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RESEARCH PAPER

The Geography of Trust and Betrayal: Moral disputes and Late Pleistocene dispersal

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The explanations for a rapid dispersal of modern humans after 100,000 BP remain enigmatic. Populations of modern humans took new routes – crossing significant topographic and environmental barriers, including making major sea crossings, and moving into and through risky and difficult environments. Neither population increase nor ecological changes provide an adequate explanation for a pattern of rapid movement, including leaping into new regions (saltation events). Here it is argued that the structural dynamics of emotionally complex collaboration and in depth moral commitments generates regular expulsion events of founding populations. These expulsion events provide an explanation for the as yet elusive element to dispersal. Alongside cognitive and cultural complexity we should recognise the influence of emerging emotional complexity on significant behavioural changes in the Palaeolithic.

Keywords: Pleistocene Dispersal; Palaeolithic Colonisations; Hunter-gatherers; Evolution of emotions; Moral conflicts; Trust; Hyper cooperation

Emotional complexity, moral conflict and the motivations for dispersal events

From after 100,000 years ago, modern humans moved out of Africa spreading faster than had any other human species, across deserts, mountain ranges and seas, to the furthest limits of the globe. The explanations as to *why* they undertook such journeys, despite the risks and often failing to survive, have eluded us. One particular frustration has been that ethnographic accounts which might help us to understand the rapid dispersal of human populations in the Late Pleistocene are almost unknown – modern hunter-gatherers which might provide an analogy are tied to politically defined boundaries with no unoccupied lands into which to move. We suspect that the processes driving dispersal exist as yet unrecognised in modern hunting and gathering populations.

Freuchen notably recounts a rare documented case of dispersal into a new region amongst the Netsilik of the Canadian Arctic (Freuchen 1961: 116–118). Might the motivations for this founding population setting out into a new region provide us with an insight into mechanisms of dispersal which have yet to be explored?

Freuchen describes the journey of Uvigsakavvik, with two other Netsilik men and their wives and children who set out alone into the most inhospitable of unoccupied arctic tundra in the early years of the twentieth century. They journeyed south from Thule around 500km into

previously unoccupied land in Melville Bay in the hope of surviving there. There was no lack of resources or ecological reason for their journey. The motivations instead lay in a moral dispute. After being accused of lying, ignored by others and with tempers running increasingly high, Uvigsakavvik could no longer bear to stay and he and his wife left his native group, gathering together his allies, two men from different groups in similar positions who were both accused of murder, intending to form a new colony far away. Remarkably Uvigsakavvik's 'outlaw' colony survived, and they even accumulated a wealth of furs. After several years of 'cooling down time' and hardship Uvigsakavvik and his wife travelled back north, bringing with them many furs and reconciling with the original group. Moral tensions would erupt once again however, as after his wife died Uvigsakavvik returned to his untrustworthy ways. He stole two wives from other hunters, as well as stealing food and making threats to Sigdlu, the husband of one of the women he had taken. Uvigsakavvik was widely felt to be an upstart. This time, despite a climate of raised tempers, he made the mistake of staying. Sigdlu, and his ally, Odark, shot and killed Uvigsakavvik when the three went out hunting narwhal together. The Netsilik to which they belonged were careful to make sure that the authorities did not find out about what Freuchen terms 'polar justice'.

Complex and powerful emotions like desires for justice, resentment, altruistic punishment, motivations to take vengeance, jealousy, pride, forgiveness, a need for belonging and commitments to shared ethics drove this example of a successful founding colony in previously unoccupied lands. Were these emotions also part of the

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impetus for Late Pleistocene human global expansion? Rather than any *impetus to discover or remarkable human ingenuity* might widespread emotional commitments, the strong glue of love and loyalty which binds us together and structures collaboration in egalitarian societies, and their *darker side*, emotions such as altruistic anger, spite, vengeance, hatred, desires to punish explain some of the enigmatic elements of human dispersal?

The paradox of collaboration

Emotional commitments and moral emotions are rarely considered as a driving force for behaviours, or for changes in behaviours in the Palaeolithic. However human emotions are key to our deep seated abilities to collaborate, and moreover have structured and predictable effects on long term behaviour.

