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The Evolution of Peace

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Abstract
While some group-living social species have affiliative and even cooperative interactions between individuals of different social groups, humans are alone in having durable, positive-sum, interdependent relationships across different unrelated social groups. Our capacity to have harmonious interdependent relationships that cross group boundaries is an important aspect of our species' success, allowing for the exchange of ideas, materials, and goods and ultimately enabling cumulative cultural evolution. Knowledge about the conditions required for peaceful intergroup relationships is critical for understanding the success of our species and building a more peaceful world. How do humans create harmonious positive sum relationships across group boundaries and when did this capacity emerge in the human lineage? Answering these questions involves considering the costs and benefits of intergroup cooperation and aggression, for oneself, one's group, and one's neighbor. Taking a game theoretical perspective provides new insights into the difficulties of removing the threat of war and reveals an ironic logic to peace—the factors that enable peace also facilitate the increased scale and destructiveness of conflict. In what follows, I explore the conditions required for peace, why they are so difficult to achieve and maintain, and when we expect peace to have emerged in the human lineage.

"There is no Enga word for peace…" (Wiessner 2019:231)

The "Tauade not only have no word for peace but display no awareness of a social order that is ruptured by violence" (Hallpike 1974:74)

1. INTRODUCTION

The debate about the origins of war and peace in the human lineage is at an impasse over whether our evolutionary history is best characterized by one of lethal intergroup aggression (war) or peace. One perspective argues that a state of lethal hostility between early human groups characterizes most our evolutionary history (Gat 2009; Keeley 1996; van der Dennen 2002; Wrangham and Glowacki 2012), while the other argues that peace extends deep into our lineage with war only recently co-evolving with increasing social complexity and agriculture (Fry 2011; Kelly 2005; Robert Kelly 2013). I propose a different approach, instead asking what are the preconditions necessary for humans to have sustained positive-sum intergroup relationships and when were they likely to have emerged? Answering these questions involve considering the costs and benefits of intergroup cooperation and aggression, for yourself, your group, and your neighbor. Taking a game theoretical perspective provides new insights into the difficulties of removing the threat of war, but also reveals an ironic logic to peace—the factors that enable peace also facilitate the increased scale and destructiveness of conflict.

Humans are unusual for the range of our intergroup relationships which can include affiliation and altruism towards strangers as well as destructive large-scale wars. While other social species such as dolphins may have affiliative relationships that cross group boundaries, sustained positive-sum

interdependent relationships that cross pronounced group boundaries are exceedingly rare among non-human mammals (Danaher-Garcia et al. 2022; Elliser, Volker, and Herzing 2022), likely appearing only in a few eusocial insect species (Rodrigues, Barker, and Robinson 2022). Our cousins the bonobos often have affiliative interactions with other bonobo groups that include grooming, sex, and sometimes food sharing (Lucchesi et al. 2020). Less well known is that violent aggression is also common when two bonobo groups meet. Of 92 intergroup encounters in the Kokolopori Bonobo Reserve, 34% of them included aggression with 15% of encounters resulting in physical injuries to at least one bonobo (Cheng et al. 2022). At the LuiKotale site, intergroup encounters between bonobo groups "were more aggressive than tolerant" with 47% of the intergroup encounters having "large-scale coalitionary aggressive events" often resulting in injuries (Moscovice et al. 2022). Among non-human social animals that engage in lethal intergroup conflict, including banded mongoose, wolves, chimpanzees, and meerkats, there is little evidence that any of these species exhibit behaviors approaching the positive-sum, tolerant intergroup interactions that humans frequently have.

The scale and scope of our conflicts are shaped by the social groups they involve, but humans are also members of multiple social groups simultaneously. For example, I can be a member of many groups that have overlapping non-exclusive boundaries including membership in my immediate family, larger kin group including affines, neighborhood, university community, city, religious organization, social club, political party, and nation all simultaneously. Conflict can occur either within any of these groups, such as when members of a family feud, or between groups, such as when one religious sect persecutes another. Tribal warfare often occurs between clans who recognize themselves as being members of a supraordinate group (e.g., warfare among the Nuer) but it also occurs between groups who have little or no overlapping group memberships such as between members of different ethnolinguistic groups (e.g., Nuer versus Dinka warfare). For these reasons, I avoid the distinction sometimes made between internal and external warfare because it does not capture the difficulty of achieving peace or the intensity of warfare. Instead, I focus on violence and peacemaking between social groups—whether those are bands, residential communities, clans, or tribes.

Our capacity to interact with members of other social groups peacefully is an important factor in our species' success (Fuentes 2004), facilitating the spread of ideas, materials, and goods across group boundaries, contributing to cumulative cultural evolution (Flannery 1972; Sterelny 2021). Intergroup exchange allows us to build the cultural technologies to adapt to a seemingly endless variety of ecological and social environments (Boyette et al. 2022) Periods of peace may also fuel increased social complexity due to expansion of exchange between groups that would otherwise be in conflict (Wiessner 2019; Wiessner 1998). The challenge of understanding how we build peaceful intergroup relationships is formidable because peace requires coordinating the interests of every individual to favor non-aggression, while intergroup aggression can be unilaterally initiated but subsequently involve the entire group.

I argue that peace is the product of cultural technologies that depend on factors that are likely to have only recently emerged in our species' history, including social institutions and cultural mechanisms for preventing and resolving conflicts. I focus on decentralized or small-scale subsistence societies, such as hunter-gatherers and horticulturalists, because they are the most relevant to thinking about the origin of peace in human evolution. This is because for much of our history we lived in small unstructured groups lacking centralization and significant social institutions. However, observations from decentralized and small-scale societies may be generalizable to aspects of intergroup conflict in hierarchical, centralized societies, including states (cf. Blattman 2022), or aspects of gang or ethnic violence (Horowitz 2001; Mays 1997). While there is strong evidence that humans evolved to be tolerant of out-group members and form affiliative relationships with non-kin, my argument will show we did not evolve an innate capacity for peace. Rather, our capacity for flexible relationships, cultural incentive systems, and strategic

modification of behavior allowed us to develop the cultural technology for durable peace (cf. Kim and Kissel 2018, who call it "peacefare"). Ironically the cultural tools that allow us to develop peaceful relationships are the very same ones that allow us to sometimes engage in total war. Thus, as Mead (1940) famously said of warfare, peace, too, is an invention.

2. WARLESSNESS, PEACE, AND COOPERATION

Previous research on peace has often categorized groups as either "warlike", "warless", or "peaceful" and argued that "peaceful societies should lack whatever instigates war" (Kelly 2000:11). One limitation with this approach is that the absence of war does not necessarily constitute peace and the lack of war tells us little about the nature of interactions between groups and the factors underlying those relationships (van der Dennen 2014). The two main explanations for warlessness among small-scale non-state societies in the ethnographic record are isolation and subordination, neither of which is synonymous with peace.

First, groups without war may be geographically and socially isolated. Geographic isolation, often combined with small population size was the most important predictor of low rates of intergroup violence in precontact Polynesian societies where the most "peaceful societies were located more than 100 kilometers from their nearest neighbor" and had under 1000 individuals (Younger 2008:927). The Copper Inuit are often used as an example of a peaceful society but also had "500 miles of barren coastline [that] separated the Copper [Inuit] from their nearest neighbors…." (Jenness 1921:549). Inuit groups that did live near other groups often had lethal intergroup violence with high casualty rates (Burch 2005).

Second, warlessness often results from the threat of violence from stronger groups, resulting in avoidance or subservient cultural roles. The Semai in Malaysia are regularly used as an exemplar of peaceful hunter-gatherers because they have low or non-existent levels of violence towards non-Semai: "Their worldview, and humanity's place in it, does not include any violence" (Semai | Peaceful Societies 2022). However, their peacefulness appears to be strongly influenced by the military superiority of the surrounding agricultural groups. The Semai "openly and often express fear that outsiders will attack them. They… teach their children to fear and shun strangers, especially non-Semai" (Dentan 1978:97). One Semai man remarked that "If we had weapons, we'd drive the Malays off our land (aims an imaginary rifle, squinting and grinning)" (Dentan 2004:169). The "Semai have learned that… counterviolence is useless; one just gets hurt again, they say. That does not mean that people… never fantasize about fighting against Malay. In fact, in the past when conditions were favorable, they have actually mounted violent resistance… Most of the time, though, they just do not think physical violence will work. Why get hurt for nothing?" (Dentan 2004:173).

So common is the pattern of stronger groups completely dominating weaker groups that Helbling (2006) argues most cases of tribal warlessness are best categorized as "enclaves", in which militarily subordinate groups retreat to inaccessible forest and mountain areas. Service (1971:35) remarks that "Nowadays [hunting-gathering bands] are enclaved among more powerful neighbors, most are even subject to police regulation, and they cannot but lose or be heavily punished for any breach of the peace. *They are better called "The Helpless People" or "The Defeated People*'." Many of the groups that are typically used as exemplars of peaceful societies such as the Semai, Hadza, Mbuti, !Kung, and Amish are enclaved and surrounded by more powerful neighbors. While these societies do lack war, they tell us little about the development of positive intergroup interactions—warlessness enforced through a state of avoidance, fear and submission seems a poor proxy for peace. If a group seldom interacts with other groups (as is the case of the Copper Inuit), or lives hundreds of miles from their nearest neighbors (as do the less violent Polynesian groups in the South Pacific), or is surrounded by stronger neighbors who would overwhelm them in violent conflict (as are the Semai), then understanding the lack of violent intergroup conflict is not a significant puzzle.

Rather than classifying societies as "peaceful" or "warlike" and then treating "peaceful societies" as equivalent, a more fruitful approach is to examine relationships between groups, focusing on the factors that shape harmonious positive sum relationships (Baszarkiewicz and Fry 2008; Kissel and Kim 2019). The definition of peace I use is modeled on Anderson (2004) and Helbling's (2006) positive and negative conceptions of peace and tries to capture a general state of interactions between groups, rather than focusing on isolated interactions, which may be harmonious. *Peace is a condition where ongoing interactions between different social groups are marked by the absence of or infrequent occurrences of aggression and violence, alongside the expectation and presence of generally harmonious relationships not enforced with the threat of violence.* Accordingly, peace is a *state* of interactions between members of different groups (whether family, kin group, clan, band, tribe, etc.), characterized by harmonious relationships and interactions where conflicts are generally resolved and are expected to be resolved without violence. A society may have peace with one group while having violent interactions with another group. This definition does not require the complete absence of aggression or violence in intergroup interactions, only that violence is rare, unexpected, and quickly resolved. Because our focus is on ongoing relationships between groups, this definition excludes isolated interactions such as shipwrecked sailors washing up in a group's territory or the Christmas Treaty during the First World War. While these interactions are peaceful, they do not qualify as peace between groups.

Cooperative Relationships Do Not Imply an Absence of War

Intergroup cooperation is likely a universal across human societies, including among societies with high rates of war and violence. While cooperation, including trade, may promote peace, the presence of cooperation alone is not evidence that war between groups is absent. This is an especially important point when examining the archaeological evidence of intergroup relationships. Cooperation including trade or even altruistic giving, can occur in the context of broader intergroup hostilities or large power asymmetries, such as those in patron-client relationships where the weaker parties act in a context of intimidation (as the Semai appear to be). In cases of active hostilities between two populations, individual parties often continue to cooperate across group boundaries, exchanging information, materials, or goods. For example, among the Kara of southwest Ethiopia "group relations [war]… are often at odds with relations between individuals, who cultivate friendships across group boundaries irrespective of the larger polities" (Girke 2008:193). A similar pattern is found in state warfare. While Russia and Ukraine are presently at war, regular cooperation occurs between Russians and Ukrainians, including trade, negotiations, and even romantic relationships. Thus, archaeological and ethnographic evidence of cooperation alone is not satisfactory for demonstrating the absence of war, even though intergroup cooperation can enable peace, and peace expands the potential for cooperation (Keohane 2005).

3. PEACE AS A SOLUTION TO A COOPERATIVE DILEMMA

The Structure of Decentralized War

Understanding how peace is achieved in small-scale decentralized societies requires first understanding how and why individuals participate in war in these same types of groups. Small-scale decentralized societies have a fundamentally different pattern of conflict than state societies with militaries (Wright 1942). Counter-intuitively, the individual costs of participation in war appear to be relatively low and the potential marginal benefits significant. Small-scale warfare is acephalous and decentralized, occurring in the absence of formal leadership or chains of command, mechanisms to compel participation, and mechanisms to restrain conflict. Membership is typically ad hoc, composed of available people who want to participate, and leadership is informal, situational, and non-coercive. Unlike militaries which can involve years of compelled participation, small-scale warfare lasts for the duration of the event—hours to days—after which the participant returns to their ordinary life. Raiding parties often form without

consent or even the knowledge of the larger social group, coordinated by one or two people who convince others to join them.[1] Unlike warfare in state societies, war in small-scale societies does "not seem to be carried out with any global strategy in mind, particularly from the territorial point of view" (Tornay 1979:114). Unlike war organized through centralized institutions, the costs and benefits of war in small-scale societies are most appropriately assessed at the individual level, rather than the group level because war in these societies in not typically waged to fulfill the strategic aims of the group, but instead to satisfy the goals of the participants.

