicated in the timeline are rough estimates. Sources: <http://www.nature.com/nature/journal/v546/n7657/full/nature22335.html>; Harari 2015.

<sup>2</sup> Avi Tuschman provides a profound analysis of this issue in his book “Our political nature. The evolutionary origins of what divides us” (Tuschman 2013).

<sup>3</sup> This is by no means meant as a glorification of war, or to bestow a “historic purpose” upon it. War has always unleashed the worst in humankind and led to unimaginable atrocities and human

suffering. If seen from the perspective of comprehensive history, however, there is a strong argument for the theory put forth by Ian Morris (Morris 2015). A similar argument – with regards to the decline of violence – is made by Stephen Pinker (Pinker 2011).

<sup>4</sup>Acknowledgements: Michael Stachowitsch for proof-reading.

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#### Further literature and links

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