Myths About the Evolution of War: Apes, Foragers, and the Stories We Tell

Luke Glowacki
Boston University
laglow@bu.edu

Abstract

The role of warfare in human evolution is among the most contentious topics in the evolutionary sciences. The debate is especially heated because many assume that whether our early human ancestors were peaceful or warlike has important implications for modern human nature. Arguments about origins of war often use the behavior of other animal species and recent hunter-gatherers to make inferences about ancestral behavior in human evolution. One side argues that warfare has a deep evolutionary history and was likely a selective force in human evolution, while the other views war as a recent development, primarily developing with the rise of sedentism and agriculture. I show that although both positions have empirical support warranting consideration, each sometimes disregards alternative evidence and relies on stereotypes that ignore variation in primate behavior and the complex reality of hunter-gatherer worlds. Many characterizations about the evolution of war are, at best, partial truths. Bonobos and chimpanzees provide important insights relevant for understanding the origins of violence, but both models are potentially limited in explaining human intergroup relationships. Hunter-gatherers often had war, but like humans everywhere, our human ancestors likely had a range of relationships depending on the social context, including cooperative intergroup affiliation. Taken together, our evolutionary legacy almost certainly includes small-scale warfare as well as friendship and cooperation across group boundaries.

1. INTRODUCTION

The debate about the origins of war shows no signs of abating. Researchers on both sides draw on observations of non-human species and hunter-gatherers when debating the evolutionary significance of warfare. Those arguing that war has deep evolutionary roots ('deep rooters') point to the fact that many social species, including our close relatives the chimpanzees, have lethal raiding that resembles war. Alternatively, those who maintain that war is a recent development in our species ('shallow rooters') take the lack of raiding among bonobos as support for a peaceful human ancestor and argue against the relevance of chimpanzees and other social species with lethal coalitionary violence. Deep rooters often look at the overwhelming occurrence of war among mobile hunter-gatherers as evidence that war was present in our evolutionary history, while shallow rooters point to the fact that war is non-existent in some foragers and significantly increases with hierarchy and monopolizable resources. These two examples—the divergent behavior of chimpanzees from that of bonobos, and variation in the behavior of hunter-gatherers—illustrate a common trend in the debate about the origins of war: There is often empirical support for both views that needs to be taken seriously, but that each side tends to overlook or dismiss.

The role of warfare in human evolution is among the most contentious topics in the evolutionary sciences. Many believe that the question of whether war was a selective feature in human evolution matters because reveals something critical about human nature, including whether our species is doomed to war. Perhaps because of the importance of this question, the debate has become entrenched, with both sides sometimes overlooking or ignoring competing evidence, or, in some cases relying on questionable or incorrect empirical claims and mischaracterizations of competing positions.

In what follows, I identify the primary claims that are made to advance deep or shallow roots perspectives. I provide evidence about each claim allowing the reader to evaluate them more critically. Taken together, I hope this approach illustrates that our evolutionary history is more complex than one of selection for war *or* peace; rather, it reflects the complicated lifeways of a highly social interdependent cultural species. Our ancestors almost certainly experienced lethal intergroup violence but also cooperated across group boundaries. Due to their salient fitness consequences, both war and intergroup cooperation were likely important selective forces in the evolution of modern humans. Recognizing that the capacity for both war *and* peace may be an outcome of our evolutionary history better explains how our species today can create durable peaceful relationships among societies that encompass billions of individuals but at the same time petty grievances and disputes can precipitate war with little provocation.

1.1. What is war?

How we define war shapes what we count as evidence for the origins of war. If our definition of war is based off of contemporary human war, sometimes called "war above the military horizon" and defined as requiring centralized leadership, complex organization, advanced material technology (e.g., fortifications or weapons), a high mortality rate, or conflict between unrelated groups, then war would be something that our pre-human ancestors and most non-humans are very unlikely to be capable of producing (Turney-High 1949). A definition that limits war to behaviors only recent humans could produce is of little use in evaluating when war emerged evolutionarily or if it occurs in other species.

To avoid anthropomorphizing the study of traits (e.g., war, friendship, social structure, pair-bonds, etc.) evolutionary scholars take care to set aside characteristics that cannot be shared across species, instead focusing on the relevant characteristics that can be generalizable across multiple species. For war, the most salient characteristic is "*lethal coalitionary violence between groups.*" Groups can be communities, clans, bands, political units, states, or even families. By this definition, war does not require weapons, fortifications, or multiple victims resulting from one incident. This definition is also silent about the motivations; war can be motivated by revenge, dominance seeking, or mate competition. War only requires that individuals as part of or supported by a coalition attempt to attack and kill members of other social groups. On this definition some species of ants, as well as meerkats, banded mongoose, wolves (but not coyotes), chimpanzees (but not bonobos, and possibly not western chimpanzees *Pan troglodytes verus*), and humans all have war because they all sometimes engage in killing members of other groups as part of a coalition. They may do so with teeth, claws, pinchers, hands and fists, or with simple technologies such as stones or spears, or complex technologies such specialized weapons and structures such as fortifications.

1.2. Studying the evolution of war.

Once we have established whether a species has war, we can ask when and why this species evolved the capability for war (just as we can ask why pair bonds, food sharing, mate guarding, or dyadic aggression evolved). To do so, we can take a phylogenetic approach and focus on whether closely related species also have this behavior, typically taking shared behaviors as evidence for a common evolutionary origin. In humans, we primarily look to bonobos and chimpanzees for evidence that a trait was shared with our ape ancestors as we are equally related to both. Alternatively, we can take an adaptive approach and ask whether species that share a trait (such as war) have other features in common, such as similar kinds of social organization that make the trait adaptive. This can be especially powerful for revealing the role that social or ecological variation may have in shaping conflict or tolerance. For instance, if humans share important traits with bonobos or chimpanzees, such as similar social structures (high fission fusion or strong female alliances), and these plausibly influence war, then the shared commonalities may help us understand the conditions which may have favored the evolution of war or peace in our species' history. For this reason, comparative studies—whether with other primates or mammals more widely—are

valuable for understanding the origins of human behavior, although they should be evaluated with caution.

In taking an adaptive approach, we often ask whether there are positive fitness consequences for success in that behavior, i.e., does participating in the activity result in oneself or one's relatives producing more offspring compared to alternative strategies? If the answer is yes—war reproductively benefits participants overall compared to alternative strategies, and that occurred over evolutionary time scales—then it becomes possible that war (or any other behavior) was a selective force shaping the evolution of the species. Over evolutionary time scales this would have resulted in an evolved psychology and biology that is predisposed to form and use coalitions for strategic violence when conditions are appropriate. An alternative to war resulting from selection during our evolutionary history is that war may emerge as a by-product of other innate traits, such as higher intelligence or particular kinds of social conditions (Kelly 2000; Kelly 2005; Roscoe 2007).

War does not require a high death rate to be a selective force. Similarly, war can be intermittent or even rare and still be an important selective factor in human evolution. This is determined by the degree that the fitness benefits resulting from participation in war outweighed the payoffs from alternative strategies, in aggregate and over evolutionary time scales. Thus, findings that chimpanzee or human communities may go years without lethal raids, or that the rates of death from within-group violence is more than between-group violence, or that there are important ecological co-variates of war in themselves do not reveal anything about the selective importance of war.

2. MYTHS ABOUT THE EVOLUTION OF WAR

Myth 1: Bonobos or chimpanzees are an appropriate starting point for understanding the origins of war. Scholars often look to bonobos and chimpanzees to understand the origins of human behavior. Both species are the closest living relatives of humans and equally related to us, having shared a last common ancestor (LCA) 6-9 million years ago (Almécija et al. 2021). The presence or absence of a trait shared between humans and bonobos or humans and chimpanzees is often taken as evidence for that trait's presence deep in our evolutionary history (Wood 2010). But because bonobos and chimpanzees have radically different social behaviors, scholars typically argue that one species or the other (either chimpanzees or bonobos) is a better model for the ancestral species of humans (Wrangham and Pilbeam 2001). Thus, if one takes chimpanzees as the better model of the LCA, the fact that both chimpanzees and humans have war is often seen as evidence that the last common ancestor of humans, chimpanzees, and bonobos had war. War in the present day may be a result of phylogenetic inertia inherited from our distant ancestors. Similarly, if bonobos are deemed a better model for the LCA, then the fact that bonobos lack lethal raiding and both humans and bonobos can tolerate strangers is taken as support for the claim that the origins of peace lie in our bonobo-like last common ancestor.

There is little consensus on whether chimpanzees (Muller, Wrangham, and Pilbeam 2017; Pilbeam and Lieberman 2017; Wrangham and Pilbeam 2001) or bonobos (Diogo, Molnar, and Wood 2017; Zihlman et al. 1978) are a better model for the last common ancestor. Moreover, many scholars argue that the last common ancestral species was radically different from any of the three species today so using either bonobos or chimpanzees as a model of LCA behavior is of limited use (Almécija et al. 2021; Duda and Zrzavý 2013; White et al. 2015; Hunt 2016; Hunt 2020). Further compounding these difficulties is that radical evolutionary changes can happen in relatively short time scales, making inferences about social behavior deep in our species' evolutionary history tenuous. Bonobos and chimpanzees likely diverged between 1.5 and 2.5 million years ago, yet within this time period they developed dramatic differences in behavior (Gruber and Clay 2016). Even within chimpanzees, there are at least 2 subspecies with

extremely different rates of intergroup lethal violence (Wilson et al. 2014). Thus, it is uncertain whether and to what extent the behavior of any bonobo or chimpanzee population is a reliable model for the behavior of the ancestral human state prior to our divergence from the other apes.

In addition to the changes that chimpanzees and bonobos have experienced in the intervening 6-9 million years since the LCA, the human lineage has undergone profound changes over this period, shifting what may have been an arboreal ape into a culturally dependent bipedal species living in interdependent multilevel societies with fluid group boundaries (Tattersall 2017). Even if the LCA were largely chimp-like, the intensive changes in the human lineage that has occurred over the last six million years renders the relevance of the LCA for modern human behavior unclear. Our more recent ancestors, the Australopiths, who preceded our genus *Homo*, did not likely resemble either bonobos or chimpanzees (Lovejoy et al. 2009; White et al. 2015) and their social behavior was also likely to have been radically different (Wilson and Glowacki 2017). Selection over far shorter time scales, such as thousands of years, can have profound effects on both biology and culture (Fan et al. 2016). The millions of intervening years our lineage has experienced since the LCA makes it difficult to have any confidence in how much of modern human behavior is due to phylogenic inertia and how much is due to selection or other evolutionary forces (e.g., drift) that have occurred since our split from the other great apes.

Because it is not clear which species is the best model for the LCA, Boehm (2013) suggests that a trait (such as war) should be present in all three species (humans, chimpanzees, and bonobos), in order to be taken as evidence for its presence in the last common ancestor. Given the uncertainty about whether the last common ancestor resembled chimpanzees, bonobos, or neither, inferences locating the origin of human war or peace in the behavior of our last common ancestor are tenuous (Fuentes 2013).

Myth 1a: The peacefulness of bonobos demonstrates that early humans may not have had war.

Bonobos are often used as support for shallow roots proponents because they are notoriously characterized as peaceful (Clay, Furuichi, and de Waal 2016; Furuichi 2011; Pusey 2022), "*renowned for making love instead, not war*" (Barash 2013) and "*… solving power issues through sexual activity*" (de Waal 2013:xii). It is correct that bonobos often resolve conflicts through sex and have much less intense intergroup aggression with other bonobos than chimpanzees do (Furuichi 2011; Gruber and Clay 2016; Wilson et al. 2014). It is also true that they have never been observed engaging in lethal violence between bonobos groups. However, the study of bonobos is in its infancy compared to the more than 60 years of detailed studies of multiple chimpanzee communities, so our understanding of the species is still developing (Wilson 2021).

The reputation for bonobo peacefulness overlooks the fact that, despite the absence of lethal violence, intergroup interactions between bonobo groups often do involve a high level of aggression. At the Lomako bonobo site, 35 percent of intergroup interactions involved physical aggression (Hohmann and Fruth 2002). Although tolerant intergroup interactions have been observed on multiple occasions at the Kokolopori Bonobo Reserve, individuals mostly socialized with members of their own group, not members of the outgroup, and 15% of encounters resulted in physical injuries (Cheng et al. 2022). At the LuiKotale field site, the pattern is similar: During a three-month intensive study period, there were 19 intergroup encounters between different bonobo groups, but the authors note that intergroup encounters "were more aggressive than tolerant" (Moscovice et al. 2022). 47% of the intergroup encounters had "*large-scale coalitionary aggressive events*" often resulting in injuries. "*During one incident, several WBp females targeted an EBp female, May, and hit and bit her repeatedly while she tried to protect her young infant*" *and she was later observed with wounds* (Moscovice et al. 2022).

