The Evolution of Peace

Luke Glowacki
Boston University
laglow@bu.edu

Last Updated: June 2, 2022

Abstract

While some group-living social species have affiliative and even cooperative interactions with other social groups, humans are alone in having durable, positive-sum, interdependent relationships between different social groups. Our capacity to have harmonious relationships that cross group boundaries is an important aspect of our species' success, allowing for the exchange of ideas, materials, goods and ultimately enabling cumulative cultural evolution. Knowledge about the preconditions 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, both 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. 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 (Hames 2019; Wrangham and Peterson 1996; 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; 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 include tolerance and affiliation with strangers as well as destructive large-scale wars. Sustained positive-sum interactions that cross pronounced group boundaries are exceedingly rare among non-human mammals. Our relatively peaceful cousins the bonobos often have affiliative interactions with other bonobo groups that include grooming, sex, or sometimes food sharing. 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 do.

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 resident, religious organization, social club, political party, and citizen of a 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. Intra and intergroup conflict may not be mutually exclusive because intergroup conflict can be nested within a larger social group. Tribal warfare, for example, 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). Surprisingly, the most lethal conflicts are not necessarily between more distinct groups; rather proximity and shared history can fuel increased hostility leading to more severe conflicts (Kalyvas 2006). For these reasons, I avoid the distinction sometimes made between internal and external warfare because it does not capture either the difficulty of achieving peace nor the intensity of warfare. Instead, I focus on violence and peacemaking between social groups—whether those are between 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). The challenge of understanding how we build peaceful intergroup relationships is formidable because it requires coordinating the interests of every single 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 depending on factors that are likely to have only recently emerged in our species' history including socially integrative institutions and cultural mechanisms for resolving conflicts. I focus on decentralized or small-scale subsistence societies because they are the most relevant to thinking about the origin of peace, but the results here may be generalizable to hierarchical, centralized societies, including states. There is strong evidence that humans evolved to be tolerant of out-group members and form affiliative relationships with non-kin, but 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 allows 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" because of the belief that "peaceful societies should lack whatever instigates war" (Kelly 2000:11), and then identified a range of societies that are "peaceful" due to their lack of war (Fabbro 1978; Kelly 2013). 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 the interactions between groups and the factors underlying those relationships. The two main explanations for warlessness among small-scale non-state societies in the ethnographic record are isolation and subordination.

First, groups without war may be geographically and socially isolated. Geographic isolation, often combined with small population size was an most important predictor of lower 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 peace 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 all peaceful societies as equivalent, a more fruitful approach is to examine relationships between groups focusing on the factors that shape peaceful 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 focuses on trying to capture a general state of interactions between groups, rather than 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 individuals 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; similarly, an occasional violent or even lethal conflict between members of two groups is not sufficient to categorize a relationship as not being peaceful. This definition does not demand perfection 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. While these interactions can likely be considered peaceful, they do not qualify as peace between groups.

Cooperative relationships do not imply an absence of war

Intergroup cooperation is likely a near universal across human societies, including among societies with high rates of war and violence. While cooperation, including trade, may promote peace, 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 such as 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 small-scale 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.

3. Peace as a Solution to the Prisoner's Dilemma

The Individual Benefits of War

Understanding how peace is achieved requires first understanding how and why individuals participate in offensive war. Counter-intuitively, the individual costs of participation are relatively low and the potential benefits significant. This is because the dynamics of warfare among small-scale populations such as hunter-gatherers are fundamentally different than in centralized societies with militaries, including chiefdoms or states. Militaries can solve the coordination problems inherent in warfare through incentivizing and organizing combatants, preventing defection through cowardice and desertion, and mitigating the risk of unprovoked aggression by their members. Small-scale warfare, in contrast, is acephalous and decentralized, occurring in the absence of formal leadership or chains of command, mechanisms to compel participation, and mechanisms to restrain conflict. 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). The most common pattern of war is a raid where attackers use strategic timing and ambush to attack a single victim or perhaps two at very low risk to themselves. Few estimates of the mortality rates for attackers participating in small-scale raids are available but those that do exist suggest it is extremely low, in the range of less than 1% for raids (Beckerman et al. 2009; Chagnon 1988; Mathew and Boyd 2011; Glowacki et al. 2016). Despite the low risk to attackers, attackers still must overcome fear and confrontational tension. "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).