The hyper-cooperation which characterises our social relationships from those of modern hunter-gatherers to those of modern industrialised societies depends not only cognitive and cultural sophistication but also on emotional complexity (Gamble et al. 2011; Rand and Nowak 2013; Burkhardt et al. 2014). Complex social or moral emotions have evolved for functional reasons (Frank 1988, Fiske 2002). Emotions such as *guilt* motivate us to make amends and re-form alliances, *gratitude* motivates us to maintain bonds despite separation in time and space, *spite* and *resentment* guard us against exploitation, forcing us to leave exploitative alliances and deterring others from exploiting us (Fiske 2002). Social or moral emotions, focused on other's interests and apparently irrational in the short term, have predictable long term benefits in terms of maintaining strong and effective alliances with much give and take, and structure our behaviour towards others.

From an evolutionary perspective our capacity for *emotional commitments*, the ties that our complex emotions support, evolved through clear strategic and economic advantages (Frank 1988). Emotional commitments and *trust* solve the economic problem of ensuring others will help you when you are vulnerable, even if it is not in their immediate interests, by providing guarantees of one's own emotional commitment to do likewise (Frank 1988; Nesse 2001). Like a binding contract, our emotions have been shown to effectively *handcuff us* to act in certain ways, foregoing the potential benefits of defection (which become *unthinkable*) for a long term gain and a level of economic cooperation not seen in other species (Nesse 2001; Rand and Nowak 2013; Spikins 2015). From hXaro partners amongst the Jo'Huansi of the Northwest Kalahari, to friends setting up in business emotional commitments allow us reap the mutual rewards of alliances with much *give and take* which are strong in crisis. However trust is *hard won*, based on significant investments, as well as many judgements of genuine motivations (Gottman 2011) and moreover is *soon lost* at the first sign of selfish behaviour. Examples include inappropriate presents in the Jo'Huansi (for whom too large a gift implies a selfish orientation to the benefits of an alliance, Weissner 2002) to a lack of remorse or guilt in business colleagues who act against the interests of others (Nesse 2001).

A transition to widespread emotional commitments will have been an important threshold in the evolutionary history of human relationships and behaviour. However Randolph Nesse comments

'In a world without commitments social exchanges arise mainly from helping relatives and trading favors. In such a world individuals can reliably be expected to act straightforwardly in their own interests. The advent of commitment changes everything. As soon as one individual finds a way to convince another that he or she will act other than in simple self-interest, social life is transformed. Now individuals must consider the possibility that others may fulfil promises and threats . . . Reputations become important predictors of behavior, and people begin spending vast amounts of effort to convince others that they will fulfil their promises and threats . . . Before you know it commitments lead people to do all kinds of things they would rather not do, whether this means carrying out spiteful threats or helping others who will never be able to reciprocate . . . These capacities may help explain the human tendency to emotionally extreme behaviours that often seem senseless.'

Nesse (2001: 1–2)

Clearly there is a 'dark side' to emotional commitments and the in depth collaboration they support (Jenson 2010). *Empathetic joy, sympathy, compassion and gratitude* pleasantly bind us to others, however *anger at cheating, spite, shame, resentment and motivations towards vengeance following betrayals* repel us. This *dark side* of motivations to *punish* plays an essential role in sustaining altruism and cooperation, preventing exploitation and guarding against free-riders (Boyd et al. 2003; Sigmund 2007). We are hard wired to seek justice despite personal cost, and motivations to police those who cheat or exploit others have been so essential to human collaboration that we are rewarded by a rush of oxytocin when we do so (De Quervain et al 2004; Strobel et al. 2011). The paradox of remarkable human collaboration is that it exists and is maintained only through its darker side of motivations to punish, harm and repel.

Might this 'dark side' of cooperation provide us with an explanation for the energy of human dispersals after 100,000 BP? Archaeological evidence for the characteristics of dispersals after 100,000 BP certainly suggests that a new explanation, beyond those provided by traditional economic or ecological perspectives, is required.

Late Pleistocene dispersals – the archaeological evidence

There seems to be a distinct contrast between patterns of dispersal in humans *prior to* and *post* the 100,000 BP onwards dispersals of 'moderns' out of Africa.