Shallow roots scholars often accuse prominent deep rooters such as Wrangham and Pinker of "*not consider[ing]*" (Fry 2019b) and "*usually ignor[ing]*" bonobos (Fry 2019a), or hypothesizing about war

"*without information about non-raiding bonobos…*" (Fry, Keith, and Soderberg 2020:315). The claim that deep rooters generally ignore bonobos is mistaken. In *Demonic Males*, Wrangham and Peterson (1996) devoted extensive discussion to understanding why the behaviors of bonobos and chimpanzees are so different. They developed an important evolutionary account for how differential selection pressure due to foraging competition resulted in lethal violence for chimpanzees and but not bonobos (Wrangham and Peterson 1996). Subsequently, Wrangham's (1999) seminal paper *Evolution of Coalitional Killing* devoted an entire section to explaining bonobo's lack of lethal raiding. Similarly, Pinker's influential *Better Angels of our Nature* (2012) devotes several pages to discussing the lack of raiding among bonobos and the reasons why bonobos may not be a good model for human evolution (see also Gat 2005:112 who argues that the strong female alliances in bonobos make them a poor model for human evolution). In fact, in arguing for a chimpanzee LCA, Wrangham and Pilbeam (2001) argue that bonobos can be just as informative about human evolution as chimpanzees depending on the particular question. Scholars can reasonably disagree on whether bonobos or chimpanzees are a better for the LCA but the oft repeated claim that deep rooters ignore evidence from bonobos is false.

Myth 1b: Chimpanzees show that humans evolved in conditions of lethal intergroup raiding.

Chimpanzees are well known for having lethal raiding between communities that can sometimes lead to the takeover of territory and the extermination of neighboring groups (Goodall 1986; Mitani, Watts, and Amsler 2010; Wilson and Wrangham 2003). Lethal raiding also appears to provide important fitness benefits for members of successful groups (Lemoine et al. 2020). Comprehensive data from every long-term chimpanzee field site shows that such aggression is unrelated to human impacts, including provisioning and habitat change, and can sometimes reach substantial levels (Wilson et al. 2014). Because the patterns of raiding between chimpanzees and humans are similar, chimpanzees are often used as evidence that lethal intergroup aggression has an evolutionary basis that likely began with our last common ancestor (Crofoot and Wrangham 2010; Manson et al. 1991; van der Dennen 1995; Wrangham and Peterson 1996).

Arguments that the lethal aggression of chimpanzees supports lethal aggression as part of our evolutionary history generally overlook the fact that there is substantial diversity between populations in the rates of intergroup aggression in chimpanzees (Fuentes 2012; Layton 2014). While lethal intergroup aggression is common among chimpanzees in eastern Africa, chimpanzees in western Africa have dramatically lower rates of lethal aggression, and some populations have no documented deaths (Wilson et al. 2014) (see Figure 1). It is unclear if the differences between eastern and western chimpanzees in the rates of intergroup violence are due to biological differences or to other factors, such as differences in ecology or the density or the number of males (Wilson et al. 2012; Wilson et al. 2014).

Regardless, based on the available data, the substantial variation in lethal violence between chimpanzee populations limits our ability to make confident inferences that ancestral chimpanzees would have had lethal raiding (Layton 2014; Fuentes 2012). As a result, shallow-rooters stress that there is an over-reliance on certain populations of chimpanzees in understanding human warfare, while neglecting more peaceful chimpanzee communities (Ferguson 2011; Fry 2013a; Sussman and Hart 2015). Arguments that chimpanzees are a good model for human evolution must account for the substantial variation between eastern and western chimpanzee behavior.

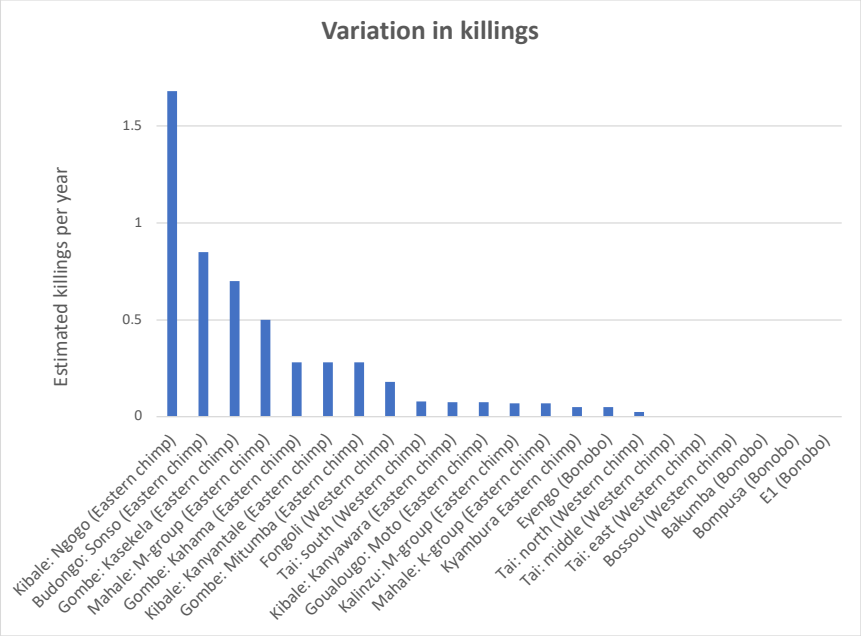

Figure 1*: Reproduced from Wilson et al. 2014. Eastern chimpanzees have much higher rates of lethal violence than western chimpanzees, some of whom may lack lethal intergroup violence.*

Myth 2: Recent nomadic foragers and small-scale societies are good models for ancestral human populations.

Both deep and shallow roots proponents rely on recent hunter-gatherer, or forager, populations as models for understanding how ancestral humans behaved. They typically agree that the best models are those societies that lack corporate social structures, but instead are organized into residential groups called bands that are based loosely on marriage, kinship, and friendship. These groups generally lack significant food storage, have strong norms for egalitarianism *within* age and sex, and are often mobile, moving camps on the basis of resource availability (Kelly 2013; Woodburn 1982).

Despite agreement about the appropriateness of nomadic foraging societies for human evolution, there is still intensive debate about which societies are most illustrative for understanding the evolution of war. The deep rooters, for example, often include horticultural societies such as the Yanomamo in discussing the evolution of war (Keeley 1996; LeBlanc and Register 2003; Pinker 2012). While deep rooters recognize that these groups are not nomadic foragers, they are often included because they are similar to mobile foragers in many important respects, such as having a heavy dependence on hunting products, high mobility, and little social stratification (Sponsel 1998). Lee (2014; 2018), Ferguson (1992; 2013), and others (e.g., Fry and Söderberg 2014) have argued that nonetheless the inclusion of non-foragers is dubious for inferences about human evolution not just because of their reliance on horticulture, but also because of the impact that states and other colonizers have had on them.

By contrast, shallow rooters typically rely on recent 20th century band level foraging groups such as the San (Bushmen), Mbuti, Batek, Semai, etc. to argue that foragers generally lack war (Fry and Söderberg 2013; Lee 2018). However, many of these groups also appear to have been significantly impacted by outside forces or rely on domesticated projects. Most foragers who survived into the 20th century appear to live in environmentally marginal habitats (Medupe et al. in revision), often as a result of coercion by

stronger and more powerful neighbors resulting in profound changes to their social systems (Helbling 2006; Service 1971). The !Kung San who are often held up as a model for a peaceful society despite having one of the world's highest homicide rates (Lee 1979) live in an extremely dry desert lacking permanent surface water (Silberbauer 1981). They have a long history of interaction with farming and pastoralist neighbors. Lee himself writes "*most of the men had experience of herding cattle at some point of their lives…many men had owned cattle and goats in the past…the !Kung were no strangers to agriculture*" (1979:409). The San's long history with pastoralists and state societies leads some to argue that they lost important features of their social structure, including raiding (Lee 1979), kin-based corporate groups, and more significant forms of leadership once they began interacting with agricultural neighbors (Singh 2021; Wilmsen et al. 1990). Other groups, such as the Mbuti, inhabit dense rainforests which, while high in plant matter, are low in edible foods. Thus, many Mbuti form important trade relationships with neighboring groups to obtain food (Turnbull 1965); in some cases 60% of their calories come from these relationships (Ichikawa 1983). Other groups such as the Sirionio and Huaorani categorized as peaceful foragers have a heavy reliance on crops they grow themselves in addition to being semi-sedentary (Holmberg 1950; Rival 1993)[1].

The effect of state societies on recent foragers are so profound that Marvin Harris writes that it is a "*serious error… to suppose that contemporary band-organized hunting and gathering societies are representative of the great bulk of paleolithic hunting and gathering groups. Almost all of the ethnographically classic cases of band-organized hunters and gatherers are marginal or refugee peoples driven into, or confined to, unfavorable environments by surrounding groups of more advanced societies*" (Harris 1968:156). For this reason they are sometimes called "*defeated refugees*" (Keeley 1996) or "*the helpless people or the defeated people*" (Service 1971:35). Thus in general 20th century foragers are poor models for human evolution in part because their social systems have been radically transformed through contact with powerful farming neighbors and states (Bird-David 1992; Haas and Piscitelli 2013; Solway et al. 1990). While no model of recent human societies is ideal, a better model is one which focuses on hunter-gatherers surrounded by other hunter-gatherers with minimal reliance on farming or trade with state societies, such as in pre-colonial Australia, the Andaman Islands, or parts of North America (Allen 2014; Dye 2013; Pardoe 2014).

An alternative view of human evolution is emerging, in which our recent foraging ancestors from the past 100,000 years would have lived in more resource-abundant areas, such as river valleys, flood plains, and coastal regions (Compton 2011; Finlayson 2014; Marean 2014; Marean 2016). Unlike foragers living in the extremely dry Kalahari Desert or dense central African rain forest, foragers in these resource-abundant regions would have faced much less resource shortage. As a result, they would have been able to live in higher population densities, forming sedentary societies with complex social structures, exhibiting some inequality and more institutionalized forms of leadership (Graeber and Wengrow 2021; Roscoe 2013; Roscoe 2014; Singh and Glowacki 2022). Accordingly, a potentially better model for the evolution of human behavior in the past 100,000 years involves semi-sedentary hunter-gatherers, rather than mostly or exclusively mobile hunter-gatherers (Roscoe 2006; Roscoe 2014). Semi-sedentary foragers often had warfare, although rates of violence varied dramatically across time and space.

Myth 3: Nomadic hunter-gatherers (foragers) didn't have war.

Those who argue that war developed with increasing hierarchy, agriculture, and sedentism often claim that nomadic foragers lacked war in any meaningful sense. They observe that many recent foraging groups did not practice war, that the egalitarian social organization did not allow for war, that resources were too scarce, or finally, that evidence for war dramatically increases with the emergence of social hierarchy and sedentism. For example, Fry (2009:9–10) wrote that "*war was a very rare anomaly*", while Sponsel (2010:20) asserted that "*hunter-gatherer bands epitomize… attributes of a non-killing society*". More strongly, scholars have maintained that claims that war was important for nomadic foragers are "*fiction*" (Sponsel

2017:38), "*nonetheless false*" (Fry and Söderberg 2014:259), and "*merely mythical caricatures detached from the data*" (Fry and Söderberg 2014:263). Giorgi (2010:93) concluded that "*nonkilling cultures have been the norm since the emergence of Homo sapien*s".

Several scholars have complied lists of multiple societies who appear to lack war, including the San, Semai, Mbuti, and other recent foragers (Baszarkiewicz and Fry 2008; Fabbro 1978; Fry 2007). It is correct that, in the 20th century, many of these foraging groups lacked war. However, as we have seen, recent foragers, especially those living surrounded by state societies or other powerful neighbors, are poor proxies for understanding intergroup relationships in human evolution. The Semai, for example, are perhaps the most famous example of a peaceful foraging society (Dentan 1968). Yet they are surrounded by more powerful neighbors whom they appear fear, and this seems to be an important reason for their lack of intergroup violence (Dentan 1978; Dentan 2004). Similarly, the peaceful Semang and Sirionio appear to have been driven from their homes and adopted retreat and fleeing as a strategy for survival (Holmberg 1950; Schebesta 1932). Thus, while it is perfectly reasonable to point to peaceful foraging societies to illustrate that human communities can live in a state of peace, the surrounding context, especially whether they are bordered by other hunter-gatherers or by powerful agricultural societies, should be carefully considered.