Participants in combat often personally benefit 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 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), though the specific mechanisms are likely to vary across society ranging from access to bridewealth, opportunities to make alliances with people who may provide reproductive partners, status, or some other cultural incentive (though see Beckerman (2009) for a potential counter-example).

Even in societies where it appears that intergroup violence is generally not socially endorsed, attackers still often receive the social benefits of being a warrior from one's peers. The ethnography of small-scale societies is replete with examples where intergroup violence may be subject to general reprobation or even punished by elders, but a smaller subset of society may still laud such activities, providing the offender 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… an enemy raid provided diversion" (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. The desire for the excitement is, I believe, inherent in all the stories I am told today. There is real pleasure in handling and using weapons and in the actual fray, quite apart; from anything else" (Gulliver 1951:149).

The Collective Costs 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). Regardless of whether success in war over the long-term does generally provide access to territory, acquired territory 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 group members: 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 (Boehm 2012). 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 in most cases 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.

In addition to the risk of being killed in revenge, wars impose collective costs through reduced 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 traveling or 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 high risk areas even if those areas are resource abundant because of the threat of conflict, losing access to valuable resources[1]. 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 Prisoner's Dilemma of War and Peace

I have shown that offensive participation in small-scale war is often low risk to attackers because of the strategic use of ambush and imbalances of power. At the same time, attackers are likely to receive important material and social benefits, especially status. Thus, individuals may reasonably anticipate benefiting from their participation in intergroup conflict at low cost to themselves. But an act of war is likely to trigger revenge leading to retaliatory attack and tit-for-tat raiding. The costs of war, however, are primarily borne by the individual's larger social 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 participate in intergroup aggression through the receipt of private benefits, but beneficial for other members of the group to maintain peace. Such a situation resembles a prisoner's dilemma where any individual member may be better off through defecting (engaging in aggression against outgroups), but the entire group would be better off with peace (cooperating).

The difficulty of limiting the payoffs of aggression by individuals is recognized as one of the most formidable challenges to the emergence of peace in small-scale societies (see Table 1). However, these

[1] During my dissertation research with the Nyangatom in Ethiopia, 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. They almost certainly met with severe hunger later in the year.

payoffs from aggression are not symmetric across a population. 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. Restraining the desires that individuals may have for conflict is a central challenge to creating peace between groups.

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." (Babcock 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)

Avoiding war requires preventing defection (aggression) each time members of two groups interact for all interacting group members. A single act of aggression by one group member can be enough to trigger conflict (Figure 1). The difficulty of coordinating the interests of every individual for non-aggression tended to make sustained peaceful relationships extremely difficult to achieve. "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.*"

Thus, achieving peace requires solving an iterated prisoner's dilemma that each member of a group plays repeatedly in every encounter with any member of another group. This dynamic is further exacerbated because war does not necessarily have to start from unprovoked aggression but can instead come 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 injury or death of a group member; a seemingly innocuous 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 solve the prisoner's dilemma, but also be tolerant and resilient against instances of real or perceived defection.