Archaic humans do little to challenge our traditional explanations for the spread of populations. Early species of hominin were typically limited in their distribution to specific environments, for example *Australopithecus spp.*,

Paranthropus spp., *Homo habilis* and *Homo rudolfensis* all appear to have been limited to grasslands and relatively open woodlands in Africa (Derricourt 2005; Bolus 2015). *Homo erectus/ergaster* expanded out of Africa into Asia by 1.6–1.7 million years ago however this seems to have been facilitated by large scale grassland environments (Finlayson et al. 2011). *Homo heidelbergensis* certainly covered ‘new ground’ in Europe but apparently at a time of particularly clement environments, helped by environmental changes in Sinai alternately attracting archaic humans and providing a transit route new areas (Derricourt 2005). Neanderthals did occupy higher latitude (and colder) regions of Europe which contrast completely to the ‘homeland’ of hominins in Africa, even occupying the Altai mountains of Siberia (Prüfer et al. 2014; Bolus 2015). However, as with other archaic species, Neanderthals appear to have made such ‘advances’ by slowly adapting to the new ecological opportunities presented to them and moreover to respect and be deterred by environmental and climatic barriers, such as the Straits of Gibraltar (Derricourt 2005).

However after 100,000 BP and in line with movements of modern humans out of Africa, we start to see a different pattern of dispersal. The characteristics of this population spread are distinctive and difficult to explain through traditional ecological approaches (see **Table 1**).

Dispersal, as human populations spread out of Africa, is *extremely rapid*. By around 6,000 BP when they arrived at what is known as ‘the Uttermost part of the Earth’ (the southernmost tip of south America) human as a species

had crossed millions of miles, many different continents and even made substantial sea crossings (Oppenheimer 2012). From movements out of Africa after 100,000 years ago (Armitage et al. 2011; Boivin et al. 2013) they occupied almost the whole globe (see **Figure 1**).

Mobility seems to have not only an extraordinary energy but also a rather *unique pattern*. Movements out of regions occur at the same times as significant patterns of movement within regions, as documented in genetic evidence (Mellars 2006b). However whilst dispersal into distant risky and inhospitable areas is relatively rapid, that into such new parts of already occupied regions is slow. The Zagros – Caucasus region is not occupied until 11,000 years after its surroundings (Bar-Yosef and Belfer-Cohen 2013) and in the southernmost tip of south America it is several thousands of years after the initial migration that the upland environments are occupied (Morello et al. 2012). It is almost as if people were choosing to tackle far flung risky environments in preference to those nearby.

Most notably unlike in previous species the spread of modern human populations *fail to respect major biogeographical barriers*. New regions, even if risky, seem to exert a certain pull. We see populations moving into extremely cold environments such as Last Glacial Maximum northern Europe, crossing significant deltas, such as the Indus and Ganges deltas, making sea crossings such as to Australia, Sulawesi, Maluku and island Melanesia, and crossing deserts, tundras and jungle environments. The crossing to Sahul and the Bismarck Islands would have involved at least ten sea crossings, including over 80–100km of open

Characteristic	Examples	References
Extremely rapid	1km per year along the ‘coastal express route’ to Australia 0.6–1km per year from the Levant to the Atlantic coast 0.6–1km per year across Australia 14,000/2000km across the Americas (less than 2000 years to reach southern south America)	– Mellars 2006a: 797 – Bar-Yosef and Belfer-Cohen 2013: 36 – Bar-Yosef and Belfer-Cohen 2013: 39 – Bodner et al. 2012
Associated with substantial movements within regions	Such as L2 and L3 lineages within Africa	– Mellars 2006b
Distance seems to exert a certain pull – Risky distant environments occupied before similar locations in occupied regions	Inland and higher altitude occupied well after the coastal zone in Tierra del Fuego Zagros-Caucasus region occupied 10,000 years later than surroundings	– Morello et al. 2012 – Bar-Yosef and Belfer-Cohen 2013: 36
Into risky and entirely new environments	Extreme cold in last glacial maximum Europe Extreme cold in Siberia Extensive deltas (Indus, Ganges and Brahmaputra deltas) Deserts, tundras and jungles Lengthy sea crossings	– last glacial maximum Europe, Housley et al. 1997 – such as the Indus, Ganges and Brahmaputra deltas, Field et al. 2006 – substantial sea crossings (such as to Sulawesi, Maluku, Gebe and Sahul, and island Melanesia, Balme and Morse 2006) – deserts, tundras and jungle environments (Bar-Yosef and Belfer-Cohen 2013) – The Red Sea, Sahara, Taurus_Zagros mountains and Iranian plateau (Bailey 2010)
‘Saltation’ rather than spread		– Gamble 2009

Table 1: Characteristics of modern human dispersal.