The most common pattern of war is a raid, primarily composed of young men. Raids are usually undertaken to fulfill the proximate goals of the raiders themselves which may include revenge, capturing loot, or gaining status. Raiding parties use strategic timing and ambush to attack one or two victims at very low risk to themselves, usually while the victims work in their gardens, collect water, or exit their village in the early mornings (Gat 1999). The victims may be members of another ethnolinguistic community or members of the same ethnolinguistic community, but of a different lineage or clan (as in feuding). Because the primary tactic in small-scale war is surprise, raiders can choose to attack when the odds heavily favor their success. As a result, attackers on raiding parties face an extremely low risk of being killed or injured during an attack, often approaching zero (Beckerman et al. 2009; Chagnon 1988; Mathew and Boyd 2011; Glowacki et al. 2016; Wrangham and Glowacki 2012). A similar pattern is found in chimpanzees, who also form raiding parties that attack members of other groups when they have a significant imbalance of power (approximately 7 attackers to 1 victim) and show little evidence of chimpanzee attackers being seriously injured or killed (Wilson and Wrangham 2003; Wilson et al. 2014). When there are causalities among human attackers, it is usually because they are detected and ambushed while traveling to the site of their intended raid but such accounts are rare (Wrangham and Glowacki 2012).

Despite the low risk to attackers, members of raiding parties still must overcome fear and confrontational tension (Collins 2009; Roscoe 2007). "This fear is curious because there is no memory of any Wao raider being killed, or even seriously injured, by the Waorani he attacked" (Beckerman et al. 2009:SI: 1). In fact, raiders may often turn back due to fear (Chagnon 1988; Mathew and Boyd 2011). While the risks to attackers on raids are low, the overall mortality rates from intergroup violence can be high, though the severity is primarily driven by victims of raiding parties rather attackers.

Thus far we have described the most common pattern of small-scale warfare that has close parallels in intergroup conflict in chimpanzees (Wilson and Wrangham 2003; Wilson and Glowacki 2017). As societies increase in sociopolitical complexity, they often adopt more structured or complex forms of intergroup violence, such as battles or ritualized conflict (Dye 2009; Dye 2013; Glowacki, Wilson, and Wrangham 2020), which can result in a much higher mortality rate to attackers and increase the chances of the defenders being successful (Dreu and Gross 2019). High risk battles, ritualized conflict, and lethal treachery all present a different set of strategic dynamics that may better approximate the conditions under which states wage war. However, because these types of more complex violence occur in only a small-number of decentralized societies and do not reflect the fundamental pattern of conflict for small-scale societies my analysis excludes them (Buckner and Glowacki 2019).

[1] During my fieldwork, I learned of several nascent raiding parties that did not gain a sufficient number of participants to mobilize and were then abandoned. Raiders typically took great care to keep non-raiders from learning of their plans, lest they be told not to go, chastised, or sanctioned for initiating a raid. At the same time, they often tried to limit the number of people who joined to improve their stealth and increase their share of any potential spoils.

The Individual Benefits to Attackers

Attackers in small-scale warfare often benefit personally from their participation through private incentives. Status is almost universally accorded to warriors, providing an important arena for men in the same society to compete with each other for status (Gat 2009; Glowacki and Wrangham 2013; Wright 1942). Across societies, even among hunter-gatherers, warriors frequently take material plunder, including captives or goods (though mobile foragers appear to do so to a much lesser extent than other types of social organization) (Cameron 2011; Gat 1999; Gat 2000). Captives can be used as reproductive partners, for labor as slaves, or to expand one's kin networks through adoption. In the few cases where they have been quantified, the individual benefits of warfare appear to improve the reproductive opportunities of warriors (Chagnon 1988; Dunbar 1991; Fleisher and Holloway 2004; Glowacki and Wrangham 2015; Hames 2020; Macfarlan et al. 2014; Macfarlan et al. 2018; Rusch, Leunissen, and van Vugt 2015). The specific mechanisms are likely to vary between societies ranging from access to bridewealth, opportunities to make alliances with people who may provide reproductive partners, increased desirability as a potential partner, or other cultural mechanisms (though see Beckerman (2009) for a potential counter-example).

Even in instances where intergroup violence is not socially endorsed, attackers often still receive the social benefits of being a warrior from their peers. The ethnography of small-scale societies is replete with examples in which intergroup violence is subject to general reprobation or even punished, but a smaller subset of society may laud warfare, providing the attackers with status among their peers. In the absence of material or social incentives, war can provide endogenous motivations through "offer[ing] excitement not found in the village" (Westermark 1984:116). "Old informants speak about the pleasurable excitement in preparing for and setting out on a… raid…. Headhunting forays of the enemy might even have been welcomed as a break to long, tedious hours of work…" (Dozier 1967:78). "There was also the craving for the sheer adventure of raiding created by the accounts of older men and whipped up by initiations, dancing and feasting, etc… There is real pleasure in handling and using weapons and in the actual fray, quite apart from anything else" (Gulliver 1951:149). Thus, even if society at large does not accord warriors with prestige, and war is unlikely to result in captured loot, warriors may still be endogenously motivated to participate in raids or be accorded esteem by their peers.

The Collective Costs and Benefits of War

"War is bad and nobody likes it. Sweet potatoes disappear, pigs disappear, fields deteriorate and many relatives and friends get killed" (Pospisil 1963:89)

Despite the common assumption that warfare in human groups is often driven by competition for natural resources, there is mixed evidence of a relationship between competition for resources and the intensity, frequency, or scale of war in small-scale societies (Adano et al. 2012; Scheffran et al. 2012). Many ethnographers argue that there is no relationship, as warfare commonly occurs in regions with abundant resources including territory. In many cases, successful groups may not acquire or take over the territory of the defeated groups. In the Alaskan arctic, for example, "there is no clear evidence of warfare for food or territory" (Maschner and Reedy-Maschner 1998:40), while among the Kofyar "none of the adversaries gained any territory by occupying farmlands or house sites" (Netting 1973:172). Moreover, any territory acquired through war would be a collective benefit available to both warriors and non-warriors, exacerbating the collective action problem of intergroup violence.

While individual warriors may benefit from participating in war, there are two major collective costs from warfare borne by all members of the attackers' group: the risk of being killed or injured in an act of revenge and the reduction of available resources though reduced opportunities for intergroup contact and

the creation of unused buffer zones. The desire for revenge is a major proximate cause of war in small-scale societies and often results in the deaths of more people than the initial offense (Boehm 2012a; Walker and Bailey 2013). After an attack, the most likely response from the attacked group is to launch an attack of their own against the offender's group, thus leading to tit-for-tat raiding. Because the specific identity of attackers is usually unknown, any member of the offender's groups will suffice as a target. As a result, *the original attackers are usually at no or little more at risk of being a victim of revenge than any other group member*. The risk of retaliation then falls on *all* group members, regardless of their participation in the initial intergroup conflict[2].

In addition to the risk of being killed in revenge, wars impose collective costs by reducing opportunities for trade, the exchange of information, and access to potential reproductive partners both within and between groups. While cooperation frequently continues across group boundaries during intergroup conflict, it is often reduced or severely curtailed as people avoid interacting with members of groups that are hostile to them. War also has the often-devastating effect of producing large unused border or buffer areas that people avoid. Among the Turkana in northern Kenya, for example, "40% of the area is estimated to be uninhabited because of conflict with other groups" (Glowacki and Gonc 2013:27), while the Zande had "miles of uninhabited bush" (Evans-Pritchard 1957:240) and the Mursi have a "no-man's land 40-50 kilometers deep" between them and their enemies (Turton 1979:194). People may also flee areas at high risk of conflict areas even if those regions are resource abundant, losing access to valuable resources[3]. For subsistence populations, these large unused border zones can mean the devastating loss of access to productive game land, grazing areas, and water sources.

The Cooperative Dilemma of War and Peace

I have shown that participation in small-scale war is low risk to attackers because of the strategic use of ambush. At the same time, attackers are likely to receive important material and social benefits, especially status. Thus, attackers may reasonably anticipate benefiting from their participation in intergroup conflict at low cost to themselves. But an act of war is also likely to trigger revenge leading to retaliatory attack and tit-for-tat raiding. The costs of war, however, are primarily borne by all members of the attacker's group, including the risk of retaliation, the creation of unused buffer zones, and the loss of opportunities that come from intergroup contact. As a result, a dynamic exists in which it may be individually beneficial to initiate intergroup aggression because of the private benefits, but simultaneously beneficial for other members of the group to have peace.

The insight that war may be hard to avoid even when peace is the most beneficial strategy for a group as a whole has been long recognized (Schelling 1980). In fact, efforts to make one's own group more secure may ultimately increase the likelihood of conflict. This is because other groups are likely to respond in kind, particularly when they have incomplete information (known as the Security Dilemma) (Blattman 2022; Levy 1998). The dynamic between war and peace is commonly modeled as a prisoner's dilemma where any individual member may be better off defecting (initiating aggression against outgroups), but the entire group would be better off with peace (cooperating) (Coombs and Avrunin 1988; Cohen and Insko 2008; Snyder 1971; Rusch 2013; van der Dennen 2014). Depending on the dynamics of the

[2] During my dissertation fieldwork, when enemy raiders were detected (through footprints, observation at a distance, or after a raid) there was often extensive speculation about who the raiders may have been and where they were from. Although people could reasonably infer the larger group identity of attackers (such as Turkana or Suri), it was impossible to identify the specific attackers.

[3] Shortly before crops of sorghum were ready for harvesting, the threat of a large raid by the Turkana became so great that a nearby settlement made the decision to abandon the area leaving their crops to spoil, while my group of settlements decided to remain. Our neighbors almost certainly met with severe hunger later in the year.

conflict, other cooperative dilemmas may better match the specific context, including games of Chicken or the Stag hunt, or Attacker-Defender games (Dreu et al. 2016; Dreu and Gross 2019; Rusch 2022; Schelling 1980). Regardless of which cooperative dilemma is the best match for the specific group dynamics, the difficulty of limiting the payoffs of aggression by individuals is one of the most formidable barriers to the emergence of peace in small-scale societies (see Table 1).

Table 1: Ethnographic examples of the difficulty of controlling aggression by individuals

Blackfeet: "Sometimes they managed to negotiate a peace with… an enemy tribe. But their peace usually proved to be only a short breather between hostilities. Their efforts were nullified by their own ambitious young men who needed enemy horses and war honors to gain economic and social status." (Ewers 1958:142)
Tauade: "One of the principal factors in the generation of warfare has been the inability of the tribes effectively to control the aggression of their individual members." (Hallpike 1977:211)
Sioux and Chippewa: "Truces were frequently made…. but invariably some reckless brave… would strike the blow which renewed the slaughter." (Radiograms of Minnesota History: Sioux versus Chippewa 1924:42)
Waorani: "We tried to stop killing….then someone would kill and we would return to killing back and forth." (Boster, Yost, and Peeke 2004:481)
Eastern North America: "They could not fully control the desires of their young men to seek glory—and perhaps continued revenge… Thus in their creation of a peace they also had to seek ways to make such adventuring… less likely." (Lee 2007:735–736)
Bokodini: "Big men could not stop men who wanted to stage a raid, nor could they order men on the field of battle to stop fighting." (Ploeg 1979:170)
Cherokee: "It was only after war leaders were brought into the tribal councils that the power and authority existed for preventing individual warriors from raiding war parties and going on raids." (Otterbein 1989:29)
Santee Dakota: "The likelihood of war was at every turn of life. So was the liking of it, and village chiefs and elders were supposed to dissuade young men who desired it merely as sport… The young men seeking… personal glory only, sometimes violated peace ceremonies. There was no way of checking them." (Landes 1959:45–48)
Northeastern Algonkian: "Such raids were, in most instances, without the sanction of the entire tribe and were engaged in by the younger, irresponsible men or youths who wished personal glory." (Hadlock 1947:214)
Mohave: "the people as a whole were pacifically inclined… While war was disliked by a majority of the Mohave, battle was the dominant concern of the *kwanamis* ('brave men') who were responsible for the recurrent hostilities and over whom there was no effective control" (Stewart 1947:257)

Preventing conflict is difficult because a single act of aggression by one group member can be enough to trigger conflict (Figure 1), as other members of the attacked group seek revenge. Thus peace, whether between small-scale societies or between states requires coordinating the interests of all group members for non-aggression making sustained peaceful relationships difficult to achieve, especially once a conflict has started. "A fundamental reason for the perpetuation of cycles of raiding… was that a unilateral decision to cease fighting was impractical… so long as neighboring villages continued to be willing to fight" (Ploeg 1979:143). It also means that even one individual acting unilaterally can determine the nature of intergroup relationships. As Clastres (2010:193) notes, "The power to decide on… war and peace… no longer belong[s] to society as such, but… to the … warriors, which would place its private interests before the collective interest of society… *The warrior would involve society in a cycle of wars it wanted nothing to do with*."