Nonetheless, many scholars have still tried to reconstruct how recent nomadic hunter-gatherers behaved through systematic reviews of ethnographic materials from multiple foraging societies. Most cross-cultural surveys find that warfare occurred among foragers, though it may be intermittent and of low mortality. Ember (1978) found that 90% of foragers had war more often than "rarely or never", Hobhouse's (1915) survey of 56 societies found that 88% practiced war, while Wright (1942) found that 92% of 216 societies had war. Wrangham and Glowacki's (2012) study of 6 world regions of hunter-gatherers surrounded by other hunter-gatherers found evidence of war, such as ambushes, raids or unused border zones, in all of them.

A frequently-cited review published in *Science* looked at detailed ethnographies of twenty-one mobile forager societies searching pre-selected ethnographic texts for specific descriptions of individuals killed by lethal violence (Fry and Söderberg 2013). The authors then coded the context of the death for variables such as if the death were coalitionary, against an ingroup or outgroup member, along with multiple other variables. Thus, each society received a value for the number of deaths due to warfare and this can be compared against deaths due to other types of violence. Crucially, if an ethnographic text did not discuss a *specific* death due to violence, then that society was coded as having zero deaths and the inference was that it lacked war. This is a potentially powerful method to assess the proportion of deaths due to intergroup violence compared to ingroup violence but is of limited utility in assessing the importance of war among hunter-gatherers. For war to be an important force in human societies, the deaths from war do not have to exceed those from withing-group violence. War can have a low mortality rate and occur sporadically and still be an important force with selective consequences.

From these 21 societies, Fry and Söderberg (2013) found a total of 148 accounts of violent deaths, with lethal violence occurring in all but three societies. Of these 148 killings, 34 percent are from intergroup conflict. The authors use a restrictive protocol excluding 13 cases that most would consider examples of aggression between different social groups—if these cases are included, it brings the percentage of intergroup killings up to 43%. They infer that because there are more deaths from within group interpersonal violence and that the absolute numbers of people killed are low, their study "*contradict[s] recent assertions that [mobile foragers] regularly engage in coalitionary violence against other groups*" and instead asserts that they "*are not particularly warlike*" (Fry and Söderberg 2013:272).

The sampling framework Fry and Söderberg use has substantive concerns. Their sample includes many groups that were living within state society or are better described as enclaves or refugees such as the Mbuti, Vedda, and Semang, rather than hunter-gatherers surrounded by hunter-gatherers. If the goal is to understand intergroup relationships of hunter-gatherers before the development of agriculture, then the inclusion of these societies is of limited utility as one would predict they would not have war against their stronger neighbors whom they are dependent on.

More alarmingly, their coding scheme *excludes descriptions of war* that did not provide an unambiguous count of the number dead. By excluding these accounts of war, Fry and Söderberg effectively treat these societies as supporting the absence of war (effectively coding them as a 0 rather than an N/A). There are *a priori* reasons to think that specific numbers of war dead may not be mentioned even when war is discussed. Many of the ethnographies they coded were written decades after the society had been incorporated into state society, so the ethnographer would be more likely to report on general practices rather than specific deaths. In other cases, the ethnographies they code are not extensive so it would be surprising if they reported on specific cases of war deaths, any more than they may report on specific cases of death due to disease or animal attack. Consider the North American group known as the Slave. The 33-page ethnography that is their primary source material begins by noting that "***of the truly aboriginal condition… there is no knowledge****. In even the earliest reports it is evidence that the contact situation had already wrought changes in the aboriginal way of life*" before proceeding to discuss wars of the past (Macneish 1956:131–132). Similarly, for the Paiute who are coded as lacking war, the text coded by the study consists of a *single 100-page ethnographic text on the role of sorcery written in the 1950's*. Despite the fact that the Paiute are reported as lacking war, the ethnography Fry and Söderberg code describes traditional Paiute life where men wear armor for protection in conflict and states that "*raids made it dangerous for families to wander alone,*" describing Paiutes raiding against other groups and "*tak[ing] scalps*" (Whiting 1950). The Fry and Söderberg coding scheme accurately does not report any specific instances of death based on these ethnographies. However, it would be an inaccurate characterization to claim these societies lacked war, which is precisely inference they lead readers to make by using the lack of specific war deaths as evidence for the lack of war.

The Yukaghir are an even more dramatic example. In the study, they are reported as lacking war, with only one lethal incident (cannibalism due to starvation). However, the ethnography Fry and Söderberg code contains extensive discussions of war, including that "*The Yukaghir did not undertake armed expeditions against one another, as they did against the Tungus, whom they hated as a people. The Yukaghir…were always on the lookout for the Tungus or Koryak,* ***in order to kill them***" (Jochelson 1926:126) Villages utilized a watch system because of the threat of raids. In one at least one incident, attackers "*kill[ed] a watchman and the sleeping warriors and… seize the camp*" (Jochelson 1926:383), while "*girls used to be taken as captives and distributed among the warriors*" (Jochelson 1926:133).

The Kaska are reported by Fry and Söderberg as lacking intergroup violence, while the ethnographic text extensively describes them as practicing war. After detailed descriptions of pre-raid preparations "*fighting started as soon as enemies were encountered… Men were not spared for capture. As victims fell warriors wielding stone knives detached scalps by cutting above the ears… The bodies of the dead received obscene treatment… Women captives became wives who initially had to be carefully watched or tied less they seek to escape*" (Honigmann 1954:94).

Similarly, the Andaman Islanders are reported as not having lethal intergroup violence. This ignores that the ethnography Fry and Söderberg code describes raiding parties in detail. "*Attacks were generally made… at early dawn when everyone would be asleep. The attacking party would rush the camp and shoot as many men as they could. Though the aim… was to kill the men, it often happened that women or children were killed. The*

whole fight would last only a few minutes… Such attacks and counterattacks might be continued for years. More usually, after one or two such fights peace would be made" (Radcliffe-Brown 1948:85). The Micmac are also reported as lacking war in the Fry and Söderberg sample, but the sources they code paint a very different picture of life: "*If we investigate the motives and the particular causes which have inspired these peoples* ***in going to war****, we find… a desire to avenge an injury… or, more often, the ambition to make themselves feared and dreaded… [they] wait… behind some tree—all in order to find opportunity to surprise, fight, and vanquish their enemies, to remove their scalps, and to return to their own country loaded with these cruel spoils.*" (Le Clercq 1910:265).

Taking the Fry and Söderberg sample at face value would lead the reader to believe that the Yukaghir, Micmac, Andamanese, Kaska, Slave, Yukaghir, and Aweikoma lack war while the ethnography they code describes a very different reality. However, based on the ethnography they code, it appears as if these societies all practiced war in their traditional context. Because of potential sampling and coding biases illustrated by this example (though all cross-cultural studies have sampling limitations and biases), relying on a range of studies is more informative than relying on any single study.

Cumulatively, the evidence is overwhelming that most documented hunting and gathering groups sometimes had war (Allen and Jones 2016; van der Dennen 1995; Wrangham and Glowacki 2012). In some societies, it appears to have been frequent and a significant source of mortality, while in others it may have been infrequent or rare. It is also clear that some 20th century mobile foraging groups such as the Semai and Mbuti lacked warfare, demonstrating that hunter-gatherers can peacefully co-exist with their neighbors (Fry 2007). However, for war to be important in our evolutionary history (or that of other primates), not every group needs to have practiced war and war does not need to occur with the severity or frequency found in agricultural societies nor have a dramatic mortality rate. It only needs to have fitness consequences for participants. Given the lethality of war it would be surprising if it lacked these.

Myth 4: Ancestral populations did not have anything to fight over or were too egalitarian to wage war.
Our hunting and gathering ancestors are commonly thought to have lived in small mobile and egalitarian groups. As a result, it is often claimed that their lifestyle did not allow for war, either because the population density was too low, their group sizes were too small, their resources were too scarce, they could easily move away from conflict, or their egalitarian social organization would have prevented war. All of these are potentially relevant for understanding the intensity and scale of war, but none of them are prohibitive of war.

Myth 4a: Population density was too low and resources were too scarce for war.
The myth that war is primarily caused by competition for natural resources or requires large populations fuels the idea that our foraging ancestors lacked war. Fry, for example, writes about our foraging ancestors that the *"population density is so low that it's hard to get enough people together to have a war… What would they fight over?... Hunter-gatherers, nomadic foragers they don't have much to fight over. It's not like they have a lot of stocks and bonds or even a food supply…so there is nothing to plunder and pillage really…. They had aggression… but it was not war"* (Fry 2019b Interview with Lopes) *and that the "group size is too small to support warfare"* (Fry and Söderberg 2013:271). This view is echoed by Sarah Hrdy: *"What would they have been fighting over? They were too busy trying to keep themselves and their children alive"* (as quoted in Angier 2009).

It is correct that the ability to monopolize valuable resources is often associated with greater rates of warfare, which is one reason why farmers and pastoralists often have higher rates of warfare (Knauft 1991; Wrangham, Wilson, and Muller 2006). However, the central claim is that the population densities of hunter-gatherers were too low to support war, or the potential benefits from warfare were too low to

promote warfare. Neither of claims is supported by strong evidence. Although many groups of hunter-gatherers were at low population densities, periodic lethal coalitionary intergroup aggression still occurred. This may be because even though some hunter-gatherers have small camp sizes (Hill et al. 2011), these groups are nevertheless embedded in webs of relationships that can span hundreds or thousands of individuals (Bird et al. 2019; Boyd and Richerson 2022; Glowacki and Lew-Levy 2022). Hadza men in Tanzania, for example, are expected to learn from over a thousand individuals in their lifetime (Hill et al. 2014). Chimpanzees are often at even lower population densities than some forager groups and yet have rates of death from intergroup violence that approach or exceed those of some hunter-gatherers. While higher population densities may facilitate warfare by putting more potential co-participants in close proximity, low population density does not prevent its occurrence.

Unlike pastoralists or farmers who can capture valuable transportable resources (food and livestock), hunter-gatherers generally have fewer material gains from warfare (Glowacki and Wrangham 2013; Manson et al. 1991). The lack of materials gains likely contributes to lower rates of warfare among forager compared to farmers and herders; however, it is not sufficient to prevent warfare. Many hunter-gatherer groups obtained valuable benefits from warfare, which sometimes included captured women or children, as well as trophies from victims (Allen and Jones 2016; Gat 2000). Given the unambiguous evidence from many foraging societies for taking captives in war, hunter-gatherers were clearly motivated to raid in order to capture women (Fry and Söderberg 2014; Fry 2021), contrary to the idea that raiding was "*impractical and runs counter to the ethos of egalitarianism*" (Fry and Söderberg 2013:271).

Whether or not there were low population densities or severe resource competition, it is clear that many mobile hunter-gatherers could and did practice warfare. In doing so, they often gained status and took captives, especially women and children, and such results appear independent of group size or resource competition.

Myth 4b: The egalitarian and flexible social composition of nomadic hunter-gatherers hinders warfare.
Mobile foragers typically have egalitarian social structures that include flexible residence patterns, high levels of mobility, and the lack of integrating social structures that make coordinating large numbers of persons difficult. For these reasons, it is sometimes claimed that they were unable to organize for warfare (Fry 2012; Fry and Söderberg 2013; Giorgi 2010; Sponsel 2010). Fry, for example, claims that *"the nomadic forager type of social organization makes the waging of war very difficult*" (Fry and Söderberg 2013 SI), while Sponsel (1996:107) claims that "*warfare would be absent… if one considers that they… lack sufficient food surplus to sustain a military organization… and do not have political leadership and organization to direct warfare."*

As these quotations correctly illustrate, the social organization of a society can limit the types of organization it can achieve. Likely because of this, hunter-gatherer warfare did not typically involve structured fighting units and chains of command but generally consisted of ad hoc unorganized raiding parties (Gat 1999; Keeley 1996). Battles, in which multiple participants faced off, appear less common than in other kinds of social organization but are ethnographically reported in some societies (Burch 2005; Meggitt 1962). Understanding how acephalous decentralized groups like hunter-gatherers or even chimpanzees wage warfare is a major area of research (Glowacki and McDermott 2022; Glowacki et al. 2016; Mathew 2017; Pandit et al. 2016) but regardless of the absence of centralization it is clear that they can and often do wage war.

While mobile hunter-gatherers generally have flexible group boundaries, in many societies, there are strong divides between groups. Among the Andaman islanders, groups kept closely to their home range because of the risk of attack by outside groups: "*Whenever two parties of them met by any chance, the larger*

party would attack the others." (Radcliffe-Brown 1948:86–87). Early ethnographic reports among the reported peaceful San document both territoriality and aggression in response to violations of a group's territory such that "*Men who hunted in the land of their neighbors are said to have been killed by them*" (Heinz 1972:412). So strong were the group divides that "*Though [the] band[s] live as neighbors there had been no exchange of marriage partners for some 15 years. This struck my attention because I knew that boys and girls were available on both sides*" (Heinz 1972:411).