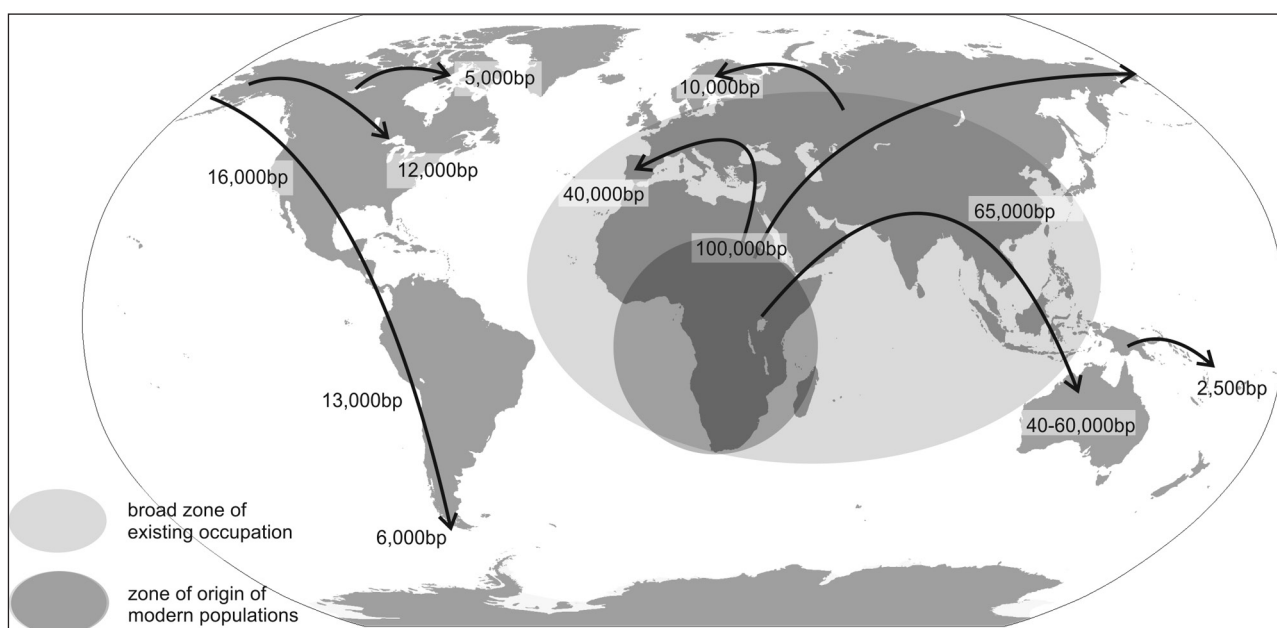


Figure 1: Dispersal pattern of humans after 100,000 BP.

sea without sight of land (Bar-Yosef and Belfer-Cohen 2013). Survival was far from certain, and we know that often such new colonies will have failed (Housley et al. 1997).

Gamble contrasts the pattern of a modern human ‘sal-tation’ dispersal (involving leaps of new groups, backed up by links to existing communities) with a more archaic ‘rolling out’ dispersal pattern (Gamble 2009). Throughout Europe and Asia modern humans seem to have leapt *into and through* archaic populations who seemed to have little need or desire to disperse in the same way. Bar-Yosef and Belfer-Cohen observe that ‘*concerning the world spread of humanity... the easiest questions to resolve are those of ‘when’ and ‘how’ while the most difficult and the most highly debated is ‘why’*’ (2013: 30).

Traditional explanations aren’t adequate. Population increase might seem the first explanation for population spread. However the spread of people across what has been termed the ‘coastal express route’ to Sahul, or down the Americas, is clearly faster than could be explained by pressures of population increase (Mellars 2006a; Stringer 2007) as is the spread in Australia (O’Connell and Allan 2012). A lack of archaeological evidence for any dense occupation along routes of dispersal also supports the suggestion that movements were not motivated by simple demographic factors (Bar-Yosef and Belfer-Cohen 2013).