The payoffs from aggression are not symmetric across a population because individuals vary in how much they are likely to benefit from their participation. Young men, in particular, are especially prone to acts of aggression in both small-scale and state societies exacerbating the conditions for war (Ganie 2020; Yair and Miodownik 2016). Young men generally face high levels of reproductive competition and are often more motivated to engage in status-seeking behaviors, such as intergroup aggression, while older men with their own families are more likely to desire peace (Wilson and Daly 1985; Wilson and Daly 1993). While women in small-scale societies rarely participate in violence themselves, they often have an important role in encouraging men towards violence through teasing or ridiculing men who abstain from violence.

Thus, achieving peace requires solving an iterated cooperative problem like the prisoner's dilemma that each member of a group plays repeatedly in encounters with any member of another group. This dynamic is further exacerbated by the fact that war does not necessarily have to originate with unprovoked aggression but can instead arise from routine conflicts between individuals. Conflicts are an inevitable feature of social life no matter how pacific the cultural values. Any conflict has the potential to escalate, resulting in violence and triggering retaliation. Furthermore, peaceful exchanges or interactions may inadvertently result in the injury or death of a group member; an accidental death or injury may be interpreted as an act of aggression leading to retaliation and initiating a cycle of tit-for-tat war. Therefore, the conditions that give rise to peace must not only coordinate the interests of individuals towards cooperation but must also be tolerant and resilient against instances of real or perceived defection.

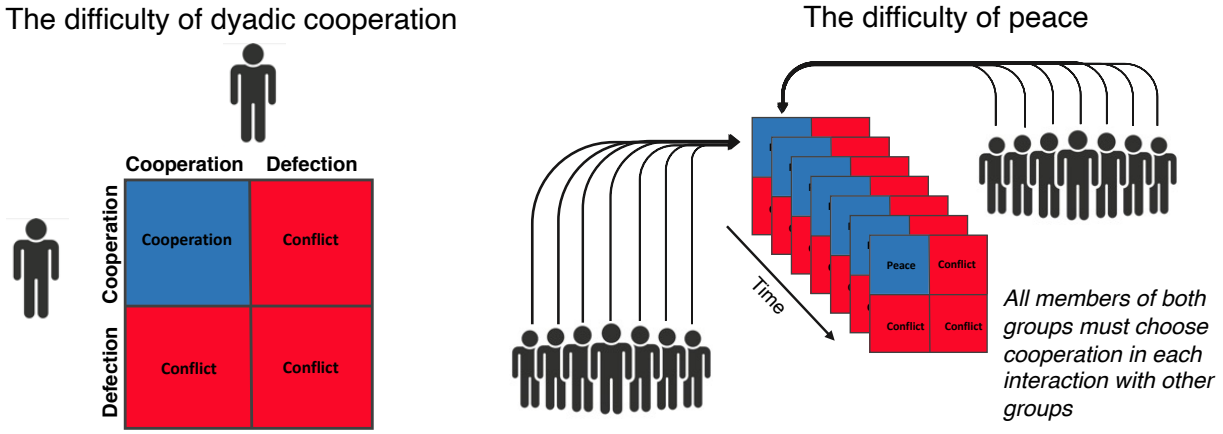

Figure 1. Peace as a Prisoner's Dilemma. *Intergroup conflict can be studied as an iterated Prisoner's Dilemma. The key challenge to peace is developing payoff systems that favor cooperation by member of both groups that are resilient against real or perceived defection.*

Relevance to Centralized (State) Warfare

My analysis focuses on intergroup violence in small-scale decentralized societies because these kinds of society best resemble our understanding of ancestral human groups. This analysis is both relevant to and diverges from warfare in centralized societies such as states. In centralized societies such as states, or chiefdoms such as many Plains Indians, intergroup violence typically is directed through an organizational structure such as executives, officers, or militaries. This organizational structure solves the coordination problems inherent in warfare by incentivizing and organizing combatants, preventing defection from cowardice and desertion (often through extreme sanctions), and mitigating the risk of unprovoked aggression by group members. The organizational structure can also incorporate a global view of the

group and use violence to achieve the goals of the group. Because of the centralization through which war is waged by states to advance the strategic aims of the group the appropriate level of analysis is the group itself, not the individuals who compose the group (Schelling 1980). Thus, Blattman (2022:17) writes about war in state societies, "Wars are long struggles… Different from brief skirmishes where reactions like these [reactive aggression, revenge, etc.] recede. Big groups are *deliberative and strategic*".

This quotation highlights the fundamental difference between small-scale decentralized war and centralized war that underlies the game theoretical logic of war and peace: whether the most appropriate level of analysis is the individual (small-scale societies) or the group (states). Small-scale war typically occurs through a series of tit-for-tat raids that lack any overall strategic objectives. Instead of these raids being directed towards deliberatively advancing the strategic objectives of the group, they are initiated to satisfy the often-short-term aims of the individual attackers, especially revenge and status. Although I focus on small-scale societies, similar dynamics are often found in urban violence (Buford 2001; Mays 1997; Shakur 2007). Thus, the most appropriate level of analysis for the conditions of war and peace in decentralized small-scale societies is the individual. It is the individual, not an organization that decides to initiate war. In contrast, among centralized societies, because war is initiated and orchestrated by a centralized organization or institution (military or government) to advance the strategic aims of the group, the appropriate level of analysis is the group (Schelling 1980).

Despite the differences in state and decentralized war, there are important similarities in the logic of war and peace. For both decentralized and centralized societies, peace is often more beneficial than war for both the group as a whole and the individuals within the group (Blattman 2022; Schelling 1980). Because of this, groups and individuals within group often seek to maintain peace and prevent conflict. Many of the primary drivers of war are the same between decentralized and centralized societies (Blattman 2022; Schelling 1980): individual actors who are able to initiate conflict without feedback from the group, such as group of young men who decide attack their neighbors in the case of a small-scale society or an authoritarian leader in control of the military (Kleinfeld 2019); incentives for war that can't be shared with the other group or are intangible, such as revenge or status (Levy 1998); and finally commitment problems. Groups cannot necessarily trust that their adversaries will honor their commitments towards peace, and to assume that the other side has cooperative non-aggressive intentions may leave them open for attack (Powell 2006; Walter 2009).

4. PREREQUISITIES FOR PEACE

Given the difficulties in creating and maintaining peaceful relationships, I now consider the conditions that enable it. I will argue that intergroup peace in humans required evolving the psychological capacity to tolerate strangers and developing the social mechanisms through which interactions between members of separate groups do not have to be negotiated uniquely but are instead governed by norms that stipulate non-aggression. At the same time, when conflicts do emerge, societies require mechanisms to resolve them and signal future cooperative intent. These systems need to have both enough resilience to withstand inevitable conflicts, and the ability to keep dyadic conflicts from spreading beyond the original parties and becoming coalitionary.

Capacity for Tolerant Interactions

Peace requires the psychological capacity for tolerant, non-aggressive interactions that cross group boundaries. While humans clearly have this capacity, many social species lack this ability. Chimpanzees, for example, rarely have tolerant inter-community interactions; instead they usually avoid each other and when an imbalance of power exists, the larger group often aggresses the smaller group (Wilson and Wrangham 2003). While bonobos do have intergroup aggression, they also have tolerant and cooperative intergroup relationships that can involve copulation and occasional food sharing. The fact that bonobos

have intergroup tolerance suggests that the capacity for tolerance between groups may have developed early in the hominid lineage or even predate it. Once a capacity for tolerance was in place, social conditions such as the expansion of kinship networks (Chapais 2009) or sanctions against overly aggressive individuals (Boehm 2012b; Wrangham 2019) may have further increased our ability to tolerate strangers, which would have simultaneously increased the potential for intergroup cooperation. Regardless of when a human capacity of tolerance emerged, intergroup cooperation requires the ability to tolerate strange individuals, something our chimpanzee cousins are incapable of. Thus, identifying when and how this ability arose will provide insight into the first crucial step necessary for peaceful intergroup relationships.

Payoff Structure Favors Cooperation

"War was not perpetual… Truces for hunting seasons were often made in the hunting areas between the combatants." (Hickerson 1962).

Peace requires the psychological ability to tolerate strangers but tolerance itself is not sufficient for peace. Peace also requires the *motivation to interact* with members of other groups (unlike chimpanzees who generally avoid other groups). Positive intergroup interactions will be favored when individuals of both parties can benefit from their interactions, such as by accessing resources that would otherwise be unavailable or that conflict would prohibit them from accessing (Pisor and Gurven 2016; 2018). In non-human social animals, the potential benefits from intergroup interactions include opportunities to interact with potential reproductive partners, infer information about groups for future transfers, or learn about the relative size and strength of neighboring groups (Pisor and Surbeck 2019). These potential benefits would apply to early humans. However, as early humans developed a more complex and specialized subsistence niche, especially one that depends on complementarity and cultural technologies, the potential benefits would have expanded leading to increased incentives for intergroup cooperation.

The creation of interdependencies would have greatly amplified the potential payoffs for intercommunity cooperation. A common form of interdependency among subsistence societies is one in which groups that depend on unpredictable and variable resources allow others to access resources in their territory in time of need, such as water, game lands, or grazing (Cronk and Aktipis 2021; Glowacki 2020; R. L. Kelly 2013; Pisor and Jones 2021). A potentially more important form of interdependence would have developed when groups began to rely on non-local resources or goods that other groups had access to and that could be procured through trade or social relationships (Schulz 2022). In small-scale societies, these include material goods, such as tools, stones for toolmaking, and ochre, as well as cultural knowledge including religious, ceremonial, or ritual information (Bird et al. 2019).

The opportunity to access valuable and hard-to-obtain resources fuels the development of trade networks and friendships that cross group boundaries (Goldschmidt 1951; Malinowski 1920; Schulz 2022). If intergroup conflict disrupts access to these benefits, group members have a strong incentive to avoid conflict, even young men who are often more inclined for war. This occurred in the Solomon Islands, for example, where "it must have required extraordinary self-control… for these head-hunters to withstand the tantalizing temptation of having a go at each other. The remarkable thing is that peace of any duration obtained. What probably occurred was that each side badly wanted what the other had to offer; these considerations overrode appetites for bloodletting for more or less extensive periods of truce." (Oliver 1955:296).

Specialization can fuel peace

Increasing material complexity often expands the opportunities for interdependence between groups (Ringen, Martin, and Jaeggi 2021; Spielmann 1986). For example, groups that can easily meet all their subsistence and material needs without relying on external relationships have fewer reasons to seek out and develop interdependent relationships (Martin, Mayer, and Thoenig 2008). Groups that rely on or value a greater range of material goods or symbolic categories, such as ritual or religious knowledge, experience potentially increased payoffs from intergroup cooperation. As groups can increasingly provide each other with valuable goods, information, or support, there will be more attempts at preventing conflict and restoring relationships afterwards (Garfield, von Rueden, and Hagen 2019). Highly interdependent regions often developed ritualized trade and exchange systems to maintain peaceful relationships, such as the White Deerskin Dance (Goldschmidt and Driver 1940), the Potlatch (Goldschmidt 1994), and Kula Ring cycle (Malinowski 1920).

Thus, peace requires more than tolerance; it requires that individuals have the motivation to interact with outgroups under uncertainty. The possibility of benefiting through obtaining resources is a key pathway to creating positive payoffs from intergroup interactions.

Norms Promote Intergroup Interactions

The capacity for tolerance and the possibility of benefiting from interactions with outgroups creates the conditions for intergroup cooperation of the type seen in bonobos, but these alone are insufficient for peace. When severe or lethal violence is a possibility, as in chimpanzees and many human groups, individuals are more likely to avoid interactions or even engage in preemptive aggression. Thus, peace also requires the ability to have reasonable expectations about whether interactions with outgroups are likely to be neutral, aggressive, or positive (avoiding neutral and aggressive interactions and seeking out positive interactions). This depends on our ability to predict both the behavior of our own group members and that of the other group. But how do we do reasonably anticipate the behavior of our group members and members of other groups? We do so by adhering to and enforcing norms regulating the behavior of our group members with the knowledge that the other group is likely doing the same.