These examples illustrate that a flexible social structure and egalitarian ethos does not prevent war. Even the most radically egalitarian nomadic hunter-gatherers such as the San appeared to have engaged in at least occasional lethal intergroup coalitionary violence prior to colonization. As Lee himself notes "*raiding expeditions had occurred in the distant past, during the youth of the grandparent generation of the oldest living people*" (Lee 1979:382), and some groups of San mounted intensive armed resistance against colonial incursions (Guenther 2014; Wright 1971). But it is also correct that increasing hierarchy, leadership, and social stratification is often associated with more intense warfare, likely due to the ease of mobilizing participants. Thus, the archaeological record generally shows a dramatic increase in warfare once social stratification emerges, a point well demonstrated by Fry and colleagues (Fry and Söderberg 2014; Fry, Keith, and Soderberg 2020). While we may not ever fully understand the causes of intergroup violence among hunter-gatherers, the record indicates that war did occur but was likely restrained in scale and intensity due to the difficult of organizing and mobilizing participants.

Myth 5: Nomadic hunter-gatherers (foragers) didn't make peace.

Deep roots proponents sometimes assume that war was the most common intergroup interaction between hunter-gatherer groups and that intergroup cooperation was rare (Keeley 1996; Wrangham and Glowacki 2012). This may be due to bias on the part of ethnographers who are more likely to write about war than the absence of war, or interest on the part of researchers. It may also be due to numerous well-known studies from Oceania and Papua New Guinea where warfare was often intense and chronic (Meggitt 1977; Pospisil 1994; Wiessner 1998; Wiessner 2019) contributing to the perception that incessant warfare was extremely common among foragers in other regions. Most of these populations were sedentary horticulturalists rather than mobile foragers, but this distinction is often not clear to non-anthropologists (though see Roscoe 2014 for discussion on forager warfare in New Guinea). Whatever the reasons, hunter-gatherer intergroup relationships are more varied than incessant war, and often include cooperation, trade, marriage, and peace (Fry 2009; Fry, Keith, and Soderberg 2020; Glowacki 2022).

While it is difficult to reconstruct the lifestyles of hunting and gathering groups prior to agriculture and colonization, a consensus is emerging that intergroup cooperation extended into the Paleolithic (Boyd and Richerson 2022; Fry 2012; Fuentes 2013; Fuentes 2004; Glowacki and Lew-Levy 2022; Hames 2019; Pisor and Surbeck 2019). Paleo-archeological evidence demonstrates that intergroup trade extends deep into our evolutionary history. Stone tool trade dates to at least 300,000 thousand years ago (Brooks et al. 2018). In southern Africa, there is extensive evidence of long-distance trade of eggshell beads across a distance of *more than 3,000 kilometers* over a period of nearly 20,000 years beginning 50,000 years ago (Miller and Wang 2021). Similarly, archaeological remains of hunter-gatherer populations the world over show extensive evidence of the exchange of trade across group boundaries (Bennyhoff and Hughes 1987; McBryde 1984; Oka and Kusimba 2008). These findings are consistent with ethnographically recent hunter-gatherer groups who often cooperated and traded across strong group boundaries that could span hundreds of miles and multiple language families (Bird et al. 2019; Fry et al. 2021).

Many hunter-gatherer groups appeared to work to avoid or minimize intergroup conflict (See Fig 3). In the Andaman Islands, notorious for regular intergroup warfare, societies developed mechanisms to resolve conflicts and renew relationships positively that was institutionalized in a peacemaking ceremony.

Members of two enemy groups would come together with the party who committed the last offense hosting the ritual. The visitors would give expression to their anger through "*mak[ing] expressive gestures at the end of which they sit down and weep together,*" exchanging weapons, giving gifts, and remaining camped together for a few days (Radcliffe-Brown 1948:134). "*The whole purpose of the rite is to abolish a condition of enmity and replace it by one of friendship*" (Radcliffe-Brown 1948:242). Among the Walbiri in western Australia, despite long simmering feuds with their neighbors, groups would often work to quell hostilities as "*between the raids there were occasional inter-trial meetings for totemic rituals and for trade*" (Meggitt 1962). Among the Ona in Terra del Fuego, there was a "*traditional ceremony called Jelj [which was an] ancient way of ending blood feuds and was performed only when all were agreed that strife was must end*" (Bridges 1948:404). It included a dramatic event where members of each hostile group had an opportunity to shoot blunted arrows at members of the other group, afterwards renewing "*friendly intercourse*" between the formerly hostile groups. Boehm (2013) reviews multiple cases using a sample of hunter-gatherer societies deemed appropriate as models for late Pleistocene societies and documents a range of behaviors foragers employed to facilitate peace, including peace meetings and formal truces [see also (van der Dennen 2014; van der Dennen 1998) for thoughtful discussion of peace among hunter-gatherers].

These examples illustrate that even though intergroup conflict may have been an important aspect of intergroup relationships, it does not mean that hunter-gatherer societies were perpetually at war (Glowacki 2022; Hames 2019). Indeed, it would be strange to imagine early human groups who were incapable of tolerantly interacting or cooperating with their neighbors, especially when it would have provided benefits such as tools, information, new allyships, or access to reproductive partners. The potential benefits from trade and cooperation with other groups creates the opportunity for evolution to act on the ability to build extended cooperative relationships across group boundaries.

Figure 3: *Left panel*: A group of Arunta men in Australia dancing in preparation before a raid against a distant group (Spencer and Gillen 1904). *Right panel*: In the Andaman Islands, making peace involved a ritualized dance between hostile groups that displayed aggressive feelings before culminating in an exchange of weapons (Radcliffe-Brown 1922).

Myth 6: No evidence of war before approximately 10,000bp.

A potentially devastating argument against the deep roots of lethal intergroup coalitionary violence is the lack of unambiguous archaeological evidence of warfare prior to approximately 10- 14,000 years ago. According to Giorgi (2010:93) "*direct violence and war appeared only in large settlements of the Late Neolithic*" while Fry claims the "*earliest evidence of warfare anywhere on the planet is 10,000 years ago, not more than that*" (Fry 2019b interview with Lopes). If unambiguous skeletal evidence of massacres were truly necessary to demonstrate the existence of warfare deep in our evolutionary history, then this absence would represent a formidable challenge. However, the claim that there is a lack of evidence for war before 10,000bp is misleading for two reasons.

For human remains from the Pleistocene to offer insight into whether warfare occurred requires both enough remains to form generalizable samples, and that the remains are in satisfactory condition to be able to infer the cause of death. However, there are vanishingly few intact archaeological remains from Pleistocene human populations before approximately 15,000 years ago, especially in Africa, where our species evolved. Grine (2016) systematically reviewed hominin remains in Africa from the Late Pleistocene over the last 200,000 years ago (MIS 6-2) finding "*a notable paucity of human remains*" with "*only a dozen or so [sites] providing particularly informative or interesting evidence spanning this period of nearly 200 kyr*" (Grine 2016:323). The vast majority consist of teeth or isolated fragments of bone, making inferences about the presence or absence of war impossible (see Table 1). Despite the lack of skeletons from the Paleolithic, several sites include strong evidence of lethal violence. Naturuk, in Kenya, is the most dramatic of these (Lahr, Rivera, Power, Mounier, Copsey, Crivellaro, Edung, Fernandez, et al. 2016). The remains of 27 individuals were found, including 12 articulated skeletons, ten of which showed lethal injuries such as blunt-force trauma and arrow wounds, in addition to several specimens appearing to be bound (Lahr, Rivera, Power, Mounier, Copsey, Crivellaro, Edung, Maillo Fernandez, et al. 2016) (though some interpret the evidence differently (Stojanowski et al. 2016)).

Thus, the claim that war did not occur because there is little skeletal evidence is faulty as the evidence to test it (numerous intact skeletons from multiple sites) is exceedingly rare. We assume that Pleistocene populations in Africa sometimes died from wildlife encounters (attacked by elephants or buffalo for instance), or during childbirth, and that the population pyramid generally consisted of more children than adults. The skeletal evidence to support these almost certainly true claims does not exist, but we do not infer that the lack of physical evidence indicates they did not occur. Rather, we predict a lack of skeletal remains due to perseveration issues, and not the underlying absence of childbirth, animal attacks, or lack of children. The same logic applies to skeletal evidence for war in the Pleistocene based on the lack of skeletal evidence. Because there are so few skeletons sufficiently intact to infer the cause of death, the lack of skeletal evidence is not strong support for the lack of war. This is a key reason why scholars often look to more recent foraging groups to reconstruct human livelihoods.

Site/ Specimen	**Site age in thousands of years**	**Human remains found**
Omo (Kibish Formation)	195,000	Cranium; fragmentary skull and partial postcranial skeleton.
Kébibat	200,000 – 130,000	Skull fragment
Twin Rivers	178,000 – 139,000	Humerus fragment
Mumbwa Caves	172,000	Two teeth; two radius fragments; possible femoral diaphysis
Jebel Irhoud	160,000	Two crania, juvenile mandible; fragmentary postcrania
Herto	160,000 – 150,000	Cranium; fragmentary cranial remains of five individuals
Singa	145,000 – 133,000	Calvaria
Border Cave	170,000 – 156,000	Postcranial fragments
Ngaloba Beds	129,000	Cranium
Blind River	124,000 – 112,000	Femur
Klasies River	115,000 – 58,000	Multiple cranial, mandibular and postcranial fragments
Sea Harvest	110,000 – 71,000	Manual distal phalanx, tooth

Grotte des Contrebandiers	110,000 – 92,000	Cranial fragments
Dar es-Soltan II	125,000 – 92,000	Incomplete skull; cranial fragments
Eyasi	104,000 – 92,000	Partial cranium; mandibles; cranial fragments; teeth
Equus Cave	103,000 – 30,000	Eight teeth
Aduma	105,000 – 80,000	Cranium; cranial fragments
Pinnacle Point	162,000 – 90,000	Parietal; tooth
Blombos	102,000 – 70,000	Nine teeth
Ysterfontein 1	130,000 – 50,000	Three teeth
Witkrans	100,000 – 50,000	Three teeth
Plovers Lake	89,000 – 62,000	Postcranial fragments
Haua Fteah	80,000 – 68,000	Two mandibular fragments
Mumba Shelter	78,000 – 60,000	Teeth
Porc-Épic	78,000 – 36,000	Mandibular fragment
Die Kelders	74,000 – 59,000	24 teeth; mandibular fragment; 2 phalanges
Klipdrift Shelter	72,000 – 52,000	Isolated tooth
Sibudu	77,000 – 38,000	Phalanx; distal fibula
Diepkloof	61,000 – 48,000	Two toe bones; tooth
Mugharet el 'Aliya	57,000 – 27,000	Juvenile maxilla; isolated teeth
Nyamita	55,000 – 45,000	Partial humerus
Magubike Rock Shleter	42,000	Six teeth
Nazlet Khater	38,000	Skulls and postcranial skeletons
Hofmeyr	36,000	Cranium
El Harhoura I	41,000 – 26,000	Mandible; tooth
Ishango 11	26,000 – 20,000	Fragmentary crania and postcrania
Taramsa 1	70,000 – 24,000	Child skeleton
Leopard's Hill Cave	24,000 – 21,000	Isolated parietal
Lukenya Hill	24,000 – 22,000	Partial calotte
Tuinplaas	<20,000 – 11,000	Skull and partial postcranial skeletons
Deir El-Fakhuri (E71K1)	18,000	Two partial skeletons
Taza Cave I	16,000 – 14,000	Skull
Afalou-bou-Rhummel	15,000 – 11,000	63 partial crania and skeletons
Gebel Silsila 2A	14,000 – 13,000	Isolated frontal bone
Jebel Sahaba (117)	14,000 – 12,000	58 partial skeletons
Wadi Halfa (6b28 & 6B36)	14,000 – 10,000	Mandible (6B28); 37 partial skeletons (6B36)
Ifri n'Baroud	17,000 – 11,000	Single postcranial skeleton
Bushman Rock Shelter	13,000 – 12,000	Single infant mandible
Mlambalasi Rock Shelter	13,000 – 12,000	Partial postcranial skeleton (? in situ)
Grotte des Pigeons (Taforalt)	13,000 – 11,000	200 skeletons in various states
Iwo Eleru	13,000 – 11,000	Incomplete skeleton and calvaria
Nataruk	10,500 – 9,500	27 skeletons, 12 articulated*

Table 1: Based on Grine (2016 Table 17.2) reproducing all African sites with hominin remains from MIS 6 until 10,000 BP.* The Nataruk cite was excluded from the Grine's data because of late publication.