Ecological conditions may have influenced *the success* of dispersal events. Successful dispersals out of Africa seem related to ecological changes (Grove 2015) and certain specific ecological conditions appear to have favoured dispersal (such as mangrove swamps, Erlandson and Braje 2015, or the ‘kelp highway’, Erlandson et al. 2007). Moreover population retreats and declines can be clearly related to environmental downturns (Bradt Möller et al. 2012). However ecological changes fail to explain a large scale pattern of global dispersal which crosses different ecological zones, major barriers and moves into inhospitable

settings. Both the direction and the dynamism of dispersal is out of place with a purely ecological response.

More sophisticated technological capacities may have had some influence on dispersal. The adoption of long distance projectiles, and particularly bow and arrow technology, would have made any conflicts more dangerous (Shea 2003; Boehm 2011) with the added use of poisons even providing a certain anonymity (D’Errico et al. 2012) for example. Added to which the use of sea-craft make it possible to move in new and more rapid ways along productive coasts (Bailey and Milner 2002). However dispersals are rapid inland as well as along coasts and moreover technological developments occur well after 100,000 BP. New technologies still fail to explain the motivations at work. Conversely strong motivations may have been the prompt for the development and use of new technologies which both made it *easier to punish offenders*, and *easier to get away*.

We can be quick to attribute global expansion to some new elevated cognitive capacity of our own species. Yet thinking skills and cognitive complexity cannot explain a propensity not seen in other species to take risks in *sal-tation style movements* into new terrain (which would often have been unsuccessful). Human populations cannot have failed to understand the risks involved in setting out in small craft into unknown and often dangerous open water, nor across deltas or mountain ranges. With no ecological push factor such journeys hardly reflect what might be termed a sensible decision grounded in sophisticated analytical reasoning alone.

The *moral dynamics* recorded in modern hunter-gatherers provide a potential explanation.

The potential for dispersion through moral disputes in modern hunter-gatherers

Complex social or moral emotions motivate movements in entirely new ways, and which extend beyond the elements of small scale hunter-gatherer mobility involved in

'mapping onto' changing resources. Young men amongst the Baka of Cameroon and Gabon for example travel great distances to learn innovative craft skills in the hope of proving their worth and being more desirable to women (Hewlett 2013). However it is disputes and conflict motivated by moral emotions which provide the most *energy* to movements. Serious moral conflicts in small scale hunter-gatherers (without complex hierarchical social relationships) may not appear to be a common occurrence within the timescales visible to ethnographic study. However *within archaeological timescales* the episodic eruption of serious moral disputes, which are often serious and heartfelt, motivating mobility and potentially dispersion become frequent.

Small scale hunter-gatherers are in fact so renowned for their harmony or *conviviality* and their collaborative ethics that conflicts are rarely a focus of study. Wrangham calculates on the basis of Burbank's twelve year study of Arnhem Land aboriginal populations in Australia that rates of intragroup aggression in hunter-gatherers are of the order of 200–300 times lower than chimpanzees (Wrangham et al. 2006 after Burbank 1992). However the maintenance of common harmony and of the collaborative ethics on which their survival depends relies on the darker side of collaborative motivations as much as the light side, and on the *possibility* of serious dispute. Group members must share a willingness to enter into serious and potentially life threatening conflict to preserve collaboration *should the need arise*. If recalcitrant transgressors were not reformed or removed a single cheat, bully or exploiter would make the collaboration on which such groups depend impossible to sustain. Serious moral disputes thus arise episodically. Boehm comments '*It seems to be a characteristic of forager bands that most of the time social life proceeds harmoniously, even though once in a while serious problems erupt*' (Boehm 1999: 84). Marshall documents four flare ups of serious discord amongst the Nae-Nae Jo'Huansi over a period of a year and a half amongst two bands of 60–75 people (Marshall 1998: 71) for example. These disputes tend to be driven by perceived betrayals of commitments from those to friendships or mates to betrayals of group interests or shared principles, and can draw in the whole group, particularly with no dominant authority and thus few ways of resolving such disputes internally (Boehm 2011). Conflicts over egalitarian or moral principles are most divisive, most difficult to resolve and most likely to involve everyone. Far from frequent to human experience it is over *archaeological* timescales that such irreconcilable disputes become potentially significant.