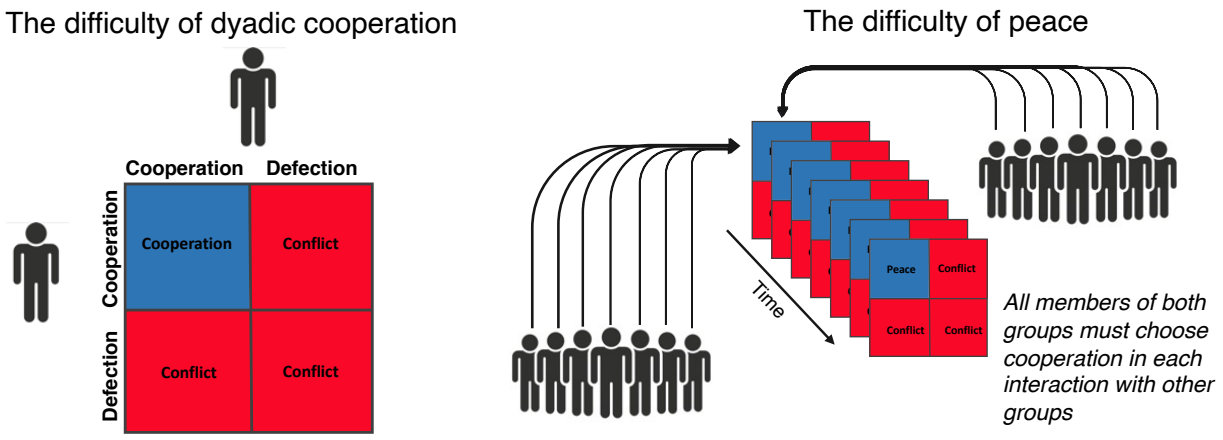

Figure 1. Peace as a Prisoner's Dilemma. *The key challenge to peace is developing payoff systems that favor cooperation by every group member in each interaction with outgroup members and that are resilient against real or perceived defection.*

3. Prerequisites for Peace

Given the difficulties inherent in creating and maintaining peaceful relationships, I now consider the conditions that favor it. I will argue developing intergroup peace requires establishing mechanisms through which social 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. Among social animals these may take the form of 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). While humans clearly have such capacities, it is not clear when this ability evolved. Chimpanzees rarely have tolerant inter-community interactions usually avoiding each other due to "an inherent fear of, or aversion to strangers [that is sometimes] expressed by aggressive attack" (Goodall 1986:531–532). Bonobos can and often do have tolerant and cooperative intergroup relationships that involve copulation and occasional food sharing. The fact that bonobos sometimes have cooperative intergroup relationships suggests that the capacity for tolerance between groups may have developed early in the hominin lineage.

Payoff Structure Favors Cooperation

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

While a psychological capacity for the tolerance of strangers is necessary for peace, it does not provide a sufficient motivation to interact with members of other communities, especially when interactions pose a risk of being killed or injured. Positive intergroup interactions will be favored when individuals of both parties can benefit from interactions with each other, such as through accessing resources that would otherwise be unavailable or that conflict would prohibit them from accessing (Pisor and Gurven 2016; 2018). When human subsistence niches became sufficiently specialized to create interdependencies, the potential payoffs for intercommunity cooperation would have greatly increased.

A common form of interdependency is one in which groups that depend on variable resources allow others to access resources in their territory in time of need, such as water, game lands, or grazing (Glowacki 2020; Moritz et al. 2011; Pisor and Jones 2021). Trade that depends on non-local resources is an especially powerful creator of interdependencies (Schulz 2022) and may include exchanging goods or resources, such as tools, stones for toolmaking, ochre, or even religious, ceremonial, or ritual knowledge (Bird et al. 2019). In the Solomon Islands, for example, "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). The opportunity to access valuable and hard to obtain resources can be an major contributor to the development of trade networks and friendships that cross group boundaries (Goldschmidt 1951; Malinowski 1920; Schulz 2022)

Expectations about the Nature of Interaction

As we have seen, the threat of aggression may hinder intergroup relationships. An important way to mitigate the threat that potential aggression imposes on intergroup cooperation is the creation of norms stipulating how to treat members of other groups, alongside expectations of how members of other groups are likely to treat one's own group members. Establishing norms governing intergroup behavior is important for three reasons: 1) They allow individuals to calculate the likely payoffs for any interaction based on their own behavior and the behavior of others; 2) Norms promote the interaction of strangers because they have reasonable expectations about how they will be treated; and 3) They buffer against the overinterpretation of the behavior of any one individual who may do something conflictual. Thus, in interactions between members of two groups, if one individual does something aberrant, a likely inference is that that individual is not adhering to the norm, rather than assuming all individuals from that social group will behave similarly.

Consider members of 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—whether they will be treated as a friend, ally, enemy, or potential threat—and how they should treat the members of the other group. In such cases, each interaction is negotiated spontaneously. The interactions are often tentative at first, as each individual seeks to determine the likely behavior of out-group members and then bases their own behavior off the signals and cues they detect from others. Interactions may be cooperative, or they may be conflictual; some individuals may be aggressive and others pacific; and all of these may quickly change during an intergroup interaction. This state often characterizes unfamiliar human groups, including cases of initial contact with colonizers and instances of ad hoc or spontaneous intergroup cooperation, such as the Christmas Treaty. The outcome when two groups that lack norms governing interactions with each other meet is uncertain—it may result in conflict, cooperation, or both and any small conflict is likely to lead to a breakdown of potential cooperation.