Preservation issues are compounded in the archaeological record because lethal wounds often inflict little or no damage to the skeleton. Milner (2005) carefully examined victims of 19th century arrow wounds in the US wars against Native Americans finding that only one out of three arrows damaged bone, even though many of these were lethal wounds. Lambert (1997) notes that at another site, only one out of four stone points are clearly embedded in bone in one victim leading some scholars to expect only 25% of injuries from stone tipped projectile weapons leave skeletal injuries. If these estimates can be applied to war in the Pleistocene it suggests that potentially up to 75 percent of deaths from war would not be attributed to lethal trauma. Thus, whatever paleoarchaeological evidence there is for war, the record likely vastly underestimates the actual incidences of lethal aggression.

The second reason this argument is misleading is that for Pleistocene populations it is virtually impossible to distinguish homicide from warfare as the skeletal signatures are nearly identical. The primary type of war among mobile hunter-gatherers is a raid that targets a lone individual through ambush, thus leaving a single victim (Gat 1999). Similarly, homicide due to in-group conflicts typically leaves a single victim, making it nearly impossible to distinguish war from homicide in the paleolithic record (Kissel and Kim 2019; Martin and Harrod 2015). Thus using skeletal evidence alone will be of limited use in making inferences about Pleistocene social behavior (Kim and Kissel 2018).

Despite the lack of unequivocal evidence for warfare prior to around 14,000 years ago, there are multiple sites with evidence of violence that could indicate warfare. Wu and colleagues (2011 SI) collected records of all traumatic lesions that have been found prior to the Last Glacial Maximum approximately 14,000 years ago. They identified sixty-one skeletons with evidence of traumatic lesions, but it is impossible to say whether these injuries resulted from interpersonal violence such as homicide, coalitionary intergroup violence such as war, or from another reason (See Table 2 of Kissel and Kim 2019 for the most interesting of these cases). Fry and Söderberg's (2013) research suggests that between 34 to 43% of deaths due to violence among mobile hunter-gatherers are from *intergroup* violence. Assuming this estimate captures the approximate proportions of deaths due to intergroup and intragroup violence among early hunter-gatherers and that war in human evolution followed a similar pattern, then of the 34% of the 61 injuries on skeletons or around 20 of the injuries could be inferred to have come from intergroup violence. This is an extremely rough estimate, but whatever the exact percentage, it is likely that at least significant number of the 61 bodies with skeletal trauma were victims of warfare.

Myth 7: If war was important in human evolution, then war is inevitable.

Shallow roots proponents sometimes claim that if warfare was important in human evolution, then our species will always have war, or worse, that this history will be used as a justification for war. Horgan cautions "*many people think that if war is ancient and innate, it must also be inevitable*" (Horgan 2016b), while Sponsel claims deep rooters "*champion the assumption that humans are innately, instinctively, genetically, or biologically programmed to be aggressive, and, therefore, that war is an inevitable manifestation of human nature*" (2010:22) with an "*absolutist, universalist, and essentialist posture*" (2010:22). Fry characterizes the deep roots argument as being plagued with a fallacious inevitability" "*We have always been this way, we will always be this way*" (Fry 2019b Interview with Lopes). If war has deep evolutionary roots, then this "*justifies militarism. If natural selection produced a human primate with a tendency to attack neighbors… well let's forget the negotiating table and arm to the teeth. Let's stick it to them before they stick it to us.*" (Fry and Söderberg 2014:263). Sapolsky, for example, writes "*if war is natural, there is little point in trying to prevent, reduce or abolish it*" (Forward to Fry 2007:5). Ironically, many of these same authors have argued elsewhere that interpersonal aggression was likely important in human evolution and that we can use the knowledge gained by studying it to reduce the likelihood of aggression in the world today

(Horgan 2016a; Sapolsky 2017). If interpersonal aggression has a biological and evolutionary basis and we can use our scientific knowledge to reduce it, then the same would be true of war.

Most evolutionary anthropologists would disagree with the assessment offered by Saplosky, Horgan, Fry and others that a biological propensity for a behavior means that it is inevitable (Nettle et al. 2013; Smith 2011; Smith 2013). Superficial caricatures presenting deep roots proponents as fatalistic or justifying war are misleading and often false. Many of the most ardent proponents for the deep roots of warfare acknowledge that although war may have a biological basis, social and cultural institutions can drastically reduce it. Pinker (2012), for instance, documents how exceptionally labile war is, with large-scale historic changes in the severity and intensity of war that correspond with cultural and social changes. Wrangham writes "*while war is not inevitable, conscious effort is needed to prevent it… Abundant evidence shows that* ***violence is socially influenced and socially preventable****. History, after all, has long told us that* ***societies can be at peace for generations****. Evolution of a behavioral tendency does not mean that the behavior has to be inevitable, flexible, or in some other way independent of human will*" (Wrangham 2019:251–254). Glowacki and colleagues argue that although warfare results from "*evolved psychological predispositions*" the "*success of peacemaking institutions gives hope that the zone of peace could one day encompass the entire planet*" (Glowacki, Wilson, and Wrangham 2020:977–978). Such quotes directly contradict the fatalistic claims that Sponsel, Fry, and others attribute to deep roots perspectives.

Further, many deep roots scholars attempt to use the scientific knowledge of war to consider how and why peacefulness arises. Wrangham, for instance, argues that by minimizing a "*high likelihood of cost-free success [in war]… people can live for long periods at peace* (Wrangham 2019:254). Wilson and Wrangham (2022) use the evolutionary study of war to suggest areas of study that might promote peace, stating, "*the challenge of preventing major wars is mainly undertaken by politicians and lawyers, but we think that every contribution might help,*" and then outlines a series of questions intended to provide insight into preventing war including what is "*the point at which leaders… perceive the benefits of peace as outweighing the costs of war? Or how [do] individuals categorize others as friend or foe?*". Rather than being afraid that a biological basis for war may justify or lead to fatalism about war, we could follow the lead of evolutionary scholars themselves, who argue that "*an understanding of warfare rooted in [evolutionary biology] seems likely to point the way towards a better understanding of the contexts that support peaceful intergroup relationships*" (Wilson 2013:382–383). Nothing about a biological basis for war as it is currently understood makes war inevitable or justifies it.

3. POISONING THE WELL

Perhaps because of the intensity of the debate over war in human evolution, arguments sometimes involve attacking the credentials, objectivity, or motivation of the researcher, serving to poison the well against them. Poisoning the well refers to a rhetorical device used to bias the reader against the other person despite the merits of the argument. Because it does not address the argument itself but paints the person conveying the argument in a negative light, it is considered a type of logical fallacy that undermines scientific discourse. My hope it that by drawing attention to how prevalent such claims have become, it will recenter the debate on the merits of the argument, rather than characteristics of those with competing positions.

Both deep and shallow rooters often attribute the competing position to biases or political motivations. Deep rooters, for example, sometimes attribute the views of shallow rooters to blank slatism or a bias resulting from a peace studies agenda (Buss 2001; Pinker 2012). This frustration sometimes spills over into ad hominem attacks, such as characterizations of shallow rooters as "*aggressive academics*" (Pinker 2012:36) or the "*peace and harmony mafia*" (van der Dennen 2005). It is correct that peace studies as a field does have a "*value orientation in favor of peace and against war*" (Barash 2023) and many of these

scholars worry that acknowledging a role for war in evolution may lead to fatalistic attitudes about war (see Myth 7). However, much scholarship on the evolution of war by shallow rooters rejects the blank slate model of human psychology, arguing that biology does, in fact, have a role in shaping human behavior and attributing war to social rather than biological causes. Similarly, instead of refusing to engage with the evidence as someone driven by a value orientation might, shallow rooters typically rely on evidence that rejects bellicose hunter-gatherer or chimpanzee models for human evolution, and point to the prevalence of peaceful intergroup relationships among foragers or the behavior of bonobos instead of chimpanzees (Ferguson 2011; Fry 2007; Fuentes 2012; Sussman and Hart 2015).

Similarly, shallow rooters often accuse deep rooters of being politically motivated or biased in such that their scientific credibility is undermined: Sponsel calls deep rooters "*apologists for war*" (2017:31; 2010:22) and "*peace resisters*" (Sponsel 2017:31) who create "*fiction, not science*" (Sponsel 2018:37–38). Fry claims deep rooters *"… have not looked at the data, [and] start… with the base narrative that war in inherent in human nature and then [construct] arguments as to why this is the case. That is not science. I'm not quite sure what it is but it's not science*" (Fry 2019b: Interview with Lopes). Deep rooters "… *have digested the myth of a warlike past—such "knowledge," in other words, is an aspect of their shared Occidental belief system. Such "knowledge" is not born of objective science. On this human nature issue, it is time to stop assuming that the world is flat and instead carefully reexamine the actual data*" (Fry 2013b:20). Alarmingly, Fry proposes that a lack of self-reflection by scholars such as Bowles, Pinker, and Wrangham is responsible for their scientific views: "*Many scholars and scientists don't do the self-reflection that I would urge them to do*" (Fry 2019b: Interview with Lopes). "*Hence one of our prescriptions for researchers working in this area involves the sometimes difficult tasks of self-reflection, self-awareness, and self-questioning in light of their cultural traditions, professional schooling, and social meanings as reflected in extant values, beliefs, and practices*" (Fry, Keith, and Soderberg 2020:317).

Sometimes these attacks spill over into attacks on the scientific credentials of prominent deep rooters, arguing that their training somehow makes then unqualified to interpret ethnographic material, the archaeological record, or primate behavioral data. For example, Fry writes that "*Samuel Bowles is an economist. Steven Pinker is a psychologist. Richard Wrangham is a primatologist. The list of non-anthropologists who assume nomadic foragers to be "warlike" is substantial (e.g., Gat, 2006; Ghiglieri, 1999; Goldstein, 2001). In science, one's training, experience, and knowledge do matter. When persons who lack anthropological training and lack ethnographic knowledge about foragers propose theories and explanations,* ***it is not surprising that the outcome is closer to myth than reality***" (Fry and Söderberg 2014:264). The reality is that these authors are in fact knowledgeable scholars with deep expertise, including about human evolution.

The misleading nature of this quotation and the others are all too common. Unfortunately, they work to bias readers from evaluating the evidence impartially. Reasonable people can disagree about the strength of evidence for the origin of war. The training one has can facilitate or hinder insights into the interpretation of evidence. Personal attacks, attributing ulterior motives, or accusations of a lack of self-reflection, are behaviors that scholars should avoid. They serve to undermine scientific discourse and sully the reputation of those involved. Even worse, they damage the scientific study of behavior as a whole.

4. DISCUSSION

Human warfare is a complex social behavior resulting from the interaction of culture, social structure, and our evolved psychology and biology. It should therefore be unsurprising that the evidence for the origins of war is complex and sometimes ambiguous. Our close cousins, chimpanzees and bonobos, provide evidence for and against the deep roots of war, depending on which species and population one takes as a better model for the last common ancestor 6-9 million year ago. It is also reasonable to argue that phylogenetic approaches using the LCA are not an appropriate way to study the evolution of war due