The politics of 'simple' hunter-gatherers are by no means simple, and it is complex judgements of emotional commitments or *trust* which structure hunter-gatherer social dynamics. Signs of positive motivations towards others, not only through positive behaviour but also emotional signs such as pleasure at their gain or remorse if causing harm, contribute to a high *trust metric*, which leads to greater support from others, whilst signs of selfish behaviour detract from it (Gottman 2011; Spikins 2012). The pay-offs for being widely trusted are seen over the long term.

Thus amongst the Martu of Western Australia for example those showing greatest spontaneous generosity were favoured as a hunting collaborators (Bird and Power 2015) whilst amongst the Ache of Paraguay a similar history of past generosity lead to greater support when ill or elderly (Gurven et al. 2000). Within large scale alliances Weissner documents how amongst the Jo'Huansi following a time of food shortages due to high winds and destruction of the mongongo nuts in /Xai/xai half of the population moved in with distant allies, cemented through visit and gift giving, who they could trust to support them at their cost, and without whom survival would have been impossible (Weissner 2002). Even minor transgressions reduce trust and ultimately one's chances of survival, whilst being prepared to punish such transgressions at one's own risk increase one's *trustworthiness*.

Declines in trust can often be reconciled if offenders are seen to have been punished, and to feel shame or guilt. Cheating or attempts at dominance can thus often be solved at an early stage by group sanctions such as ridicule or gossip which function to 'bring down' someone considered to be an upstart (see **Table 2**). Turnbull explains an incident amongst the Mbuti of the Ituri Forest of Zaire for example in which Cephu placed his hunting nets in front of others, unfairly catching more game (Turnbull 1961: 91–101). Cephu's 'cheating' was so severe a transgression that everyone united in publicly ridiculing him. Turnbull suspected that Cephu had hoped to move away with his own group but after this incident he was left without enough allies to make a separate hunting party and was forced swallow his pride and express his remorse in grovelling apology.

Sanctions such as ridicule and ostracism reflect a certain emotional distancing from an offender, and desires to punish, with the possibility of future reconciliation. Bird-David for example describes the case of a woman amongst the Nyaka of southern India who was ostracised following taking food and refusing to share (Bird-David 1990) and the anthropologist Jean Briggs was ostracised for three months by the Canadian Inuit for displaying anger (Briggs 1996). Ostracism is a highly painful experience, itself

Counter-dominance tactic	Number of societies in which observed ethnographically
Display of negative public opinion	10
Criticism	6
Ridicule	5
Disobedience	7
Deposition (overthrow)	9
Fission	17
Exile	2
Execution	10

Table 2: Counter-dominance tactics – data on 48 small scale societies with egalitarian tendencies from Boehm 1993: 232.

provoking movements. Moreover the so-called ‘Dobby Effect’, our common self-punishment in response to feelings of guilt, and arising from an evolutionary history of punishment for transgressions, which might be mitigated through remorseful prior self-punishment (Nelissen 2012), may also come in play. Pre-emptively *ostracising oneself* by moving far away from others may also have functioned as a form of reprisal reducing self-punishment.

Declines in trust can pass a threshold point after which there is no going back, and reconciliation, at least in the immediate term is impossible. Pre-emptive movements to *prevent disputes escalating* are a common reason for shifts in band composition amongst hunter-gatherer populations (Lee 1979), to the extent that a social sorting of groups with different perspectives can be identified (Apicella et al. 2012). The mobility of both males and females further ensures that potential conflicts can be resolved through mobility (Hill et al. 2011). Shifts of composition of bands to accommodate complex changes in allegiances and prevent irreconcilable disputes turning into a crisis might not necessarily provide the more extreme impetus to set out to settle unoccupied regions which Uvigsakavik experienced, however they may have played a role. Moreover the widespread *within region* mobility that complex moral and political alliances and disagreements promotes in turn certainly provide an environment in which like-minded allies will be aware of each other and new groups can easily be formed.