Norms Reduce Uncertainty in Intergroup Relationships

The vast scale at which humans cooperate with both ingroups and outgroups is fundamentally different than any other vertebrate species. This ability is enabled by uniquely human capacity for norm compliance and enforcement (Chudek and Henrich 2011). Norms are prescriptive rules or expectations about behavior that are *known* by members of a community and *enforced* by the community (Knight 1992). Accordingly, with norms in place, community members are expected to act in socially prescribed ways, they and other community members are aware of these prescriptions for behavior, and deviations from them these prescriptions enforced, often through external mechanisms that include some form of sanctions.

Norms mitigate the threat that potential aggression imposes on intergroup relationships because they can simultaneously stipulate both how oneself and one's group members should treat members of other groups (such as with aggression or non-aggression) and how members of another group should treat oneself and one's own group members. Once norms governing intergroup behavior develop, they reduce the likelihood of unanticipated aggression for two reasons: 1) Norms allow individuals to calculate the likely payoffs of intergroup interactions based on the behavior of their group members and the behavior of the outgroup (whether members of either group are likely to use aggression). Being able to assess how an intergroup interaction is likely to unfold promotes the interaction of strangers by removing uncertainty about the outcome of the interaction (whether it is likely to result in violence). 2) A critical threat to positive intergroup relationships occurs when one individual behaves in a manner that can be interpreted

as being threatening or hostile. Norms buffer against the overinterpretation of the behavior of any one individual who may do something conflictual and provide a chance for the offending group to restore the relationship by enforcing the norm with sanctions. Thus, in interactions between members of two groups, if one individual does something aberrant, a reasonable inference is that the individual is not adhering to the norms governing intergroup interactions, rather than assuming that their behavior represents a new norm. Thus, norms facilitate intergroup interactions by increasing resilience if an actor deviates from the norm.

Consider two groups of strangers who meet for the first time with no prior knowledge of each other. Individuals have few, if any, expectations about how they will be treated by members of the other group (e.g., whether they will be treated as a friend, ally, enemy, or potential threat). They also lack expectations about how they should treat the members of the other group (e.g., with wariness, warmness, or hostility). In such cases, each interaction is negotiated spontaneously and tentatively, as in primates, as each individual seeks to determine the likely behavior of out-group members and then adjusts their own behavior based on the signals and cues they detect from others in their group and the outgroup. Interactions may be cooperative, or they may be conflictual; some individuals may be aggressive and others pacific; and the state of interactions may quickly change. A small conflict can easily lead to a breakdown of the relationship. Norms solve the problem of uncertainty in interactions by providing guidelines about how oneself and one's group should treat members of the other group but require confidence that the other group holds similar norms.

An overlooked but critical aspect of norms is that they require seeing members of a group as just that, members of a group and not merely a collection of individuals (Moffett 2013; Smaldino 2019). Because norms require knowing how members of a group should act, they require the psychological ability to categorize persons, including oneself, as members of a group (Hechter and Opp 2001; Sripada and Stich 2005). Group identification may be based on physical features such as proximity, residence, or relatedness, or social structures such band or clan membership. The capacity to identify ourselves and others as members of social groups that share certain properties allows us to interact with strangers not just as strangers; instead, we can base our treatment of them on their group membership and expect them to do the same in return (Lew-Levy et al. 2018; McElreath, Boyd, and Richerson 2003; Pope-Caldwell et al. 2022).

Once norms governing relationships with outgroups are in place for both interacting groups, individuals can be reasonably confident about how they will be treated by members of the other group and able to calculate whether the interaction will be positive. The uncertainty around whether norms for non-aggression will be enforced is a serious impediment to peace (recognized as the bargaining problem) (Walter 2009). Small-scale groups sometimes use the reliance other groups have on norms for non-aggression to their advantage. For example, in instances of lethal treachery, a group may invite another group to have a peaceful feast with them. When the visitors have fallen asleep, the group that offered the invitation may slaughter the visitors (Wadley 2003; Walker and Bailey 2013). Overt treachery often leads to a long-term impairment of social relationships as individuals will have less confidence in trusting that norms for non-aggression will be enforced in the future.

The key insight is peace requires that individuals be able to not only tolerate and benefit from interacting with strangers but anticipate that the interactions will be non-aggressive. Doing so on an *ad hoc* basis, such as when two groups of primates encounter each other often leads to avoidance rather than cooperation. If interactions do occur, they are usually tentative and commonly involve aggression, thus easily breaking down, as in bonobos. But once humans evolved the ability to identify themselves and

others as a member of group and to enforce norms, the conditions were in place for the development of norms about how to treat outgroups.

Norms to Promote Peace and Punish Spoilers

When I asked the Bodi, 'will there be an end to the killing and warfare if you get many cattle and abundant pasture?' they replied 'no, it will go on forever.' (Fukui 1994)

We have seen that peace requires the ability to have and enforce norms about how to act towards members of other groups. Norms about how to treat outgroup members may stipulate non-aggression, which promotes peace, or they may endorse violence towards outgroup members which drives warfare. In small-scale traditional societies, violence towards outgroups was frequently tolerated or even rewarded through cultural incentives (Otterbein 1989). Multiple studies have found that the presence of norms for violence are associated with increased warfare and a lack of peace (Fry et al. 2021; Glowacki and Wrangham 2013; Goldschmidt 1994). The key challenge is for societies to prevent or replace norms that reward aggression, such as through providing status to aggressors, with norms that prohibit aggression and implement coercive sanctions for those who violate them.

Fortunately norms can change and norms prohibiting violence can be adopted quickly (Pinker 2012). Although this process has not been studied in detail, theoretical work shows that a small number of individuals who adopt new norms can lead to a cascade effect where norms in the larger group change quickly (Centola et al. 2018). When socially influential individuals adopt norms against conflict and promoting tolerance, overall levels of conflict can be significantly reduced (Paluck 2011; Paluck, Shepherd, and Aronow 2016). In small-scale societies, similar shifts in norms towards non-aggression are often led by prominent individuals who negotiate for peace, renounce war, or refuse to honor warriors with blessings or other cultural rewards (Fry et al. 2021; Glowacki and Gonc 2013; Glowacki and von Rueden 2015; Strecker 1999).

Norms for non-aggression towards outgroups require enforcement, often through sanctions against individuals who violate these norms. Strong sanctions for norm violators are difficult to enforce in small-scale decentralized societies, especially more egalitarian ones because punishment itself imposes costs, including the loss of a potential group member if the sanctioned individual changes their group residence (Baumard 2010; Wiessner 2005). The inability to develop strong enforcement mechanisms for norms preventing violence is a key challenge in decentralized societies (see Table 1). These societies can impose reputational sanctions, exclusion, or ostracism for norm violators, but these are often less effective than strong sanctions, such as fines, physical punishment, or even execution for those who break the peace.

Severe sanctions for norm violators typically occur in more complex societies with structures promoting social solidarity, such as age-sets, that invests a group of coevals with authority over their members. Age-mates may be motivated to sanction peers who violate important norms, including breaking the peace, because the norm violation imposes reputational damage on the rest of the age group, thus avoiding the second-order free-riding dilemma. (Baumard and Liénard 2011; Lienard 2016). Similarly, in societies where older men yield significant social and political power, they may also be able to impose severe sanctions on peace violators (Singh, Wrangham, and Glowacki 2017). For instance, among the Daasanach of southwest Ethiopia "approximately 150 young Daasanach wanted to go to war… The plans of attack were disclosed and all the other age-sets… beat the youngest men with sticks and made them withdraw their plan" (Sagawa 2010:101). Preventing unilateral aggression thus requires not only a general absence of norms towards unprovoked violence, but it also requires the will and capacity to sanction group members who seek war unilaterally.

Even in contexts where outgroup aggression may be subject to general disapproval, for some subset of the population, such as youth, acts of aggression may still provide social approval by one's peers. The status and prestige available from one's peers, even if there is general social disapproval, may be enough to motivate participation in acts that are otherwise not socially sanctioned, including violence. In contemporary industrial society, a similar dynamic is often at work in petty crimes such as shoplifting, vandalism, ice cream licking, and swatting, etc., where society at large disapproves of such acts, but sub-cultures award them status contributing to their perpetuation (Brownfield 2018; Ferracuti and Wolfgang 2013).

Mechanisms to Resolve Conflicts

"The Hamar are an eternal enemy, and between them and the Mela there are no means of settling conflicts and making peace." (Fukui 1994:37)

Resolving conflicts is the most serious challenge to the development and maintenance of peace in small-scale societies. Conflicts often spread beyond the original parties to include the larger social group creating a cycle of tit-for-tat violence making resolution even more challenging (Garfield 2021). Even in cases where individuals who have been aggrieved do not wish to seek revenge, the social pressures to do so may be enormous. Among the Kara of Ethiopia for example, a notorious war was started after a man whose wife had been killed in 2003 decided to seek revenge. He and his friends attacked members of the offending group, the Nyangatom, in retaliation and killed seven people. However, because he did not touch the bodies or bring back any items belonging to the deceased, other group members harassed him, suggesting that he still had not taken revenge and was not a "true killer". In response, he then killed two more Nyangatom people and returned with their clothes, triggering a larger scale war that destabilized the region for several months and led to the deaths of many others (Girke 2008). This example demonstrates the danger of revenge as potential kindling for large-scale conflict and illustrates how social pressures may motivate individuals to seek revenge regardless of their intrinsic desires. Although the warfare described in the example was prompted by intentional acts of aggression, there also exists the possibility that unintentional harm caused by outgroup members will be misinterpreted as having aggressive intent, triggering intergroup conflict. "Accidental homicide or injury is rarely differentiated from intentional killing or wounding (Dozier 1967:92–93)".

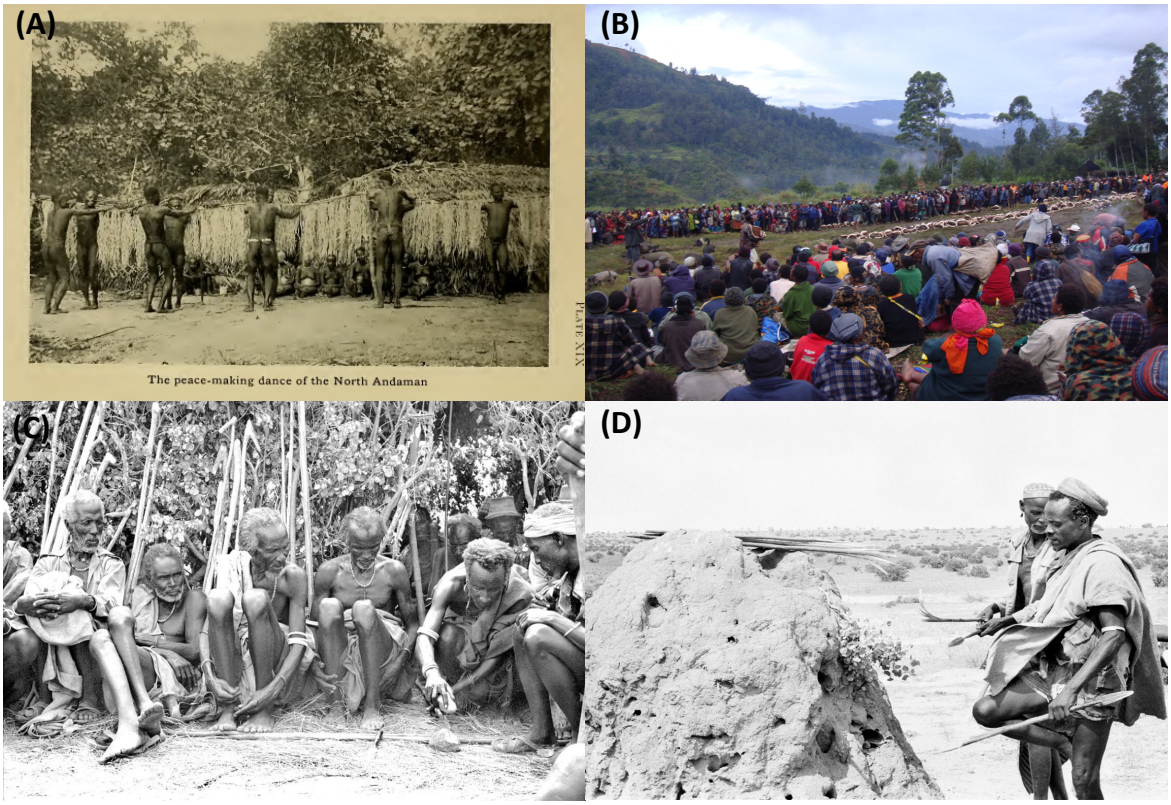

Figure 2: Examples of Peace-Making Rituals *(A) Andaman Islands: peace-making involves a ritualized dance between hostile groups where aggressive feelings are displayed culminating in an exchange of weapons (Radcliffe-Brown 1948:134 & 238). (B) Enga: distribution of compensation after a death, approximately 100 pigs were slaughtered and money distributed (Courtesy of Polly Wiessner). (C) Peace agreements with Arbore and other groups in southwest Ethiopia involve symbolically blunting spears and (D) then breaking and burying the broken spears (Bury the Spear! 2004).*

Restitution and Signaling Cooperative Intent

"War [can be] triggered by an individual, [but] peace can only be re-established communally"
(Girke 2008:202)

The key challenge after intergroup conflict is to prevent members of the aggrieved group from taking revenge. This often requires restitution to the aggrieved party for the harm they have suffered [See Table 2]. This may involve in-kind exchanges, such as replacing stolen livestock with other livestock, often in greater number, or the utilization of different currencies. Because blame is often ascribed to the group rather than the individual, restitution frequently comes from members of the perpetrator's group, rather than from the perpetrators themselves.