784 uncertainty about the LCA and the radical changes in the human lineage since our separation from the
785 other apes. More fruitful approaches consider what traits humans share with other apes and the adaptive
786 conditions that give rise to these. Bonobos and humans both have strong female alliances and intergroup
787 affiliation, while chimpanzees and humans have intergroup raiding and high rates of fission-fusion.
788
789 The behavior of recent foragers also fails to resolve the debate about the origins of war. Most foragers
790 appear to have had at least occasional war, especially in the form of small, low-risk raids. Yet for some
791 foraging societies, war was infrequent and unpredictable, and some foragers seem to have lacked war
792 altogether suggesting our foraging ancestors were capable of intergroup cooperation and peace. Still, given
793 the ubiquity of at least occasional intergroup violence among pre-state foragers it would be surprising if
794 our foraging ancestors lacked war altogether.
795
796 The paleo-archaeological record is similarly complex. There are a significant lack of intact human remains
797 from the Pleistocene, limiting our ability to rely on skeletal materials to date the origins of war. The intact
798 remains there are provide evidence that lethal aggression occurred but was variable in time and place,
799 although it is unclear whether it is war or interpersonal violence. The skeletal evidence for war begins to
800 clearly emerge in the last 15,000 years, and then substantially increases with the development of
801 agriculture, hierarchy, and increased availability of intact human remains. But this does not imply that
802 war did not exist before agriculture or was unimportant. Even infrequent wars with low mortality rates
803 could be an important factor in human evolution despite failing to leave a clear record in the skeletal
804 remains of Pleistocene populations.
805
806 All human societies appear to have the capacity to flexibly respond to their neighbors through war or
807 peace. Intergroup relationships may involve aggression, or cooperation, or both. The flexibility of
808 contemporary societies as well as ethnographically documented foragers suggests that tolerance and
809 cooperation were likely to have been important selective features in human evolution alongside the
810 strategic use of coalitionary violence. Just as relationships between societies today can include aggression
811 and cooperation, it is reasonable to expect the same to be true of our foraging ancestors once benefits for
812 cooperation or aggression appeared. To assume that intergroup relationships in the evolution of *Homo*
813 *sapiens* were predominantly warlike or peaceful is to ignore the complexity of human societies and the
814 differing motivations of individuals—and the fact that both cooperation and aggression can pay but which
815 strategy dominates depends on the context, including the behavior of others.
816
817 Despite the many misconceptions about the origins of war and peace, we are coming closer to
818 understanding the birth of these behaviors. Increasing but still sparse evidence from the Paleolithic is
819 demonstrating that war predates agriculture, but as many shallow rooters have argued, the presence of
820 violence profoundly varies across space and time (Lee 2018). Long-term field studies of bonobos,
821 chimpanzees, and even gorillas reveal that both lethal violence and cooperation can be natural features of
822 a primate species like ourselves. Powerful modeling work reveals that evolutionary dynamics can lead to
823 the precursors of our exceptional capacities for war and peace: parochial and altruism. Taken together,
824 these findings converge on an evolutionary history that is more exciting and complex than just one of war
825 or peace. Our early human relatives likely found that both war and peace could be beneficial and struggled
826 to create the institutions that could balance their costs and benefits. We carry their evolutionary legacy
827 today in our own struggles to create a more peaceful world, but one in which we all too often turn to
828 violence.
829
830 **Acknowledgements**
831 Much appreciation to Will Buckner for sharing his knowledge of the ethnographic record with me and
832 helpful comments on the manuscript. Pria Anand, Zach Garfield, Manvir Singh, and Richard

Wrangham provided insightful reviews. Mike Wilson kindly pointed me to literature on primates and the LCA and encouraged me to think about human evolution more deeply. Mary and Ron at the Ernst Mayr library are gratefully acknowledged for accommodating my many visits and assistance with obtaining resources.

References

Allen, Mark W.
2014 Hunter-Gatherer Violence and Warfare in Australia. *In* Violence and Warfare Among Hunter-Gatherers Pp. 97–111. Walnut Creek, CA: Left Coast Press.

Allen, Mark W., and Terry L. Jones, eds.
2016 Violence and Warfare among Hunter-Gatherers. Routledge.

Almécija, Sergio, Ashley S. Hammond, Nathan E. Thompson, et al.
2021 Fossil Apes and Human Evolution. Science 372(6542). American Association for the Advancement of Science: eabb4363.

Angier, Natalie
2009 Cute, Cooing Babies: The Key to Understanding Social Behavior? The New York Times, March 4. https://www.nytimes.com/2009/03/04/health/04iht-snangier.1.20589891.html, accessed February 7, 2023.

Barash, David
2023 FAQs – David Barash. https://dpbarash.com/faqs/, accessed February 27, 2023.

Barash, David P.
2013 Do Human Beings Have an Instinct for Waging War? Aeon. https://aeon.co/essays/do-human-beings-have-an-instinct-for-waging-war, accessed January 31, 2023.

Baszarkiewicz, K., and D. Fry
2008 Peaceful Societies. *In* Encyclopedia of Violence, Peace, and Conflict. L. Kuntz, ed. Pp. 1557–1570. Oxford: Academic Press.

Bennyhoff, James, and Richard Hughes
1987 Shell Bead and Ornament Exchange Networks Between California and the Western Great Basin. Anthropological Papers of the American Museum of Natural History 64(04): 79–175.

Bird, Douglas W., Rebecca Bliege Bird, Brian F. Codding, and David W. Zeanah
2019 Variability in the Organization and Size of Hunter-Gatherer Groups: Foragers Do Not Live in Small-Scale Societies. Journal of Human Evolution 131: 96–108.

Bird-David, Nurit
1992 Beyond "The Hunting and Gathering Mode of Subsistence": Culture-Sensitive

877 Observations on the Nayaka and Other Modern Hunter-Gatherers. Man 27(1). [Wiley, Royal
878 Anthropological Institute of Great Britain and Ireland]: 19–44.
879
880 Boehm, Christopher
881 2013 The Biocultural Evolution of Conflict Resolution Between Groups. *In* War, Peace, and
882 Human Nature: The Convergence of Evolutionary and Cultural Views. Douglas P. Fry, ed. New
883 York: Oxford University Press.
884
885 Boyd, Robert, and Peter J. Richerson
886 2022 Large-scale Cooperation in Small-scale Foraging Societies. Evolutionary Anthropology:
887 Issues, News, and Reviews: evan.21944.
888
889 Bridges, Lucas
890 1948 Uttermost Part of the Earth. London: Hodder and Stoughton.
891
892 Brooks, Alison S., John E. Yellen, Richard Potts, et al.
893 2018 Long-Distance Stone Transport and Pigment Use in the Earliest Middle Stone Age.
894 Science 360(6384). American Association for the Advancement of Science: 90–94.
895
896 Burch, Ernest
897 2005 Alliance and Conflict: The World System of the Inupiaq Eskimos. University of Nebraska
898 Press.
899
900 Buss, David M.
901 2001 Human Nature and Culture: An Evolutionary Psychological Perspective. Journal of
902 Personality 69(6): 955–978.
903
904 Cheng, Leveda, Liran Samuni, Stefano Lucchesi, Tobias Deschner, and Martin Surbeck
905 2022 Love Thy Neighbour: Behavioural and Endocrine Correlates of Male Strategies during
906 Intergroup Encounters in Bonobos. Animal Behaviour.
907 https://www.sciencedirect.com/science/article/pii/S0003347222000550, accessed March 23,
908 2022.
909
910 Clay, Zanna, Takeshi Furuichi, and Frans B.M. de Waal
911 2016 Obstacles and Catalysts to Peaceful Coexistence in Chimpanzees and Bonobos.
912 Behaviour 153(9/11). Brill: 1293–1330.
913
914 Compton, John S.
915 2011 Pleistocene Sea-Level Fluctuations and Human Evolution on the Southern Coastal Plain
916 of South Africa. Quaternary Science Reviews 30(5): 506–527.
917
918 Crofoot, Margaret C., and Richard W. Wrangham
919 2010 Intergroup Aggression in Primates and Humans: The Case for a Unified Theory. *In* Mind
920 the Gap: Tracing the Origins of Human Universals. Peter M. Kappeler and Joan Silk, eds. Pp.

171–195. Berlin, Heidelberg: Springer. https://doi.org/10.1007/978-3-642-02725-3_8, accessed March 9, 2023.

van der Dennen, J. M. G.
1995 The Origin of War: The Evolution of a Male-Coalitional Reproductive Strategy. Groningen: Origin Press.
1998 The Politics of Peace in Primitive Societies: The Adaptive Rationale Beyind the Corroboree and Calumet. *In* Indoctrinability, Ideology, and Warfare: Evolutionary Perspectives (Pp. 151–188. New York: Berghahn Books.
2005 Querela Pacis: Confession of an Irreparably Benighted Researcher on War and Peace. An Open Letter to Frans de Waal and the "Peace and Harmony Mafia. http://rint.rechten.rug.nl/rth/dennen/letter.htm, accessed February 27, 2023.
2014 Peace and War in Nonstate Societies: An Anatomy of the Literature in Anthropology and Political Science. Common Knowledge 20(3): 419–489.

Dentan, R.
1968 The Semai: A Nonviolent People of Malaya. Case Studies in Cultural Anthropology. New York: Holt, Rinehart and Winston.
1978 Notes on Childhood in a Nonviolent Context: The Semai Case. *In* Learning Non-Aggression. A. Montagu, ed. New York: Oxford University Press.

Dentan, R
2004 Cautious, Alert, Polite, and Elusive: The Semai of Central Peninsular Malaysia. *In* Keeping the Peace: Conflict Resolution and Peaceful Societies around the World. Graham Kemp and Douglas P. Fry, eds. New York: Routledge.

Diogo, Rui, Julia L. Molnar, and Bernard Wood
2017 Bonobo Anatomy Reveals Stasis and Mosaicism in Chimpanzee Evolution, and Supports Bonobos as the Most Appropriate Extant Mode l for the Common Ancestor of Chimpanzees and Humans. Scientific Reports 7(1). Nature Publishing Group: 608.

Duda, Pavel, and Jan Zrzavý
2013 Evolution of Life History and Behavior in Hominidae: Towards Phylogenetic Reconstruction of the Chimpanzee–Human Last Common Ancestor. Journal of Human Evolution 65(4): 424–446.

Dye, David H
2013 Trends in Cooperation and Conflict in Native Eastern North America. *In* War, Peace, and Human Nature: The Convergence of Evolutionary and Cultural Views P. 25.

Ember, Carol R.
1978 Myths about Hunter-Gatherers. Ethnology 17(4). JSTOR: 439–448.

Fabbro, David
1978 Peaceful Societies: An Introduction. Journal of Peace Research 15(1): 67–83.

Fan, Shaohua, Matthew E. B. Hansen, Yancy Lo, and Sarah A. Tishkoff
2016 Going Global by Adapting Local: A Review of Recent Human Adaptation. Science 354(6308). American Association for the Advancement of Science: 54–59.

Ferguson, Brian R.
2011 Born to Live: Challenging Killer Myths. *In* Origins of Altruism and Cooperation Pp. 249–270. Springer.

Ferguson, Brian, and Neil Whitehead, eds.
1992 War in the Tribal Zone: Expanding States and Indigenous Warfare. Santa Fe, New Mexico: School of American Research Press.

Ferguson, R.B.
2013 Pinker's List: Exaggerating Prehistoric War Mortality. *In* War, Peace and Human Nature: The Convergence of Evolutionary and Cultural Views. Pp. 112–131. Oxford: Oxford University Press.

Finlayson, Clive
2014 The Improbable Primate: How Water Shaped Human Evolution. Oxford University Press.

Fry, Douglas
2007 Beyond War: The Human Potential for Peace. Oxford University Press.
2012 Life without War. Science 336: 879–884.
2013a Cooperation for Survival: Creating a Global Peace System. *In* War, Peace, and Human Nature: The Convergence of Evolutionary and Cultural Views. Douglas Fry, ed. Pp. 543–558. New York: Oxford University Press.
2013b War, Peace, and Human Nature The Challenge of Achieving Scientific Objectivity. *In* War, Peace, and Human Nature: The Convergence of Evolutionary and Cultural Views. Douglas Fry, ed. New York: Oxford University Press.
2019a The Much Overlooked Foundational Principle of Restraint. Peace Review 31(1). Routledge: 46–54.
2019b The Dissenter: Is War Part of Human Nature? Interview by Ricardo Lopes. November. https://open.spotify.com/episode/7C6lxsinFPtk4QXTqRwdzw.
2021 The Dissenter: The Origins and Causes of War, and Peace Social Systems and How to Maintain Them. Interview by Ricardo Lopes. September 9. https://open.spotify.com/episode/628blsSGgdZ0VNlpj9gwmf.

Fry, Douglas, Charles A. Keith, and Patrik Soderberg
2020 Social Complexity, Inequality and War before Farming: Congruence of Comparative Forager and Archaeological Data. *In* Social Inequality before Farming? Multidisciplinary

Approaches to the Study of Social Organization in Prehistoric and Ethnographic Hunter-Gatherer-Fisher Societies. Luc Moreau, ed. Pp. 303–320. https://doi.org/10.17863/CAM.60627, accessed March 25, 2022.

Fry, Douglas P
2009 Anthropological Insights for Creating Non-Warring Social Systems. Journal of Aggression, Conflict, and Peace Research 1(2): 4–15.

Fry, Douglas P., and Patrik Söderberg
2013 Lethal Aggression in Mobile Forager Bands and Implications for the Origins of War. Science 341(6143). American Association for the Advancement of Science: 270–273.

Fry, Douglas P., Geneviève Souillac, Larry Liebovitch, et al.
2021 Societies within Peace Systems Avoid War and Build Positive Intergroup Relationships. Humanities and Social Sciences Communications 8(1): 17.

Fry, Douglas, and Patrik Söderberg
2014 Myths about Hunter-Gatherers Redux: Nomadic Forager War and Peace. Kirk Endicott, ed. Journal of Aggression, Conflict and Peace Research 6(4): 255–266.