The continued proximity of a transgressor can provoke intense anger and violent responses leading not only to *enforced* exile but also *capital punishment* of offenders. In a cross cultural study of 50 Pleistocene forager type societies Boehm records cases of moral conflict leading to sudden capital punishment for anti-social behaviour recorded for 24 of them (see **Table 3**). Almost all of these cases were ‘commitment offences’ i.e. derived from a failure to commit to group interests and norms (group intimidation, sexual transgression, taboo violation) or to personal loyalties (theft, adultery or other betrayal) see **Table 3** (Boehm 2014; Knauff et al. 1991). Expulsions and killings are also recorded for what appear to be relatively

minor crimes such as being *quarrelsome* (for example amongst the Iliaura of north central Australia, Boehm 1993, after Spencer and Gillen 1976: 263), *bossiness* (for the Jo’Huansi, Lee 1979), being *angry* (for the Canadian Inuit, Briggs 1996) *lying* or *cheating* (for example amongst the Mbuti, Turnbull 1961).

Moral disputes based on perceived *betrayals of trust* provide ample motivations to leave a group, and on occasions to take allies and find somewhere new, whether to prevent the escalation of aggression, to avoid humiliation or the pain of ostracism or to *get quickly out of harm’s way*.

The effects of moral conflicts on dispersal

Even at a conservative estimate that moral disputes might prompt new and distant colonies to be formed every 25 years, and such founding populations might travelling only 250km (half that travelled by Uvigsakavik) egalitarian dynamics would prompt dispersal at a rate of 1000km every century (or 10km per year). More rapid movements might be expected if using boats, such as hypothesised along the coast of the Americas and into Australia. Thus the elevated rate of Late Pleistocene dispersal is easily explained through deliberate responses to move away through moral conflict.

A motivation to *put some distance or barrier between oneself and former friends, lovers or allies* also explains why the nature of modern human dispersal is one of *saltation events* rather than gradual creep. Barriers such as mountain ranges or sea crossings can even be *an attraction* to movement of human populations under the influence of moral conflicts. The region of the Red Sea provides one such example. During the last glacial cycle there have been several periods when the Bab-El-Mandeb straits were crossable even without strong seaworthy boats (Bailey 2010). Such a topographic feature might thus have provided precisely the kind of barrier (which remains crossable back again when tempers might have calmed) which could be particularly attractive to founding populations of transgressors and their allies, explaining substantial archaeological evidence for movements into the Arabian Gulf. From the perspective of founding populations, like

Type of deviance	Specific deviance	Societies reporting
Intimidation of group (21 reports)	Intimidation by malicious sorcery	11
	Repeated murder	5
	Action otherwise as tyrant	3
	Psychotic aggression	2
Sexual transgression (6 reports)	Incest	3
	Adultery	2
	Premarital sex	1
Taboo violation (5 reports)	Endangers group by violating taboo	5
Miscellaneous (4 reports)	Betray group to outsiders	2
	‘Serious’ or ‘shocking’ transgression	2
Unspecified deviance (7 reports)		7

Table 3: Instances of capital punishment in 50 Pleistocene type foraging societies (after Boehm 2014: 36).

that led by Uvigsakavvik, the Bab el Mandeb straits might be seen as a *fortuitous no man's land*. Likewise undertaking a risky sea crossing to Australia becomes more understandable if one hopes to deter any heated reprisals. Any small group heading out to sea, perhaps in the dead of night, could not have been followed by even the most ardent of individuals seeking revenge.

Why did moral disputes become significant after 100,000 bp?

Might there have been a critical threshold leading to a widespread dependence on emotional commitments, along with their 'darker side' motivating dispersals, would explain a significant transition occurring after 100,000 years ago?

Some of the key elements of human emotional commitments are likely to be of some antiquity, present perhaps in the last common ancestor between humans and other apes. Our nearest relatives, chimpanzees, feel empathy (an appropriate response to another's emotion) and even compassion (being motivated by suffering to actively help others) (de Waal 2008) and moreover occasionally a whole chimpanzee group has even been recorded uniting to expel overly dominating males (Flack and de Waal 2000; Boehm 2011; Whiten and Erdal 2012). This tentative capacity to *bring down* a dominating individual, seems to indicate both a capacity for *altruism* and a sense of *unfairness*, termed by Flack and de Waal the *building blocks of morality* (Flack and de Waal 2000).