Norms towards outgroups require socially integrative mechanisms

Developing generalizable norms about how to treat members of other groups and how they are likely to treat you requires seeing members of a group as just that: members of a group, not merely a collection of individuals (Moffett 2013; Smaldino 2019). The capacity to identify 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 (such as whether to treat them as friend, ally, or foe) and expect them to do the same in return.

Whether based on membership in band, clan, or kinship, once a group-based identity was developed, it allowed members of the group to identify their common interests and develop norms promoting them (Singh, Wrangham, and Glowacki 2017). These norms govern both behavior towards ingroup members, but also the behavior towards members of other groups based on their membership in that group (Lew-Levy et al. 2018; Pope-Caldwell et al. 2022). An individual can interact with a member of another social group with a reasonable expectation about how they will be treated by that group on the basis of the group's norms, and about how to they themselves should treat members of this other group. Thus, norms based on social identity allow individuals to calculate the likely payoffs inherent in interactions with members of other groups (or in any social situation) facilitating intergroup interactions.

Preventing Conflict: Norms promoting peace and sanctions for defection

"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)

Intergroup conflict is not just driven by a desire for material benefits but is also influenced by the norms individuals hold about appropriate and socially valued behavior. Norms about how to treat members of other groups can help facilitate positive intergroup interactions, but a more substantive challenge for the development of peace is ensuring that individuals within a society have little incentive to engage in acts of aggression against members of other groups. Multiple studies have found that the presence of cultural reward systems or norms for violence are associated with greater warfare or a lack of peace (Fry et al. 2021; Glowacki and Wrangham 2013; Goldschmidt 1994). An important part of creating peace is the abandonment of social incentives such as status from intergroup aggression. Although this process has not been studied in detail, it appears that it is often led by prominent individuals who negotiate for peace, renounce war, or refuse to honor warriors with blessing or other cultural rewards (Fry et al. 2021; Glowacki and Gonc 2013; Glowacki and von Rueden 2015; Strecker 1999).

Sanctions for norm violators are a crucial mechanism for enforcing norms of non-aggression and can involve physical beatings or even the execution of individuals who break the peace. For instance, among the Daasanach of southwest Ethiopia "when there is peace, no raids are allowed and if they occur, they might be sanctioned." (Houtteman 2010:142) and "approximately 150 young Daasanech 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. The second difficulty is that even 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. While older adults may generally scorn war, for youth, one's peers may still accord intergroup violence with status and prestige, motivating participation in acts that are otherwise not socially sanctioned. In contemporary industrial society, the same 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 which may be why revenge is "the most commonly given reason for warfare in noncentralized societies" (Wiessner 2006:168). Conflicts often spread beyond the original parties to include the larger social group making resolution even more challenging (Garfield 2021). Retaliation threatens to create a cycle of tit-for-tat violence. 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 traveled to Nyangatom 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 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)".