Not only does the offending group have to offer restitution, but the aggrieved group has to accept it as satisfactory. This negotiation provides another arena for conflict between groups as they determine an adequate level of restitution that satisfies both groups. For example, among the Kalinga, "kindreds [of the victim] are rarely satisfied with simply being paid off, and often retaliate by a counter-killing or wounding" (Dozier 1967:93). Reaching satisfactory compensation can be difficult, especially when tensions between groups are high and there are few neutral parties. For example, among Wanggular of

Melanesia "De-escalation was difficult. Offences could be compensated but this arrangement did not work satisfactorily…. There was no intermediary party… who could assist the two hostile parties to agree on the size and content of the payment…. Thus it seemed almost impossible for Wanggularm to settle quarrels" (Ploeg 1979:170–171).

Many kinds of harm resulting from intergroup conflict, such as the death of a group member, do not have obvious means of restitution. This poses a greater challenge to restoring relationships because the loss of the aggrieved group cannot be directly replaced. At the same time, the offending group needs to signal cooperative intent, e.g., that future interactions are likely to be positive and that the offender's actions do not represent a new norm on the part of the offender's group (Roscoe 2013). The need to signal cooperative intent is why peacemaking after a violent conflict often requires that the offending group execute one of their own group members. For example, among the Curripaco "lineage members decided to execute ritually their kinsman who had killed, rather than provoke a spate of tit-for-tat revenge killings" (Valentine 2008:36). Among the Erbore of southwest Ethiopia, one elder reported "We brought about peace by allowing two Erbores…to be killed by our enemies. I, myself, have handed over one of our sons to be killed" (Sullivan 2008:16). In addition to or in place of execution, the offending group may offer a group member, usually female, to the other group as compensation (Goldschmidt 1994). For the Suri of southwest Ethiopia, when the killer cannot be identified "the family of the killer should give 30 cattle and a girl to the family of the dead man" (Sullivan 2008:21). With drastic actions such as the execution of the offender or exchange of a group member, the offender's group can signal to the aggrieved group that future interactions are likely to be positive. But executing an ingroup member to satisfy the demands of an outgroup is a large demand that the offending group is sometimes unwilling to take. For the Kalinga, for example, the peace-maker "does not always have the courage to take a life from his own region to satisfy the [peace] pact provisions" (Dozier 1967:93) thus potentially leaving the conflict unresolved.

Because restoring or creating peace requires the community to reaffirm or adopt new norms towards the outgroup, peace-making often involves the meeting of many people from both groups to discuss the conflict and its resolution, often engaging in symbolic ceremonies indicating resolution. This will commonly involve eating and drinking together, as well as rituals that symbolize that the conflict has been resolved and neither party desires revenge (Tadele and Lambebo 2019). Pastoralist groups in east Africa may break or bury items related to conflict such as spears or weapons, believing that peace may hold as long as these items remain buried (Strecker 1999), while in North America, peace efforts frequently involved the ceremonial smoking of tobacco together (See Table 2). Symbolic gifts may be given between members of the opposing groups that indicate a desire for peace (Bacdayan 1969). Such traditions also exist in hierarchical, centralized societies, including states, with militaries often indicating surrender by turning over ceremonial swords.

Table 2: Common Conflict Resolution Mechanisms

Symbolic Ceremony	1. *Sama Dialut* – a coconut-splitting ritual ceremony involving prayer that culminates in enemy parties resuming speech with each other (Sather 2003). 2. *Rotumans* – an apology that varies based on the seriousness of the offense and can include gifting the other party a cow, presenting a specific drink, or wearing ritual leaves (Howard 2003). 4. *Ojibway* – leaders exchange goods such as guns, clothes, and pipes with the enemy, then eat/smoke from the same plate/pipe for a set amount of time (Warren 1885).

	5. *Andaman Islanders* – dance ceremony where the "forgiving party" dances into camp making threatening gestures towards the other group. Afterwards both parties exchange weapons (Radcliffe-Brown 1948).
Wergild (compensation for harm done)	1. *Santa Cruz Islanders* – an exchange of a pig to compensate for damage (Davenport 1969). 2. *Curripaco* – exchange of a woman or future child to resolve conflict over land (Valentine 2008). 3. *Tlingit* – exchange of blankets and an enslaved person, to compensate for the loss of a life (Jones 1914). 4. *Murngin* – sending food and tobacco to the injured group; every member of the clan must partake (Warner 1931).
Mock or ritualized conflict	1. *Yukpa* – use of corncob arrows (Halbmayer 2001). 2. *Northwest Amazon* – enactment of warfare before gifting (Chernela 2008). 3. *Ona – Jelj*: shooting arrows without arrowheads between enemy parties (Bridges 1949). 4. *Murngin* – ritualized spear-throwing between groups, towards the aggressor (Warner 1931).
Ingroup sanctions	1. *Curripaco* – killing those who had killed previously (Valentine 2008). 2. *Daasanach* – those who disturbed the peace had their animals killed as punishment (Houtteman 2010). 3. *Kapauku* –responsible party has to pay or be given to the enemy to be killed (Pospisil 1994).

Third-party Mediators and Leadership

We have seen that restoring relationships after a conflict requires the ability to sanction peace violators, the coordination of compensation between groups, and the ability to signal cooperative intent. These are difficult conditions to satisfy especially in the context of an ongoing conflict. Two factors can greatly increase the likelihood of peace: leadership and third-party mediators. Despite the potential efficacy of leadership and third-party mediators, small-scale decentralized societies often lack strong leadership and third-party institutions due to their egalitarian nature.

Leadership facilitates peace because individuals who wield asymmetric power can prevent war or establish peace using their influence over others in a way that is not often available in hierarchy-free societies (such leaders can also use their influence to motivate warfare) (Garfield, Syme, and Hagen 2020). As a result, peace efforts in small-scale societies are frequently led by prominent individuals who motivate ingroup members to maintain peace, sanction offenders, and negotiate with outgroup members (Fry 2007; Fry et al. 2021; Glowacki and Gonc 2013). Some societies institutionalized the role of peacemaker into a position such as a peace chief or peace leader (Bacdayan 1969; Goldschmidt 1994; Moore 1990), who "appeared at the scene of battle… and attempted to induce disputants to come to amicable agreement" (Goldschmidt 1951:326). However, these kinds of formal peace leaders tend to only occur in societies with significant social stratification such as the Kalinga and Cheyenne, and the absence of prominent leadership who can negotiate for peace is a key impediment to the development of peace in decentralized societies with intergroup conflict. Because restoring the peace often involved the execution of the offender or another ingroup member, the peacemaker may have the unenviable job of "kill[ing]an offender… who refused to abide by the decisions mutually agreed upon by a group" (Dozier 1967:83). Thus, peace leaders were often "feared and respected" (Dozier 1967:83) for their "particular capabilities [of] physical strength, leadership, political acumen, wealth, and the extent and solidarity of his kin group" (Bacdayan 1969:64).

Third parties have an important role in restoring relationships after conflict in small-scale societies, whether within or between groups (Fitouchi and Singh 2022; Hoebel 2009). Third-party mediators may be customary leaders or institutions, such as groups of elders or other bodies of prominent individuals, while in contemporary contexts they are often government representatives or non-governmental organizations. They often facilitate the negotiations about compensation and restitution such that they are acceptable to both parties, rarely relying on punishment for restoring relationships (Fitouchi and Singh 2022; Singh and Garfield 2022; Wiessner 2020).

Box 1. Anatomy of a Cycle of Peace and Conflict

Key events in a cycle of peace and conflict during a several-month period between the pastoralist communities of Daasanach, Hamar, and Turkana in southwest Ethiopia/ northern Kenya. All four groups are loosely integrated into state societies while retaining strong customary institutions.

Spring 2011: An Ethiopian non-governmental organization hosts a multi-day inter-tribal peace meeting for the Daasanach, Nyangatom, and Hamar. The three groups agree to reconcile and make peace.

Early August 2011: Daasanach kill 12 Turkana people, including 9 women and 2 children, and steal a number of livestock. Turkana retaliate by attacking the Daasanach. Cumulatively, 33 people are killed in the clashes.

Early August 2011: Drought decreases the area of viable grazing land, and the Hamar and Daasanach begin grazing livestock along their shared group borders. With closer proximity and a state of peace in place, they begin regular visitation and trade with one another. Intergroup relationships are positive, and people visit each other across group boundaries with little fear of attack.

August 21-23, 2011: To solidify positive relationships in the face of bubbling disputes, the Ethiopian government organizes peace meetings between the Daasanach and Hamar. They engage in rituals in which they bury their weapons and agree to continued peace. The elders who are present state that anyone who causes conflict should be punished. A government official speaks at the proceedings, underscoring that peace will bring benefits to both groups. He also asks that the elders emphasize the importance of peace to the members of their communities. Finally, he stipulates that offenders will be punished as individuals (i.e., sentenced to prison) rather than through customary, community-based justice, which typically involves restitution through repayment of livestock.

August 30-31, 2011: Tensions have recently increased between the Daasanach and Hamar, so another peace meeting is held. The meeting includes traditional peace rituals in which sheep are slaughtered and their blood poured into holes that they have dug in the ground. The blood is covered with soil. Although sheep intestines are typically eaten, the peace ritual requires that they instead be buried in a separate hole, symbolizing that the Daasanach and Hamar have no hunger for conflict or revenge. The fat of each sheep is separated, and a Daasanach elder holds fat from a Hamar sheep and vice versa. Then, each hangs the fat around the other's neck, and they wash their bodies with a mix of water and milk. This symbolizes their reconciliation.

The next day, elders on both sides speak. The Hamar elder states: "…*The youth are the ones who are killing and stealing so they should be careful not to create more problems. We will punish those who will not listen to us according to the laws of our culture. Therefore, what I want from now on is to live with the Daasanach as one*." The Daasanach elder replies: "*All we want is peace, so after concluding this meeting we will gather and speak to the youth. We will punish anyone who does not listen to our words according to the laws of our culture.*" A high-level representative from the Federal Government closes with the following remarks: "*Don't think that you can kill and steal as you please like before. That is in the past. Now, a person who has done wrong will be prosecuted by law. Where you come from, when a person kills another he is awarded high honors by family and relatives. Their mother, father and wives become famous. That's why*

clashes continue. So women must stop doing such things, as it's their praise that leads men to committing crimes."

Early September 2011: Despite the peace meeting several weeks earlier, tensions between the Hamar and Daasanach have increased. Another peace meeting is held on the border between Hamar and Daasanach to head off conflict. A Hamar elder begins, saying, "*This land is ours. Why did you come here*?". The Daasanach elder replies, "*This land is ours, not yours, so we can graze cattle where we want*." At this, young Hamar men in attendance pick up their AK-47s. Government administrators intervene, asking the Daasanach youth not to pick up their weapons. After tempers cool, the youth of both groups are sent away. The remaining elders cannot reach an agreement and decide to meet again at a later date.

September 17, 2011: While the Hamar and Daasanach are watering their cattle together at a common watering hole, a Daasanach man arrives and shoots a Hamar man, striking him in the chest and killing him. The attacker then flees into the forest. The two groups separate their cattle and depart to their separate territories and this is the end of their co-grazing.

September 21, 2011: The Daasanach, Nyangatom and Turkana have a peace meeting in Kenya.