Fuentes, Agustin
2004 It's Not All Sex and Violence: Integrated Anthropology and the Role of Cooperation and Social Complexity in Human Evolution. American Anthropologist 106(4): 710–718.

Fuentes, Agustín
2012 Race, Monogamy, and Other Lies They Told You: Busting Myths about Human Nature. Univ of California Press.
2013 Cooperation, Conflict, and Niche Construction in the Genus Homo. *In* War, Peace, and Human Nature The Convergence of Evolutionary and Cultural Views. Douglas Fry, ed. Oxford ; New York: Oxford University Press.

Furuichi, Takeshi
2011 Female Contributions to the Peaceful Nature of Bonobo Society. Evolutionary Anthropology: Issues, News, and Reviews 20(4): 131–142.

Gat, Azar
1999 The Pattern of Fighting in Simple, Small-Scale, Prestate Societies. Journal of Anthropological Research 55(4): 563–583.
2000 The Human Motivational Complex: Evolutionary Theory and the Causes of Hunter-Gatherer Fighting, Part II. Proximate, Subordinate, and Derivative Causes. Anthropological Quarterly 73(2): 74–88.

Giorgi, Piero P.

2010 Not Killing Other People. *In* Nonkilling Societies. Joám Evans Pim, ed. Center forGlobal Nonkilling.

Glowacki, Luke
2022 The Evolution of Peace. EcoEvoRxiv. https://ecoevorxiv.org/vntwr/, accessed October 20, 2022.

Glowacki, Luke, Alexander Isakov, Richard W. Wrangham, et al.
2016 Formation of Raiding Parties for Intergroup Violence Is Mediated by Social Network Structure. Proceedings of the National Academy of Sciences 113(43): 12114–12119.

Glowacki, Luke, and Sheina Lew-Levy
2022 How Small-Scale Societies Achieve Large-Scale Cooperation. Current Opinion in Psychology 44: 44–48.

Glowacki, Luke, and Rose McDermott
2022 Key Individuals Catalyse Intergroup Violence. Philosophical Transactions of the Royal Society B: Biological Sciences 377(1851): 20210141.

Glowacki, Luke, Michael L. Wilson, and Richard W. Wrangham
2020 The Evolutionary Anthropology of War. Journal of Economic Behavior & Organization 178: 963–982.

Glowacki, Luke, and Richard W. Wrangham
2013 The Role of Rewards in Motivating Participation in Simple Warfare. Human Nature 24(4): 444–460.

Goodall, Jane
1986 The Chimpanzees of Gombe: Patterns of Behavior. Cambridge Mass. Belknap Press of Harvard University Press.

Graeber, David, and David Wengrow
2021 The Dawn of Everything: A New History of Humanity. Penguin.

Grine, Frederick E.
2016 The Late Quaternary Hominins of Africa: The Skeletal Evidence from MIS 6-2. *In* Africa from MIS 6-2. Sacha C. Jones and Brian A. Stewart, eds. Pp. 323–381. Vertebrate Paleobiology and Paleoanthropology. Dordrecht: Springer Netherlands. http://link.springer.com/10.1007/978-94-017-7520-5_17, accessed May 25, 2022.

Gruber, Thibaud, and Zanna Clay
2016 A Comparison Between Bonobos and Chimpanzees: A Review and Update. Evolutionary Anthropology: Issues, News, and Reviews 25(5): 239–252.

Guenther, Mathias
2014 War and Peace among Kalahari San. Journal of Aggression, Conflict, and Peace Research 6(4): 229–239.

Haas, Jonathan, and Matthew Piscitelli
2013 The Prehistory of Warfare Misled by Ethnography. *In* War, Peace, and Human Nature: The Convergence of Evolutionary and Cultural Views Pp. 168–190. New York: Oxford University Press.

Hames, Raymond
2019 Pacifying Hunter-Gatherers. Human Nature 30(2): 155–175.

Harris, Marvin
1968 The Rise of Anthropological Theory: A History of Theories of Culture. New York: Columbia University Press.

Heinz, HJ
1972 Territoriality among the Bushmen in General and the !Ko in Particular. Anthropos 67(3/4): 405–416.

Helbling, Jürg
2006 War and Peace in Societies without Central Power: Theories and Perspectives. Warfare and Society: Archaeological and Social Anthropological Perspectives. Aarhus University Press Aarhus: 113–139.

Hill, K. R., R. S. Walker, M. Bozicevic, et al.
2011 Co-Residence Patterns in Hunter-Gatherer Societies Show Unique Human Social Structure. Science 331(6022): 1286–1289.

Hill, Kim R., Brian M. Wood, Jacopo Baggio, A. Magdalena Hurtado, and Robert T. Boyd
2014 Hunter-Gatherer Inter-Band Interaction Rates: Implications for Cumulative Culture. PLOS ONE 9(7). Public Library of Science: e102806.

Hobhouse, L.T., G.C. Wheeler, and M. Ginsberg
1915 The Material Culture and Social Institutions of the Simpler People. London: Chapman and Hall.

Hohmann, G., and B. Fruth
2002 Dynamics in Social Organization of Bonobos (Pan Paniscus). *In* Behavioural Diversity in Chimpanzees and Bonobos. C. Boesch, G. Hohmann, and L.F. Marchant, eds. Cambridge: Cambridge University Press.

Holmberg, Allan R

1950 Nomads of the Long Bow: The Siriono of Eastern Bolivia. Washington: Smithsonian Institution.

Honigmann, John Joseph
1954 The Kaska Indians: An Ethnographic Reconstruction. New Haven: Yale University Publications in Anthropology, 162.

Horgan, John
2016a I Am Innately Aggressive, Not Innately Warlike. Scientific American Blog Network, February 9. https://blogs.scientificamerican.com/cross-check/i-am-innately-aggressive-not-innately-warlike/, accessed June 8, 2022.
2016b Japanese Study Deals Another Blow to Deep-Roots Theory of War. Scientific American Blog Network, April 4. https://blogs.scientificamerican.com/cross-check/japanese-study-deals-another-blow-to-deep-roots-theory-of-war/, accessed June 8, 2022.

Hunt, Kevin D.
2016 Why Are There Apes? Evidence for the Co-Evolution of Ape and Monkey Ecomorphology. Journal of Anatomy 228(4): 630–685.
2020 Chimpanzee: Lessons from Our Sister Species. Cambridge University Press.

Ichikawa, Mitsuo
1983 An Examination of the Hunting-Dependent Life of the Mbuti Pygmies, Eastern Zaire. African Study Monographs 4. The Research Committee for African Area Studies, Kyoto University: 55–76.

Jochelson, Waldemar
1926 The Jesup North Pacific Expedition: The Yukaghir and the Yukaghirized Tungus. New York: Memoir of the American Museum of Natural History.

Keeley, Lawrence
1996 War Before Civilization. Oxford University Press.

Kelly, R. L.
2013 The Lifeways of Hunter-Gatherers: The Foraging Spectrum. New York: Cambridge University Press.

Kelly, Raymond C.
2005 The Evolution of Lethal Intergroup Violence. Proceedings of the National Academy of Sciences 102(43): 15294–15298.

Kelly, Raymond Case
2000 Warless Societies and the Origin of War. University of Michigan Press.

Kim, Nam, and Marc Kissel
2018 Emergent Warfare in Our Evolutionary Past. New York: Routledge.

Kissel, Marc, and Nam C. Kim
2019 The Emergence of Human Warfare: Current Perspectives. American Journal of Physical Anthropology 168(S67): 141–163.

Knauft, Bruce M.
1991 Violence and Sociality in Human Evolution [and Comments and Replies]. Current Anthropology 32(4). The University of Chicago Press: 391–428.

Lahr, M. Mirazón, F. Rivera, R. K. Power, A. Mounier, B. Copsey, F. Crivellaro, J. E. Edung, J. M. Maillo Fernandez, et al.
2016 Inter-Group Violence among Early Holocene Hunter-Gatherers of West Turkana, Kenya. Nature 529(7586). Nature Publishing Group: 394–398.

Lahr, M. Mirazón, F. Rivera, R. K. Power, A. Mounier, B. Copsey, F. Crivellaro, J. E. Edung, J. M. Maillo Fernandez, et al.
2016 Mirazón Lahr et al. Reply. Nature 539(7630). Nature Publishing Group: E10–E11.

Lambert, Patricia
1997 Patterns of Violence in Prehistoric Hunter-Gatherer Societies of Coastal Southern California. *In* Troubled Times: Violence and Warfare in the Past Pp. 77–109. Amsterdam: Gordon and Breach.

Layton, Robert
2014 Evolutionary Anthropology, Co-Operation and Warfare. *In* Applied Evolutionary Anthropology: Darwinian Approaches to Contemporary World Issues. Mhairi A. Gibson and David W. Lawson, eds. Pp. 177–200. Advances in the Evolutionary Analysis of Human Behaviour. New York, NY: Springer. https://doi.org/10.1007/978-1-4939-0280-4_8, accessed February 27, 2023.

Le Clercq, C.
1910 Publications of the Champlain Society, vol.5. Publications of the Champlain Society.

LeBlanc, S., and K. Register
2003 Constant Battles: The Myth of the Peaceful, Noble Savage. New York: St Martins Press.

Lee, Richard B.
2014 Hunter-Gatherers on the Best-Seller List: Steven Pinker and the “Bellicose School’s” Treatment of Forager Violence. Journal of Aggression, Conflict and Peace Research 6(4). Emerald Group Publishing Limited: 216–228.

2018 Hunter-Gatherers and Human Evolution: New Light on Old Debates. Annual Review of Anthropology 47(1): 513–531.

Lee, Richard Borshay
1979 The! Kung San: Men, Women and Work in a Foraging Society. Cambridge University Press.

Lemoine, Sylvain, Christophe Boesch, Anna Preis, et al.
2020 Group Dominance Increases Territory Size and Reduces Neighbour Pressure in Wild Chimpanzees. Royal Society Open Science 7(5): 200577.

Lovejoy, C. Owen, Gen Suwa, Scott W. Simpson, Jay H. Matternes, and Tim D. White
2009 The Great Divides: Ardipithecus Ramidus Reveals the Postcrania of Our Last Common Ancestors with African Apes. Science 326(5949). American Association for the Advancement of Science: 73–106.

Macneish, June Helm
1956 Leadership among the Northeastern Athabascans. Anthropologica(2): 131–163.

Manson, Joseph H., Richard W. Wrangham, James L. Boone, et al.
1991 Intergroup Aggression in Chimpanzees and Humans [and Comments and Replies]. Current Anthropology 32(4). The University of Chicago Press: 369–390.

Marean, Curtis W.
2014 The Origins and Significance of Coastal Resource Use in Africa and Western Eurasia. Journal of Human Evolution 77. The Role of Freshwater and Marine Resources in the Evolution of the Human Diet, Brain and Behavior: 17–40.
2016 The Transition to Foraging for Dense and Predictable Resources and Its Impact on the Evolution of Modern Humans. Philosophical Transactions of the Royal Society B: Biological Sciences 371(1698). Royal Society: 20150239.

Martin, Debra L., and Ryan P. Harrod
2015 Bioarchaeological Contributions to the Study of Violence: Bioarchaeology and Violence. American Journal of Physical Anthropology 156: 116–145.

Mathew, Sarah
2017 How the Second-Order Free Rider Problem Is Solved in a Small-Scale Society. American Economic Review 107(5): 578–81.

McBryde, Isabel
1984 Exchange in South Eastern Australia: An Ethnohistorical Perspective. Aboriginal History: 132–153.

Medupe, Dithapelo, Sean Roberts, Mary K. Shenk, and L. Glowacki

in revision Why Did Foraging, Horticulture and Pastoralism Persist after the Neolithic Demographic Transition? The Oasis Theory of Agricultural Intensification. Philosophical Transactions of the Royal Society B: Biological Sciences.

Meggitt, Mervin
1977 Blood Is Their Argument: Warfare Aong the Mae Enga Tribesman of the New Guinea Highlands. Mayfield Publishing Company.

Meggitt, M.J.
1962 Desert People: A Study of the Walbiri Aborigines of Central Australia. Sydney: Angus and Robertson.

Miller, Jennifer M., and Yiming V. Wang
2021 Ostrich Eggshell Beads Reveal 50,000-Year-Old Social Network in Africa. Nature: 1–6.

Milner, George R.
2005 Nineteenth-Century Arrow Wounds and Perceptions of Prehistoric Warfare. American Antiquity 70(1). Cambridge University Press: 144–156.

Mitani, John C., David P. Watts, and Sylvia J. Amsler
2010 Lethal Intergroup Aggression Leads to Territorial Expansion in Wild Chimpanzees. Current Biology 20(12): R507–R508.