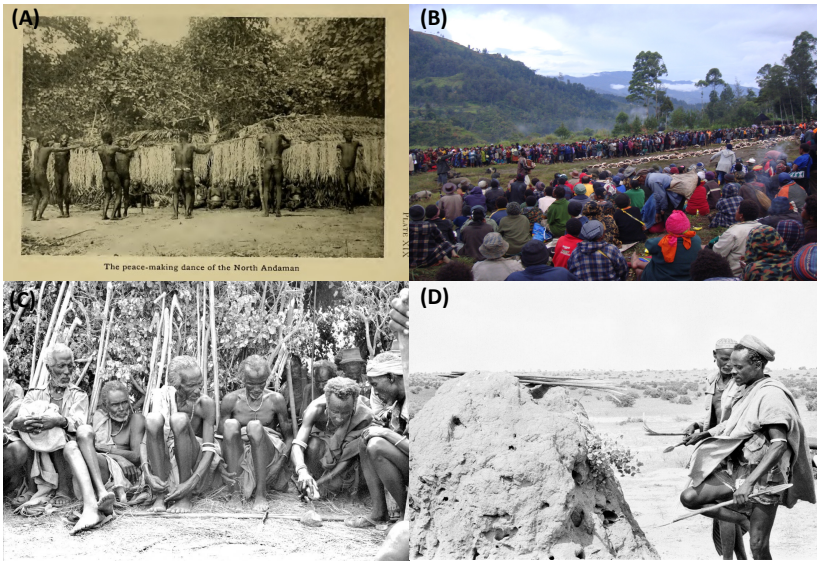

Figure 2: Examples of Peace-Making Rituals *(A) Andamanese Islands: peace-making involves a ritualized dance between hostile groups where aggressive feelings are displayed culminating in an exchange of weapons (Radcliffe-Brown 1948:134 & 238). (B) Enga: distribution of compensation after a death, approximately 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 (Streker and Pankhurst 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 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, for "no more powerful means of cementing social ties than the giving of gifts and the eating of foods in common exists" (Bell 1935:258). Among the Kalinga "the ceremonial drinking… signifies the sealing of the pact" (Bacdayan 1969:69). Ceremonies including actions and items also common that "symbolize reunification and solidarity between conflicting parties" (Tadele and Lambebo 2019:434). For example, 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). Gifts may be given between members of the opposing groups that "are symbolic of the satisfactory conclusion of the pact and expression of hope" (Bacdayan 1969:69). 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, ritual mat, 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 1949:194). 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. Daasanech – 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).

4. Specialization and Leadership

We have seen that achieving peace requires the ability to sanction peace violators, the coordination of compensation between groups, and the ability to signal cooperative intent. Achieving these is a formidable challenge in any society, but especially in non-hierarchical hunting and gathering societies. While non-hierarchical societies with egalitarian norms (usually hunter-gatherers) are often described as peaceful and do frequently have lower rates of deaths due to warfare than horticulturalists, it may be more difficult for them to achieve durable peace than it is for societies with greater specialization and leadership.

Interdependence is a key pathway to creating norms that favor non-aggression. Specialization and increasing material cultural complexity often expand 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. 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. Thus, we expect that as groups can increasingly provide each other with valuable goods, information, or support, there will be more overt attempts at preventing conflict and restoring relationships afterwards (Garfield, von Rueden, and Hagen 2019). In the Solomon Islands, for example, "When inter-island trading flourished there seems to have been less active hostility between the associated areas…. Occasionally, a hostile act would temporarily interrupt the trade peace… 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). Similarly, among the Inupiat "a combination of international trade and selective easements for the use of another's territory—provided much more effective means of acquiring scarce resources than conquest ever could have" (Burch 2005:60). 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).

Leadership can also facilitate 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 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). Among the Konso, traditional religious leaders are "special peacemakers, whose responsibility [includes] intervening in case of fights between different lineages" (Hallpike 1974:72). 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). While peace leaders are present in numerous societies, they tend to only occur in societies with significant social stratification such as the Kalinga and Cheyenne.

5. 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 and markets, is rightfully recognized as destabilizing to indigenous societies, often with extremely harmful outcomes, sometimes including short-term increases in violence as societies react to new pressures (Ferguson 1988; Ferguson and Whitehead 1992). However, there is overwhelming evidence that initial contact with states is often followed by a dramatic reduction in violent 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).

The reduction in tribal violence is often viewed positively by local 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 Warorani, 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 Philippines, "with the disappearance of head hunting, the avenue to power and influence has been rechanneled and now men achieve status by wealth and political activity" (Dozier 1967:77). 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 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).

Third-party mediators are often important in conflict resolution including among small-scale societies (Singh and Garfield 2022; Wiessner 2020). 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 addressed the attendees one reported "we are sick and tired of the attacks on us and our children… men solve their problem and latter 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 been an important aspect of reducing intergroup violence in small-scale societies.

Figure 3. Peacemaking 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.*

6. When 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 (Wilson 2013). Language would also increases the capacity of communities to coordinate with each other, and can allow groups to plan subsequent interactions or collective events such as group hunting or resource management.

Paleo-archaeology provides tentative 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. Prior to 700,000 years ago, there is little evidence that humans engaged in or would have needed to engage in intergroup cooperation. 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). 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.

Dramatic changes in early human behavior began around 300,000 years ago. The earliest evidence of 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) (Brooks et al. 2018). At the Sibilo School Road Site in Kenya, there is strong evidence for long-distant transport of stone materials dating to more than 200,000 years ago from

sources located up to 166km 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). The inability to avoid reacting aggressively to conflicts would be a major impediment to intergroup cooperation, as any conflict may have resulted in retaliatory aggression. Evidence of reduced reactive aggression is a proxy for an increased capacity for outgroup tolerance which would enable conflict resolution. The earliest evidence for gracility among human ancestors comes from archaic *Homo sapiens* around 320,000 year ago suggesting that humans around this period would have become less likely to respond to conflicts with reactive aggression (Wrangham 2019).