September 24, 2011: Five Hamar youths take revenge for the death of the Hamar man earlier that month and kill a young Daasanach man tending cattle.

Fall 2011: Group relations continue in a similar cycle, fluctuating between conflict and peace.

5. THE TENSIONS BETWEEN WAR AND PEACE

The social dynamics leading to war and peace in small-scale societies are complex and societies are often in tension as their members struggle to balance the potential costs and benefits that can come from war and peace. The payoffs to war and peace vary by individual, the nature of conflict, and the specific out group. Although war often imposes collective costs, non-participants, such as older adults may benefit from war if they can use it to satisfy their material or political goals and hence encourage young men towards war. Among pastoralists in East Africa for instance, male elders often receive a share of captured livestock thus creating an incentive for them to encourage youth to raid (Glowacki and Wrangham 2015) while in Big Men societies war may be used to advance the political or economic goals of individuals who then incite young men to war (Koch 1974; Meggitt 1977). Women may also sometimes benefit from offensive warfare, either from access to spoils, or the status that may come from being associated with a prominent warrior. At the same time, some individuals may benefit more from peace than others, either by using the peace process to advance their political or economics aims or establishing themselves as a prominent individual who is able to negotiate for peace (Wiessner 1998)[4]. These competing tensions between war and peace create a complex social dynamic where individuals or factions may simultaneously benefit from war while recognizing the harms that come from increased warfare, including retaliation, loss of intergroup trade, and disruptions to their livelihoods [see (Almagor 1979; Wiessner 2019) for detailed ethnographic descriptions of these tensions].

As decentralized societies begin to develop internal social structures, including age or status groups, or informal but powerful leadership either through groups of elders (gerontocracies) or specific individuals (Big Men, proto-Chiefdoms), the conditions in which war can be used to advance the strategic aims of the group become possible and can approach those found in state societies (Blattman 2022; Schelling 1980). For example, the Enga in Papua New Guinea have powerful Big Men who wield large amounts of

[4] During my field research a prominent leader of one of the groups I worked with was well-known to NGOs as an advocate for peace. He used his relationship with NGOs and participation in peace meetings to advance his standing with the government and NGOs. I witnessed several occasions where he returned from a peace meeting and soon after advocated for responding to adversarial groups with aggression. He was ultimately killed in a raid he led against a neighboring group.

influence and sometimes use war to advance the group's aims, including leveling imbalances of power when other groups began to gain an advantage. "Warfare was one means to counter unequal development by torching the schools or aid posts of neighbors, destroying coffee gardens and stores…" (Wiessner 2006:181). When war is used to advance the aims of the group, then models of war that are typically applicable to states become more appropriate, including models that see war as arising from imbalances of power or security dilemmas (Blattman 2022; Posen 1993; Wagner 1994). In such conditions, the model I develop here is inadequate to explain when conflict or peace emerges.

6. STATE INTRUSION AND PEACE

In the absence of strong mechanisms to prevent and resolve conflicts, especially ones robust enough to restrain the impulses of youth, it is extremely difficult for groups to achieve and maintain peace. Thus, many small-scale societies were often locked in cycles of tit-for-tat violence from which it was nearly impossible to escape. "Revenge raids often spiraled out of control and retaliatory actions assumed a pathological character" (Gabbert 2012:238). The "Suri survivors do feel the loss and they do see the problem, but they don't know how to stop [it]." (Abbink 2009:33). "We tried to stop killing… then someone would kill and we would return to killing back and forth" (Boster, Yost, and Peeke 2004:481). Among the Waorani, "one group would invite another to a drinking feast where both would pledge to end their vendettas… The results were often disastrous. Since there was no way to enforce conformity on the wishes of the majority, as likely as not the visitors would be ambushed on their way home by hotheads… There was, in short, no safe way to establish initial peaceful contacts between enemies or promote the growth of trust" (Robarchek and Robarchek 1998:156). As a result, significant exogenous shocks that alter incentive structures are often necessary to precipitate the development of peace and contact with states is the most significant of these.

Contact with states and colonizing institutions, such as missionaries, is rightfully recognized as a destabilizing, and often destructive, force on indigenous societies, frequently with harmful outcomes, sometimes including short-term increases in violence as societies react to new pressures (Ferguson 1988; Ferguson and Whitehead 1992). While states would often use violence to regulate the behavior of the groups they sought to control, there is overwhelming evidence that initial contact with states is often followed by a dramatic reduction in violent inter-tribal hostilities (Helbling 2006; Helbling and Schwoerer 2021; Rodman and Cooper 1983). While there are exceptions to this pattern, the scholarship on pacification points to a significant role of states in reducing tribal violence. In South America among the Ache, for example, "What had been unthinkable when all the Atchei were living independently in the forest—their reconciliation… came about once they had lost their freedom" (Clastres 1998:100), while in the Arctic "some Yupiit believe that the Russians are really the only reason the Bow and Arrow wars ended" (Funk 2010:557).

The reduction in violence is often viewed positively by tribal members. After the Australian government prohibited raiding among the Tiwi, "some of my older informants considered it a blessing when the pattern of sneak attack was terminated in 1912." (DeVore and Lee 1968:158). The Gebusi in New Guinea went from "intense intercommunity… lethal violence" and "one of the highest rates of killing documented in the ethnographic record—to exhibiting a homicide rate that has dropped to zero" where "agents of colonial intrusion were seen as powerful benefactors if not saviors" (Knauft 2011:220). In South America, "as they [the Waorani] began to realize that the feuding could stop, some members… began urging their kin to heed the words of the missionaries" (Robarchek and Robarchek 1998:156).

States create several pathways to reduce intergroup conflicts. In small-scale societies, war is often the primary pathway to status and wealth and incorporation into state society provides a new arena to compete for wealth and status. Among the Bokondini with the arrival of colonial government, "the most

important traditional avenue to becoming prominent was cut off…. The mission teachings, on the other hand, held out a possibility of escape from this subordination and opened an alternative to gain prestige" and "it is likely… that they [young men] thought they would gain prestige by being active mission preachers" (Ploeg 1979:176). Contact with states also imports new values that may provide an alternative to those that promote war. Among the Waorani, who previously had some of the highest rates of lethal violence for any society, "What they [missionaries] provided was new cultural knowledge—new information and new perceptions of reality—that allowed a reorganization of both cultural and individual schemata…they were able to imagine and to seek a new world, one without the constant fear of violent death. In a matter of months, the Upriver band abandoned the pattern of internal and external raiding that had persisted for generations" (Robarchek and Robarchek 1998:157).

States also provide access to valuable new goods. For the Kutchin, "why did the two peoples stop fighting…? It is likely, that the natives…. saw trading and trapping as more profitable than fighting" (Slobodin 1960:90). For the Enga, peace followed shortly after contact, when the Australians "gave beads, salt, steel axes—everyone wanted it so they all followed the Kiap [Australians] and stopped fighting. *We stopped fighting because we did not want to lose the source of these things*" (Podolefsky 1984:75). In the Arctic "a desire for the newly arriving Western goods replaced the raiding parties with trading parties and hostilities… transformed into different forms of competition in the new economic situation (Funk 2010:557). Finally, among the Hor of Ethiopia, "[new] developments also can be advantageous for the peace process, e.g., when new fashion items substitute for killing emblems, and when guns and bullets are sold on a large scale by young Arbore in order to buy mobile phones and pay their telephone costs" (Gabbert 2012:244).

States often create formal conflict resolution mechanisms with coercive authority and apply sanctions to those who violate intergroup peace. Among the Gambella in western Ethiopia, for example, "whenever there was fighting, the SPLA [a military organization] would come. Everybody involved in the fighting would have to line up. The soldiers would kill one or two, whether they were involved in the fight or not, did not matter. Then the soldiers would take all the cattle from the parties involved as a punishment. That was how the SPLA kept the peace" (Meckelburg 2008:184). The same can be seen among the Kalinga where, "the attraction of headhunting…has not disappeared: it is only that the penalty for homicide is high" (Dozier 1967:77).

External institutions such as courts create the potential for powerful third parties to restore relationships. For example, among the former nomadic foraging !Kung San, internal conflicts often threatened to spill over into violence. As they began to be incorporated into state society, the !Kung adopted formal leadership and adjudication positions: "Isak Utugile was appointed headman… and he administered customary law there for the next 25 years. Since Isak became headman, !Kung have preferred to bring serious conflicts to him for adjudication rather than allow them to cross the threshold of violence. The *kgotla* ("court") has proved extremely popular with the !Kung. Many speak of the bringing of the *molao* (law) to the district as a positive contribution of the Batswana" (Lee 1979:396).

State institutions commonly allowed actors who were traditionally excluded by indigenous institutions, such as women and youths, to participate in the peace process (Figure 3). For example, during a 2006 peace meeting in the Omo Valley, when women spoke to the groups assembled one reported "we are sick and tired of the attacks on us and our children… men solve their problem and later on the problem returns. We ladies are arguing… *they should give us the chance* [to make peace]" (Sullivan 2008:20). In Papua New Guinea, in the middle of a tribal battle "women walked into the middle of a battlefield between opposing sides…. They offered the men payments of foodstuff, money, cigarettes and soft drinks

to lay down their arms. The women were members of a woman's club… associated with 'governmental law' and business, which were then seen as impartial yet powerful forces (Henry 2005:434).

States provide a way to prevent and resolve conflicts through formal conflict resolution mechanisms including formal sanctions, the creation of new benefits from peace, and new value systems that facilitate peace. While state presence is often rightly criticized for the damaging effects it has had on indigenous institutions and livelihoods, it has been an important aspect of reducing intergroup violence in small-scale societies.

Figure 3. Peace-making in contemporary societies. *Women and youths are typically excluded from traditional forms of peace-making in many societies. Contemporary peace-making initiatives actively work to involve all sections of communities. At a large inter-tribal peace meeting in the Omo Valley A) Nyangatom women speak about their desires for peace. B) Male youths from differing groups indicate their desire for peace. Photos courtesy of Sylwia Pecio.*

7. WHEN INTERGROUP COOPERATION AND PEACE EMERGED

Despite the uncertainty regarding when war evolved in our pre-human ancestors, we can make reasonable inferences about the development of cooperative and peaceful intergroup interactions among early humans based on archaeological and morphological evidence, studies of recent foraging groups, and game theoretical considerations such as those presented above. Did the last common ancestor have the capacity for tolerance towards strangers like bonobos, or exhibit reliable hostility and aggression like chimpanzees? The answer depends on which species makes a better model for the last common ancestor; regardless, the fact that bonobos exhibit high levels of tolerance towards outgroup members indicates that tolerance could have been present deep in the *Homo* lineage or even earlier. The benefits of tolerant interactions would have greatly increased once humans developed the use of language, when interactions with nearby communities would have provided opportunities to share valuable information about territory, resources, or the behavior or location of other communities, or coordinate and plan activities such as group hunting or resource management (Wilson 2013).

Paleo-archaeology provides clues as to when repeated cooperative intergroup interactions first became important in the human lineage, particularly through evidence of specialization and long-distance exchange networks. While the paleoarchaeological record reflects preservation bias and estimates are likely to be revised when new evidence emerges, it at least provides a baseline to date the development of cooperative relationships between groups (Tryon and Faith 2013). Prior to 700,000 years ago, there is little evidence that our *Homo* ancestors engaged in or would have needed to engage in intergroup cooperation and avoidance of other groups was probably a common strategy due to the risk of being killed or injured in intergroup interactions. The fact that early *Homo*, unlike chimpanzees or bonobos, used

sophisticated tool such as hand axes or spears (Ambrose 2001), would have made such interactions more perilous than in primates, as a single individual from another group could inflict potentially lethal violence (Johnson and MacKay 2015).

This begins to change around 615 to 499,000 years ago, when early humans began to be more selective about the stone materials they worked with. Instead of primarily using stones obtained locally (within 5km of their residential sites), they began to acquire lithic materials from more distant sources (Potts et al. 2018) with some evidence of occasional long-distance transport (Clark et al. 1984; Féblot-Augustins 1990). The increased reliance on non-local materials suggests that these early humans were expanding their ranges, becoming more likely to encounter and interact with other groups and creating benefits to sharing information about techniques and locations of materials.