Moscovice, Liza R., Gottfried Hohmann, Benjamin C. Trumble, Barbara Fruth, and Adrian V. Jaeggi
2022 Dominance or Tolerance? Causes and Consequences of a Period of Increased Intercommunity Encounters among Bonobos (Pan Paniscus) at LuiKotale. International Journal of Primatology. https://doi.org/10.1007/s10764-022-00286-y, accessed May 4, 2022.

Muller, M. N., R. Wrangham, and D. Pilbeam, eds.
2017 Chimpanzees and Human Evolution. Cambridge: Harvard University Press.

Nettle, Daniel, Mhairi A. Gibson, David W. Lawson, and Rebecca Sear
2013 Human Behavioral Ecology: Current Research and Future Prospects. Behavioral Ecology 24(5): 1031–1040.

Oka, Rahul, and Chapurukha M. Kusimba
2008 The Archaeology of Trading Systems, Part 1: Towards a New Trade Synthesis. Journal of Archaeological Research 16(4): 339–395.

Pandit, Sagar A., Gauri R. Pradhan, Hennadii Balashov, and Carel P. Van Schaik
2016 The Conditions Favoring Between-Community Raiding in Chimpanzees, Bonobos, and Human Foragers. Human Nature (Hawthorne, N.Y.) 27(2): 141–159.

Pardoe, Colin
2014 Conflict and Territoriality in Aboriginal Australia: Evidence from Biology and Ethnography. *In* Violence and Warfare Among Hunter-Gatherers Pp. 112–132. Walnut Creek, CA: Left Coast Press.

Pilbeam, D., and D. Lieberman
2017 Reconstructing the Last Common Ancestor of Chimpanzees and Humans. *In* Chimpanzees and Human Evolution. M. N. Muller, R. Wrangham, and D. Pilbeam, eds. Cambridge: Harvard University Press.

Pinker, Steven
2012 The Better Angels of Our Nature: Why Violence Has Declined. Penguin Books.

Pisor, Anne, and Martin Surbeck
2019 The Evolution of Intergroup Tolerance in Nonhuman Primates and Humans. Evolutionary Anthropology: Issues, News, and Reviews 28(4): 210–223.

Pospisil, Leopold
1994 I Am Very Sorry I Cannot Kill You Anymore: War and Peace among the Kapauku. *In* Studying War: Anthropological Perspectives Pp. 113–126. Routledge.

Pusey, Anne E.
2022 Warlike Chimpanzees and Peacemaking Bonobos. Proceedings of the National Academy of Sciences 119(31). Proceedings of the National Academy of Sciences: e2208865119.

Radcliffe-Brown, A. R.
1922 The Andaman Islanders; a Study in Social Anthropology. Cambridge University Press.

Radcliffe-Brown, Alfred Reginald
1948 The Andaman Islanders: A Study in Social Anthropology. Https://lccn.loc.gov/22015323. Library of Congress, Glencoe, IL: The Free Press. https://ehrafworldcultures-yale-edu.ezproxy.bu.edu/document?id=az02-001.

Rival, Laura
1993 The Growth of Family Trees: Understanding Huaorani Perceptions of the Forest. Man 28(4). [Wiley, Royal Anthropological Institute of Great Britain and Ireland]: 635–652.

Roscoe, Paul
2006 Fish, Game, and the Foundations of Complexity in Forager Society: The Evidence from New Guinea. Cross-Cultural Research 40: 29–46.
2007 Intelligence, Coalitional Killing, and the Antecedents of War. American Anthropologist 109(3): 485–495.

2013 Social Signaling, Conflict Management, and the Construction of Peace. *In* War, Peace, and Human Nature: The Convergence of Evolutionary and Cultural Views. Douglas P. Fry, ed. New York: Oxford University Press.
2014 Foragers and War in Contact-Era New Guinea. *In* Violence and Warfare Among Hunter-Gatherers. Mark W. Allen and Terry L. Jones, eds. Pp. 223–240. Walnut Creek, CA: Left Coast Press.

Sapolsky, Robert M.
2017 Behave: The Biology of Humans at Our Best and Worst. Penguin.

Schebesta, Paul
1932 Among the Forest Dwarfs of Malaya. London: Hutchinson & Co.

Service, Elman
1971 Primitive Social Organization. New York: Random House.

Silberbauer, George B.
1981 Hunter and Habitat in the Central Kalahari Desert. Cambridge University Press.

Singh, Manvir
2021 Beyond the !Kung. Aeon. https://aeon.co/essays/not-all-early-human-societies-were-small-scale-egalitarian-bands, accessed February 23, 2023.

Singh, Manvir, and Luke Glowacki
2022 Human Social Organization during the Late Pleistocene: Beyond the Nomadic-Egalitarian Model. Evolution and Human Behavior 43(5): 418–431.

Smith, Eric Alden
2011 Endless Forms: Human Behavioural Diversity and Evolved Universals. Philosophical Transactions of the Royal Society B: Biological Sciences 366(1563). Royal Society: 325–332.
2013 Agency and Adaptation: New Directions in Evolutionary Anthropology. Annual Review of Anthropology 42(1): 103–120.

Solway, Jacqueline S., Richard B. Lee, Alan Barnard, et al.
1990 Foragers, Genuine or Spurious?: Situating the Kalahari San in History [and Comments and Reply]. Current Anthropology 31(2): 109–146.

Spencer, Baldwin, and F.J. Gillen
1904 The Northern Tribes of Central Australia. London: Macmillan and Co.

Sponsel, Leslie E.
1996 The Natural History of Peace: The Positive View of Human Nature and Its Potential. *In* A Natural History of Peace. Thomas Gregor, ed. Pp. 95–125. Nashville, TN: Vanderbilt University Press.

1998 Yanomami: An Arena of Conflict and Aggression in the Amazon. Aggressive Behavior 24(2): 97–122.
2010 Reflections on the Possibilities of a Nonkilling Society and a Nonkilling Anthropology. *In* Nonkilling Socieites. Joám Evans Pim, ed. Center forGlobal Nonkilling.
2017 The Anthropology of Peace and Nonviolence. Diogenes 61(3–4): 30–45.
2018 One Anthropologist's Answer to Glenn D. Paige's Question Challenging Peace Studies. Journal of Peace Education 15(3): 267–287.

Stojanowski, Christopher M., Andrew C. Seidel, Laura C. Fulginiti, Kent M. Johnson, and Jane E. Buikstra
2016 Contesting the Massacre at Nataruk. Nature 539(7630). Nature Publishing Group: E8–E10.

Sussman, Robert W., and Donna Hart
2015 Primate Models for Human Evolution. *In* Basics in Human Evolution. Michael P. Muehlenbein, ed. Pp. 73–82. Boston: Academic Press. https://www.sciencedirect.com/science/article/pii/B9780128026526000062, accessed February 27, 2023.

Tattersall, Ian
2017 Why Was Human Evolution So Rapid? *In* Human Paleontology and Prehistory: Contributions in Honor of Yoel Rak. Assaf Marom and Erella Hovers, eds. Pp. 1–9. Vertebrate Paleobiology and Paleoanthropology. Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-46646-0_1, accessed January 31, 2023.

Turnbull, Colin M.
1965 The Mbuti Pygmies: An Ethnographic Survey. Anthropological Papers of the American Museum of Natural History(Journal Article). American Museum of Natural History.

Turney-High, H.H.
1949 Primitive War: Its Practice and Concepts. Columbia: University of South Carolina Press.

de Waal, Frans B. M
2013 Forward. *In* War, Peace, and Human Nature The Convergence of Evolutionary and Cultural Views. Douglas P. Fry, ed. Oxford: Oxford University Press.

White, Tim D., C. Owen Lovejoy, Berhane Asfaw, Joshua P. Carlson, and Gen Suwa
2015 Neither Chimpanzee nor Human, Ardipithecus Reveals the Surprising Ancestry of Both. Proceedings of the National Academy of Sciences 112(16). National Acad Sciences: 4877–4884.

Whiting, Beatrice Blyth
1950 Paiute Sorcery, vol.15. New York: Viking Fund Publications in Anthropology.

Wiessner, Polly

1998 Historical Vines: Enga Networks of Exchange, Ritual, and Warfare in Papua New Guinea. Washington, D.C.: Smithsonian Institution Press.
2019 Collective Action for War and for Peace: A Case Study among the Enga of Papua New Guinea. Current Anthropology 60(2). The University of Chicago Press: 224–244.

Wilmsen, Edwin N., James R. Denbow, M. G. Bicchieri, et al.
1990 Paradigmatic History of San-Speaking Peoples and Current Attempts at Revision [and Comments and Replies]. Current Anthropology 31(5). University of Chicago Press: 489–524.

Wilson, Michael
2013 Chimpanzees, Warfare, and the Invention of Peace. *In* War, Peace, and Human Nature: The Convergence of Evolutionary and Cultural Views Pp. 361–388. Oxford University Press.

Wilson, Michael, Christophe Boesch, Barbara Fruth, et al.
2014 Lethal Aggression in Pan Is Better Explained by Adaptive Strategies than Human Impacts. Nature 513(7518). Nature Publishing Group: 414–417.

Wilson, Michael, and Luke Glowacki
2017 Violent Cousins: Chimpanzees, Humans, and the Roots of War. *In* Chimpanzees and Human Evolution. Martin Muller, Richard Wrangham, and David Pilbeam, eds. Pp. 464–508. Cambridge: Belknap Press.

Wilson, Michael, Sonya M. Kahlenberg, Michael Wells, and Richard W. Wrangham
2012 Ecological and Social Factors Affect the Occurrence and Outcomes of Intergroup Encounters in Chimpanzees. Animal Behaviour 83(1). Elsevier: 277–291.

Wilson, Michael Lawrence
2021 Insights into Human Evolution from 60 Years of Research on Chimpanzees at Gombe. Evolutionary Human Sciences 3. Cambridge University Press: e8.

Wilson, Michael, and Richard W. Wrangham
2003 Intergroup Relations in Chimpanzees. Annual Review of Anthropology 32(1). Annual Reviews 4139 El Camino Way, PO Box 10139, Palo Alto, CA 94303-0139, USA: 363–392.
2022 To End War, We Need to Understand Its Origins, Evolution and Causes. https://blog.michael-lawrence-wilson.com/blog/, accessed June 8, 2022.

Wood, Bernard
2010 Reconstructing Human Evolution: Achievements, Challenges, and Opportunities. Proceedings of the National Academy of Sciences 107(supplement_2). Proceedings of the National Academy of Sciences: 8902–8909.

Woodburn, James
1982 Egalitarian Societies. Man 17(3). JSTOR: 431–451.

Wrangham, R., and D. Pilbeam
2001 Apes as Time Machines. *In* All Apes Great and Small: Volume 1: African Apes Pp. 5–17. New York: Plenum/Kluwer.

Wrangham, Richard
1999 Evolution of Coalitionary Killing. American Journal of Physical Anthropology 110(S29). Wiley Online Library: 1–30.
2019 The Goodness Paradox: How Evolution Made Us More and Less Violent. Springer.

Wrangham, Richard, and Luke Glowacki
2012 Intergroup Aggression in Chimpanzees and War in Nomadic Hunter-Gatherers. Human Nature 23(1): 5–29.

Wrangham, Richard, and Dale Peterson
1996 Demonic Males: Apes and the Origins of Human Violence. Houghton Mifflin Harcourt.

Wrangham, Richard W., Michael L. Wilson, and Martin N. Muller
2006 Comparative Rates of Violence in Chimpanzees and Humans. Primates 47(1): 14–26.

Wright, John B.
1971 Bushman Raiders of the Drakensberg, 1840-1870: A Study of Their Conflict with Stock-Keeping Peoples in Natal. University of Natal Press.

Wright, Quincy
1942 A Study of War. Chicago: University of Chicago Press.

Wu, Xiu-Jie, Lynne A. Schepartz, Wu Liu, and Erik Trinkaus
2011 Antemortem Trauma and Survival in the Late Middle Pleistocene Human Cranium from Maba, South China. Proceedings of the National Academy of Sciences 108(49): 19558–19562.

Zihlman, Adrienne L., John E. Cronin, Douglas L. Cramer, and Vincent M. Sarich
1978 Pygmy Chimpanzee as a Possible Prototype for the Common Ancestor of Humans, Chimpanzees and Gorillas. Nature 275(5682). Nature Publishing Group: 744–746.

ENDNOTES

[1] Special thanks to Will Buckner for curating and making available many resources on this topic. See this Twitter thread for more insights into recent foragers: https://twitter.com/Evolving_Moloch/status/1083514455802109952