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. 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, we expect that by 300,000 years ago at the latest, human intergroup relationships would have at least been periodically cooperative. However, the available evidence from this time period does not demonstrate the presence of social structures or specialization that facilitates high levels of interdependence, support group-based norms, or indicate socially integrative mechanisms. Further, the more frequent intergroup interactions that developed around 300,000 years ago would have also the increased likelihood that some intergroup disputes would result in violence. 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.

Our more recent evolutionary history provides strong evidence that humans were developing complex materials and social technologies that would have made peace more likely within the past 100kya. With the development of complex material technologies and status symbols such as shell beads at 80,000 years ago or earlier (Bouzouggar et al. 2007), access to the materials and knowledge of how to produce these status items would have increased the incentives for intergroup cooperation to obtain the materials and possibly cultural knowledge. Beginning 50,000 years ago, humans in East Africa began creating beads from ostrich eggshells (Miller and Wang 2021). Not only were ostrich eggshell beads traded locally, 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). These extensive trade networks lasted 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-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.

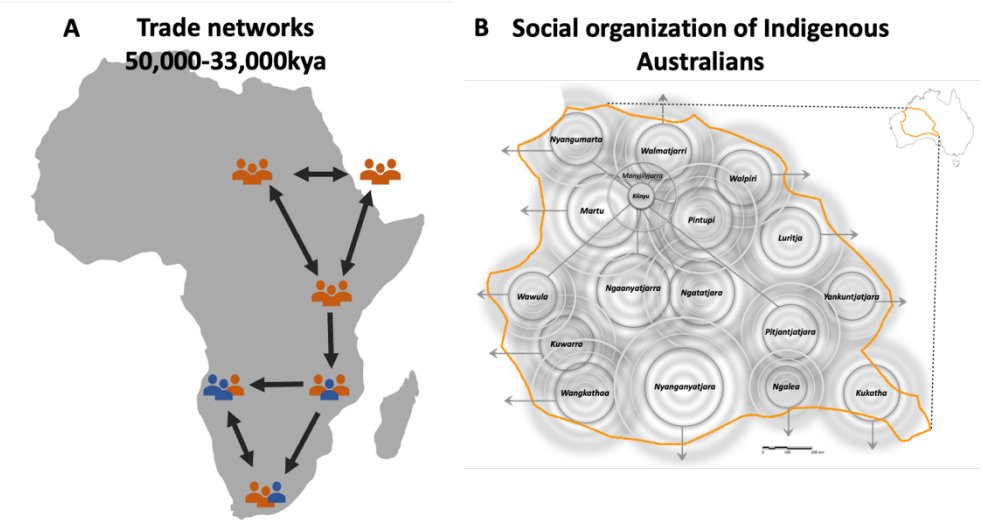

Figure 4: Long-distance Trade and Networks. *(A) Long-distance trade networks of ostrich eggshell beads connected eastern and southern Africa from 50-30kya. Based on Fig 4c in Miller and Wang (2021). (B) Hunter-gatherer social organization in western Australia where individuals are embedded in multiple 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 date the beginnings of peace, circumstantially, societies would have been able to create peace when they developed social structures that would have promoted high levels of interdependence, group-based norms, and socially integrative mechanisms to prevent and resolve conflicts. This likely began at least 50,000 years ago or earlier when evidence of large-scale trade, cooperation, and increasing socio-political complexity emerge (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 even more selective pressure for the tolerance of strangers and affiliation across group boundaries, and even more selection 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 unknown. 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.

Discussion

From the available evidence, it appears that intergroup cooperation would have developed by at least 200-300,000 years ago and 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 80,000 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 middle of the 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 were inherently peaceful, and that lethal conflict is a recent development. 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, the capacity for 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.

Acknowledgements
Navdeep Kaur and Bella Faber Rico were instrumental in locating resources. Comments from and discussions with Pria Anand, William Buckner, Lee Cronk, Zach Garfield, Moshe Hoffman, Sheina Lew-Levy, Manvir Singh, and Richard Wrangham greatly improved the manuscript.

Conflict of Interest Statement
The author declares he has no conflicts of interest.

Funding Statement
This research received no specific grant from any funding agency, commercial or not-for-profit sectors.

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