Intergroup Cooperation in the late Middle Pleistocene

Dramatic changes in early human behavior began around 300,000 years ago. Some of the earliest reliable evidence of regular long-distance transport of stone materials appears between 295,000 and 320,000 years ago, with raw stone materials being transported more than 50 kilometers in straight line distance (walking distance would have been much greater), exceeding the typical home range of 20 kilometers of many recent hunter-gatherers (Brooks et al. 2018). At the Sibilo School Road Site in Kenya, there is strong evidence for long-distance transport of stone materials dating to more than 200,000 years ago from sources located 25k km, 144 km, and 166 km away. Surprisingly, most of the transported obsidian is from the farthest source at 166km away, not the closest source at 25km away (Blegen 2017). The distance many of these materials were transported is far greater than the estimated home ranges of forager bands and is more consistent with the exchange networks for modern hunter-gatherers, which could involve scores of people across hundreds of miles (Ambrose 2012; Bird et al. 2019; Yellen and Harpending 1972). The fact that most of the stone at the Sibilo Site was from the furthest source 166km away suggests "intensive, perhaps even obligate intergroup exchange rather than down-the-line-exchange" such as the exchanges that characterize the Kula Cycle (Ambrose 2012:65). Around the same time, the use of ochre was increasing, and by 300,000 years ago it was in regular use in some regions, with much of it also being transported long distances, at a minimum of 38km but potentially up to 170km away (Watts, Chazan, and Wilkins 2016).

The evidence for increasing intergroup exchange around 300,000 is paralleled by skeletal changes in the human lineage towards increasing gracility. Skeletal and cranial gracility is often used as a proxy for reduced reactive aggression, (Chirchir 2021; Wrangham 2019) though how reliable of a measure gracility is for decreased reactive aggression is still debated. Reduced reactive aggression allows for increased capacity for outgroup tolerance, enabling affiliation with strangers. The earliest evidence for gracility among human ancestors comes from archaic *Homo sapiens* around 320,000 years ago (Wrangham 2019), around the same time as the emergence of long-distance stone transport, suggesting that humans around this period were becoming less reactively aggressive and at the same time as increasingly relying on trade

The development of long-distance transportation networks, increased selectiveness of stone tool materials, bodily adornment with ochre, and reduced reactive aggression all around 300,000 years ago or earlier suggests strongly suggests that the early human social environment was changing dramatically during this period. These changes would have increased the potential payoffs from intergroup cooperation, leading groups of early humans to seek out opportunities to interact with other groups they could possibly benefit from (Wilson and Glowacki 2017). The payoffs from cooperation are significant enough that during this period, it is likely that the ability to identify cooperative possibilities across intergroup boundaries would have been a selective force favoring increased prosociality (Hames 2019; Wilson 2013). Thus, by 300,000 years ago at the latest, humans would have been capable of intergroup tolerance, relationships across

group boundaries would have at least been periodically cooperative, and these relationships would have provided access to valuable resources including stone for making tools and ochre (Pisor and Ross 2021)[5].

Peace, however, requires more than periodic cooperative intergroup exchange. It requires the specialization to facilitate interdependence and social structures to develop and enforce group-based norms. Direct and circumstantial evidence in support of these during this period are lacking. Given what we can reasonably infer about group size and social complexity this deep in the Pleistocene (apx. 300 kya), they were highly unlikely to be present. Societies at this time were likely to be small and unstratified, and have few means to regulate and enforce norms against intergroup aggression. Without these social structures in place to regulate intergroup interactions, the increased frequency of intergroup interactions during this time period also increases the likelihood that some intergroup disputes would result in violence. At the same time, from the lack of material and cultural complexity during this time period their livelihoods did not require high-levels of interdependence. Without the ability to prevent and resolve conflicts, it would have been extremely difficult to turn periodic cooperative intergroup interactions into the stable harmonious relationships required for peace.

The Potential for Peace in the Late Pleistocene

Our more recent evolutionary history provides strong evidence that humans were developing material and social technologies that would have made peace more likely within the past 100,000 years. Between 75 to 100 kya there appears to have been a large increase in the development of complex material technologies, status symbols such as shell beads, and symbolic behaviors (Bouzouggar et al. 2007; Roberts and Stewart 2018; Shipton et al. 2018). Access to the materials and knowledge of how to produce these items would have increased the incentives for intergroup cooperation to obtain these materials and the cultural knowledge of their manufacture and meaning. The development of decorative and status items such as these indicate that group identity was becoming important, which enables the capacity for group-enforced norms, and that informal leadership was emerging, both of which would have facilitated the peace process. The development of new lithic techniques and specialized hunting, as well as the regular exchange of stone, shell, and ochre all during the last 100 kya (Foley and Lahr 2003; Mcbrearty and Brooks 2000) created the conditions for high levels of interdependence, which is a crucial means of incentivizing cooperation and preventing conflict.

Rather than intergroup relationships being mostly local, evidence of extremely wide-spread trade emerges beginning 50,000 years ago when humans in East Africa began creating beads from ostrich eggshells (Miller and Wang 2021). Not only were ostrich eggshell beads traded, but a comprehensive study mapping the spread of bead patterns across eastern and southern Africa found that beads were exchanged over an area of *3,000 kilometers connecting both eastern and southern Africa (Fig. 4) lasting from 50-30,000kya* (Miller and Wang 2021). Even after this pan-African trade broke down, regional trade within eastern and southern Africa over vast distances persisted until the present. Wide social networks like the ostrich eggshell trade are consistent with ethnographically recent hunter-gatherers who also were embedded in extensive exchange networks spanning hundreds of miles (Bird et al. 2019; Boyd and Richerson 2022) (Figure 4).

The development of status items during the Late Pleistocene suggests the presence of cultural incentive systems for individuals who distinguished themselves. Based on this, we would expect that in addition to intergroup cooperation, lethal intergroup conflict would at least sometimes have occurred during this period, with the potential to become intense. This is supported by the fact that most recent hunter-

[5] Thanks to Anne Pisor for suggesting that these might have also included long-distance ties between members of the same group.

gatherer and other small-scale groups have at least occasional warfare (Ember 1978; Fry and Söderberg 2013; Otterbein 1989; Wrangham and Glowacki 2012; Wright 1942), while Boehm (2013) found that nearly half of Late-Pleistocene Appropriate foraging groups in a sample of 100 societies had lethal intergroup conflict, though he argues this is an underestimate due to inadequate ethnographic accounts.

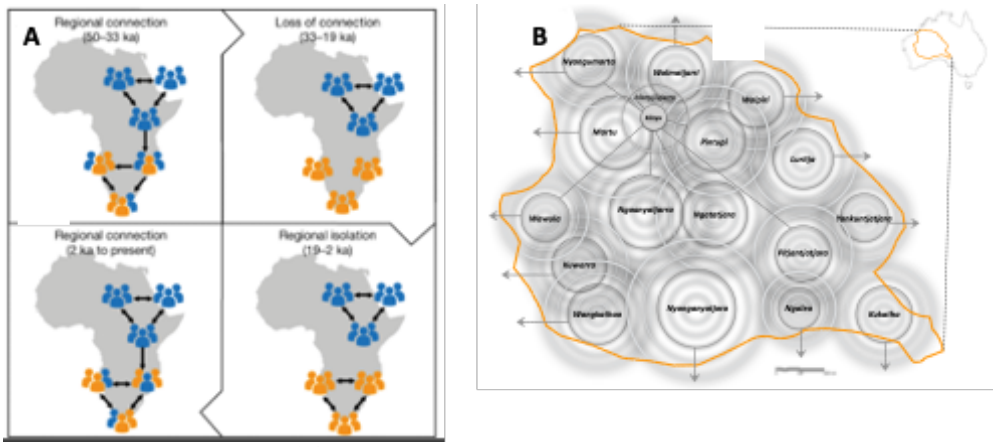

Figure 4: Long-distance Trade and Networks. *(A) Long-distance trade networks of ostrich eggshell beads connected eastern and southern Africa from 50-30kya. Reproduced from Fig 4c in (Miller and Wang 2021). (B) Hunter-gatherer social organization in western Australia where individuals are embedded in multiple levels of networks that span wide regions, including numerous language groups facilitating trade and the sharing of ritual knowledge. Reproduced from (Bird et al. 2019).*

While we cannot confidently date the beginnings of peace, circumstantially, societies would have been able to create peace when they developed social structures that promoted high levels of interdependence, group-based norms, and socially integrative mechanisms to prevent and resolve conflicts. This likely began at least 80,000 years ago or earlier, when evidence of large-scale trade, cooperation, and increasing socio-political complexity emerged (Boyd and Richerson 2022; Miller and Wang 2021; Singh and Glowacki 2021), though regular intergroup cooperation likely dates to at least several hundred thousand years ago. Once the positive benefits created through peace appeared, they would have created more selective pressure for the tolerance of strangers and affiliation across group boundaries and against reactive aggression to facilitate conflict resolution.

The extent to which lethal violence may have co-occurred with the development of peace during this period is uncertain. Cross-culturally among small-scale societies, war is the primary pathway to status for individual men, and status after age is the most important predictor of reproductive success (Hill 1984; von Rueden and Jaeggi 2016). In the few recent small-scale societies where it has been studied, participation in small-scale intergroup war appears to be associated with success in reproductive competition. Thus, it is reasonable to expect that when Pleistocene societies developed social structures similar to more recent small-scale groups, such as status hierarchies and social incentive systems, that coalitionary aggression as well as intergroup cooperation may have been a selective factor in our species' evolution. Insofar as humans during this period resemble more recent small-scale societies, we would expect that intergroup cooperation would continue alongside intergroup conflict and that groups may have simultaneously had peace with one or more groups while also having conflict with other groups.

The timeline I have developed here is tentative and will likely be updated as new evidence emerges. I argue that by 300,000 years ago and until approximately 100,000 kya, early *Homo sapiens* had intergroup cooperation, including trade, that was likely to have been an important part of their livelihoods. However,

without evidence for cultural and social complexity, we cannot infer that conditions for high levels of interdependence or the social structures to prohibit violence existed during this period. Thus, while intergroup cooperation occurred and was may have been a selective force for increased prosociality, it was likely accompanied by periodic intergroup conflict. Intergroup conflicts would have been opportunistic, occasional, and low intensity, with one or two victims, as opposed to the intense tit-for-tat raids seen among many contemporary small-scale societies. Beginning sometime between 100-80 kya, or slightly earlier, humans developed the social structures and cultural technologies to facilitate high levels of interdependence, creating greater benefits to cooperation, and to regulate conflict through norms that prohibit aggression and can be enforced through sanctions. These social structures would have created the conditions for societies to achieve peace, but also increased the potential severity of conflict through creating group-based identities, norms that may award aggression, and enabling the organization of individuals for aggression. Thus, from 100,000 years ago or so until the rise of hierarchical centralized societies, intergroup relationships likely consisted of both war and peace just as the more recent ethnographic record reflects.

8. THE COEVOLUTION OF PEACE AND CONFLICT

I have argued that the form of intergroup violence our early human ancestors (apx 300 to 100 kya) would have been most likely to engage in is the raid, where a small-group of individuals attempt to attack and kill members of other groups at low risk to themselves (Wrangham 1999). Similar patterns are found in chimpanzees, wolves, and some other primate species including spider monkeys. Raiding parties would have been initiated by a small group of individuals acting in their own self-interest with little regard for the group's welfare. Raids themselves would have had lacked significant coordination, structure, or complexity besides utilizing the tactics of surprise and stealth. At the same time, human societies would have lacked internal social structures or differences in coercive authority within age and sex groups, approximating the social structure of more recent nomadic foraging groups (Fry 2011). Without the existence of institutions or individuals capable of wielding coercive authority, society would have been unable to regulate intergroup violence, either by preventing it or utilizing it to advance the aims of the group. Because these societies would have lacked a strong sense of group identity, which emerged with greater cultural complexity in the past 100 kya, the tit-for-tat revenge common in recent human groups would have likely been absent. During this period of our species' evolution, the preconditions necessary to transition from simple raids to more complex and deadly forms of conflict, such as battles, would have been absent. Developing more complex and high-risk types of conflict in humans requires solving the collective action problem in warfare, incentivizing participants to take greater risks, and coordinating members. It is difficult to imagine how these challenges could have been overcome without social structures that could mobilize, incentivize, and coordinate participants—social structure that were likely absent at the beginning of our species.

These social structures that facilitate war also enable the cooperation required for peacemaking and large-scale cooperation more generally. Thus, early in our species' history we would have lacked the ability to wage the total warfare found in hierarchal societies and that fully emerged in agricultural states, but we would have also been unable to pursue peace through successfully pursuing sustained interdependent cooperative relationships between groups. When humans developed the cognitive and cultural capacities allowing them to solve challenging collective action problems, they would have both been able to wage more complex and deadly war and pursue peace using the same social and cognitive mechanisms that allow for total war (Kim and Kissel 2018). An increase in war would have created an increased need for peace, thus "the elaboration of peacemaking goes hand in hand with the origin and development of war" (Kelly 2000:161). War and peace likely co-evolved from small, unorganized raids and periodic intergroup cooperation to intense, larger-scale strategic violence alongside the development of cultural technologies allowing sustained cooperation and trade, such as bond friendships, fictive kinship, ritualized trade, and

rituals for peace. The development of increased social complexity enables both peace and war; thus, tribes have a greater capacity for peace and more intense warfare than bands, chiefdoms more than tribes, states more than chiefdoms. As societies become capable of scaling conflict or peace up, the dynamics of war and peace change enabling total war and sustained peace (Turchin 2007).

9. DISCUSSION

Why Isn't Peace More Common in Other Species?

Chimpanzees usually avoid strange chimpanzees, but when they greatly outnumber a group of strangers, they are more likely to attack and kill them. Bonobos, on the other hand, sometimes approach strange bonobos, sharing food, grooming, or mating with them, but they often do so in the context of high levels of physical aggression between groups. Neither bonobos nor chimpanzees, nor any other primate, has anything like the durable positive-sum harmonious relationships that characterize human groups. Why do humans have the ability for peace while other mammals lack it? The key components that enable peace include high potential benefits from intergroup interactions, the ability to anticipate the behavior of strangers and regulate the behavior of other group members, and the capacity to resolve conflicts and signal future cooperative intent of group members. Each of these provides a partial solution to the prisoner's dilemma that leads to costly intergroup conflict so in theory these capabilities could develop in other social mammals, including chimpanzees and bonobos. But peace doesn't develop in these other species because solving these challenges is significant. Humans were positioned to create peaceful cooperative intergroup relationships due to unusual aspects of our evolution that prepared us to uniquely benefit from interdependent relationships.

The potential benefits humans receive from intergroup interactions appear larger than for other social mammals. For most social mammals, the primary benefits include meeting potential reproductive partners and inferring information about groups for future transfers or interactions. Humans gain these potential benefits and many more due to our unique lifestyles, which require high levels of interdependence. Hunter-gatherers, who characterize most of our species history, typically engage in complementary foraging strategies where individuals target resources in consideration of the resources that others are pursuing (R. L. Kelly 2013). Then, they return to a central place where food is shared among a wider social group including family and other community members (Gurven and Jaeggi 2015; Wood and Marlowe 2013). At the same time, we depend on sophisticated cumulative cultural technologies, including fire for cooking food, stone tools for butchering, and weapons for hunting, alongside cooperation in labor and parenting, all of which are hypothesized to date deep into the Pleistocene preceding the origins of *Homo sapiens* (Kaplan, Hooper, and Gurven 2009; Kramer 2010; Wrangham 2009).

The obligate food sharing, complementarity, and cultural technology seen in humans is in stark contrast to other social animals, who can generally satisfy their adult caloric needs through non-cooperative, non-cultural individual or collective foraging behavior. By the birth of our species, early *Homo sapiens* was preadapted for intergroup interdependence because our very survival requires high levels of in-group interdependence. Once we began to expand our home ranges and rely on resources obtained from distant areas, we would have come into more frequent contact with outgroups; but unlike other species with low levels of interdependence, these early humans would have been able to obtain high benefits from intergroup interactions due to the fact that we were already an interdependent species. It is a small step to go from relying on in-group members to access food, information, and materials necessary for survival, to obtaining these from outgroup members, especially during periods of scarcity. Because non-human social mammals have drastically lower levels of interdependence within their groups than humans do, their potential benefits from intergroup interactions may not be sufficient for durable positive-sum relationships to develop.

Non-human animals also lack many of the psychological capacities that enable peace in humans, especially norm compliance and enforcement, which are critical for modifying the potential payoffs that individuals may receive from aggression. While the origins of our norm psychology continues to be debated, several theories posit that it extends to the birth of our species or perhaps earlier (Boehm 2012b; Wrangham 2019). It is unlikely that cooperative intergroup interactions were a significant component in the development of a norm psychology because a rudimentary version of this psychology would need to be in place before high levels of intergroup interdependence could emerge. Without the capacity to enforce the behavior of other group members, it is difficult to understand how other social mammals could avoid the prisoner's dilemma that leads to conflict when the potential benefits from aggression and cooperation are asymmetric.

While humans are unique among vertebrates for having peace, we are not the only species to have sustained cooperative and positive-sum intergroup relationships. While many species of ants have lethal intergroup violence that often exceeds the severity of human warfare (Moffett 2011), several species of ants are *polydomic*, appearing to have relationships that meet the conditions of peace in which spatially distinct ant nests have non-aggressive mutual exchanges of workers, brood, and food between them (Ellis and Robinson 2016; Ellis et al. 2017; Robinson 2014). Unlike humans, they arrive at peace through fundamentally different mechanisms, avoiding the prisoner's dilemma that makes conflict so common in humans[6].

In humans, small-scale war arises from the fact that the payoffs from aggression differ between group members. Some individuals may benefit more than others. In evolutionary terms, success is ultimately measured in fitness—individuals who do better are those who pass on more copies of their genes. Warfare in humans can be a pathway for warriors to increase their fitness by having more children than they would otherwise or by receiving support that leads to improved offspring survival. This asymmetry in the potential benefits between group members creates a prisoner's dilemma in which individuals may be incentivized to aggress against outgroups, making peace difficult to obtain. We use cultural solutions to solve the prisoner's dilemma, enabling peace.

In contrast, ants achieve peace through an entirely different pathway unavailable to most animals. While each reproductively intact human can reproduce, giving rise to potential fitness differences, in ants, workers are unable to reproduce, and genes are only passed on through the success of their queen. In these conditions, the colony, not the individual is considered the reproductive unit (Hölldobler and Wilson 1990). Thus, the interests of individual ants within the same society are aligned with each other: One ant cannot asymmetrically benefit through intergroup aggression compared to their other group members. If aggression or cooperation is the best strategy for an ant society, the payoffs apply symmetrically to all workers in that society. In effect, the prisoner's dilemma that makes peace so challenging in humans and other animals is entirely avoided in ants. It is not clear what conditions in ants favor the development of intergroup cooperation, though polydomous ants in separate colonies tend to be closely related (Robinson 2014). However, recent research suggests that cooperation between polydomous colonies is not due solely to their relatedness because polydomous colonies also have increased kin competition resulting from having more individuals in closer proximity competing for limited resources (Rodrigues, Barker, and Robinson 2022). Understanding how ants can achieve the remarkable feat of durable, positive-sum, interdependent relationships will potentially provide new insights into the conditions that prevent and promote intergroup cooperation.

[6] Many thanks to Elva Robinson for pointing me towards the literature on polydomous ants and her important insight that they avoid the PD that enables intergroup conflict in humans.

Variation in War and Peace Across Human Societies

This framework also provides insight into why war and peace vary so much across human societies and can resolve some of the conflicting evidence regarding intergroup relationships in small-scale societies. War among mobile hunter-gatherers is sometimes considered intractable (Helbling 2006; Wrangham and Glowacki 2012)(though see (Fry 2007) for an alternative perspective). At the same time, hunter-gatherers tend to have less frequent conflicts and lower rates of death due to warfare than small-scale groups such as horticulturalists and pastoralists (Keeley 1996; Wrangham, Wilson, and Muller 2006). What explains these apparent discrepancies?

Mobile hunter-gatherers typically have fewer status distinctions, reduced reproductive skew and wealth inequality, and less developed social institutions to regulate behavior. The result of these is that the prisoner's dilemma is less acute among mobile hunter-gatherers because the potential benefits from offensive aggression are generally lower for participants than in societies with more complex social structures such as pastoralists. Lacking these social structures, it is also difficult for hunter-gatherers to regulate the behavior of would-be defectors and thus make peace. As a result, they are sometimes characterized as having ceaseless war, even though the actual intensity and severity of war is often lower than in other small-scale groups such as horticulturalists or pastoralists with more social structures. Societies with more integrative and socially binding features such as age-sets or markers of strong in-group identity have a greater capacity to make peace, but these same features can be used to promote war.

Thus, evaluating how social and cultural factors shape payoffs to individuals is critical to understanding social variation in war and peace. It may be difficult or impossible to make peace when the payoffs for defection are high. At the same time, the social structures that are necessary for implementing peace can also exacerbate the conditions that lead to conflict by making it easier to mobilize individuals. The key factor is not that a subsistence strategy necessarily yields either war or peace, as is sometimes assumed for hunter-gatherers and pastoralists, but rather that social and cultural features constrain and influence behavior by shaping the payoffs associated with war and peace.

Conclusion

From the available evidence, it appears that intergroup cooperation would have developed by 300,000 years ago and likely been a selective feature of human evolution, favoring the propensity to identify and exploit opportunities for positive-sum intergroup interactions. The social structures required for peace, however, developed much more recently, likely within the past 100,000 years. Although this is a narrower time frame, it still provides ample opportunity for selection to favor the evolution of psychological traits that would facilitate conflict prevention and resolution, including increased tolerance, affiliation, social norm compliance, and reduced aggression.

The presence of material and social benefits to attackers, alongside the low risk of being killed or injured, can promote intergroup violence. Multiple lines of evidence also suggest that these payoffs may have been present for at least the past several hundred thousand years, but the timing of their emergence is uncertain. Certainly, by the late Middle Pleistocene, we would expect that human groups would have had at least occasional lethal conflict, resulting either from disagreements that escalated or because unilateral aggression would have been beneficial to the aggressors. This argument also suggests that, without further evidence, we should not consider ancestral interactions between human hunter-gatherer groups as one of "unremittent hostility" or "ceaseless war". Rather, we would expect that as soon as humans were able to have positive sum interactions, they would have sought out ways to do so. Generally tolerant interactions (ranging from avoidance to cooperation) would have been more common than violent conflict. The costs and benefits resulting from both violence and cooperation would have created selection pressures for each

insofar as they resulted in differential fitness (Majolo 2019). This may explain why it is so easy for humans to cooperate across group boundaries, and also why it is so easy for that cooperation to break down into conflict.

Despite the fact that humans everywhere have a spectrum of relationships ranging from peace to war, some scholars continue to stipulate that our early human ancestors did not have lethal intergroup aggression. This view perpetuates the stereotype of hunter-gatherers as fundamentally different from other humans and advances a contemporary version of the noble savage. The alternative I argue for here is that our human hunting and gathering ancestors were like humans everywhere—they could identify the costs and benefits resulting from various behaviors and act strategically on them. They could identify and enforce norms that advanced their interests, including norms that favored aggression or peace. As a result, some ancestral hunter-gatherers were likely to be motivated towards cooperation or aggression across groups depending on the situation (Kissel and Kim 2019; Majolo 2019). Once intergroup conflict emerged, they would have struggled, just as contemporary groups do, to resolve the conflict and restore cooperation.

The traits and the technologies that allow people to mobilize, achieve collective action, cooperate across groups, and sanction spoilers to enable peace are the same traits that are used to wage war. Social identity, for example, is a mechanism that can promote intergroup conflict for the same reasons that it can facilitate peaceful interactions—by allowing generalized norms about outgroups and through holding other members of a group responsible for the behavior of each of their members. Social complexity and leadership can promote peace but are also associated with an increase in warfare intensity. Recognizing the costs and benefits of relationships and acting strategically to maximize them can lead to groups either setting aside long-held differences or engaging in unprovoked aggression. Thus, the better our species became at creating peace, the better we also became at waging war. The alternative to social mechanisms to create peace is confinement to a limited social world like that of bonobos or chimpanzees, in which each and every interaction with outgroups has to be negotiated individually—a world that leaves little certainty about future interactions and where truly positive sum long-term relationships are impossible. It is also a world lacking the fluid exchange of ideas across group boundaries, where cumulative cultural evolution, the linchpin of our species' success, does not occur.

We have seen that intergroup cooperation is one step on the pathway to peace. But peace requires innate psychological capacities, including tolerance, social identity, the development and enforcement of norms, and the ability to identify the costs and benefits of actions and to strategically modify one's behavior accordingly. Peace also requires cultural traditions and social structures to prevent and resolve conflicts that emerge. Thus, while intergroup coalitionary aggression and intergroup cooperation may be evolved traits, peace is an invention. It is the solution to a specific problem—how to prevent and resolve conflicts, creating the conditions for sustained positive-sum interactions that cross group boundaries. If our society is to progress beyond the ironic logic of peace and war, it will require engineering social systems that can withstand the challenges of defectors and the potential payoffs from violence. It will require recognizing that humans are the product of our evolved psychological tendencies, which includes the propensity to easily form coalitions and divide the world into ingroups and outgroups—and sometimes to use violence strategically against others to benefit ourselves—but also includes the propensity to form cooperative intergroup relationships and treat strangers as friends.

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