Chimpanzees can collaborate, however they do so *pragmatically* rather than through emotional commitments, and moreover *competition* is the norm within their social relationships. There is no good evidence for more complex moral emotions, such as gratitude, revenge or spite in chimpanzees (Jenson et al. 2006), and whilst alliances with some degree of interdependence exist these are based on the returns of favours (Shino and Aureli 2010). Indeed with no sense of *loyalty* chimpanzees drop allies quickly should they no longer be useful, such as if losing rank or being ill or injured (Gilby et al. 2014), and moreover expect no repercussions. Individuals enter conflicts motivated only by personal gain (Watts and Mitani 2001) and the 'punishment' of an individual by one who has no direct personal gain from intervention, is extremely rare (Boehm 2011; Riedl et al. 2012). The costs of such *pragmatism* is that cooperation (such as in food sharing or hunting) is limited. Violence is common (Wrangham et al. 2006) and there are many records of lethal within group aggression (Kaburu 2013) but the social organisation of chimpanzees both within and between groups prevents such violence leading to movements. Aggressive attacks are initiated by superiors and subordinates pragmatically have no option but to be submissive and accept aggression. Furthermore only females can occasionally move between groups without being attacked and killed by patrols (Boesch et al. 2008). Chimpanzee communities thus have a remarkable stability in composition even over periods of hundreds or thousands of years, as illustrated by genetic studies of Y chromosome distinctions (Langergraber 2014). There is no evidence for any effective founding populations forming new communities. (see **Figure 2A**).

There have been few ecological pressures driving chimpanzees towards greater collaboration. However in more risky environments and under selective pressures to find new ways to buffer shortfalls and risks, to find food and to defend themselves we see the gradual emergence of mutual interdependence and emotional commitments in hominins (Spikins 2012; 2015; Tomasello and Vaish 2013). Widespread emotional investments beyond immediate kin, including collaborative breeding and food sharing appear to have been the key to allowing early hominins not only to survive in difficult and variable environments but also to move into a new ecological niche which included collaborative hunting and fostered subsequent brain expansion (Whiten and Erdal 2012). The significance of positive reputations and trust within social dynamics appears to emerge around two million years ago (Spikins 2012) becoming well in evidence by around 450,000 years ago as shown in both collaborative hunting and care for the vulnerable (Spikins 2015). Increasing pressures on social, cultural and in turn emotional complexity appearing to be taking place (Taçon 2006; Gamble et al. 2011). In these societies being affiliative rather than competitive seems to pay off, at least within the group.

Tomasello and Vaish argue that a key evolutionary transition occurs between mutual interdependence within a group, and a wider *collaborative morality* and willingness to enforce social norms (Tomasello and Vaish 2013). This collaborative morality depends on both evolved emotional complexity as well as socio-cultural context. It may be this transition, building on existing group based emotional commitments, that we see occurring after 100,000 BP (see **Figure 2B**). Certainly it is after this point that we see archaeological evidence for widespread large scale alliances in exchanges of non-functional gifts and greater mobility in terms of movements of raw materials suggesting that a certain shared morality allowed external alliances to form (Balme and Morse 2006; D'Errico and Stringer 2011). Archaeological evidence after this point suggests a pattern of low levels of overall violence, interspersed with sporadic outbreaks such as that seen in egalitarian hunter-gatherers today, as well as isolated occurrences of individual killings similar to those we recorded as deriving from sexual jealousies, counter-dominance tactics and reprisals for betrayed loyalties in ethnographically documented contexts (Boehm 2011; Roksandic et al. 2006; Spikins 2008). A pattern of difficult to resolve (albeit rare) moral conflict followed humans moving out of Africa after 100,000 BP might also be indicated by the association between the spread of the L3 haplotype groups out of Africa and ritualised violence, a sign of social measures developed to curb the spread of serious disagreements (Moreno 2011). Moreover genetic and linguistic evidence supports a pattern of a sequential expulsion of small founding populations (Atkinson 2011) and several migrations out of Africa (Reyes-Centeno et al. 2015) which would fit with a pattern of dispersal events due to moral disputes.

The precise factors influencing the post 100,000 year transition to *collaborative morality* may be complex. We may be tempted to infer that modern humans as a species,

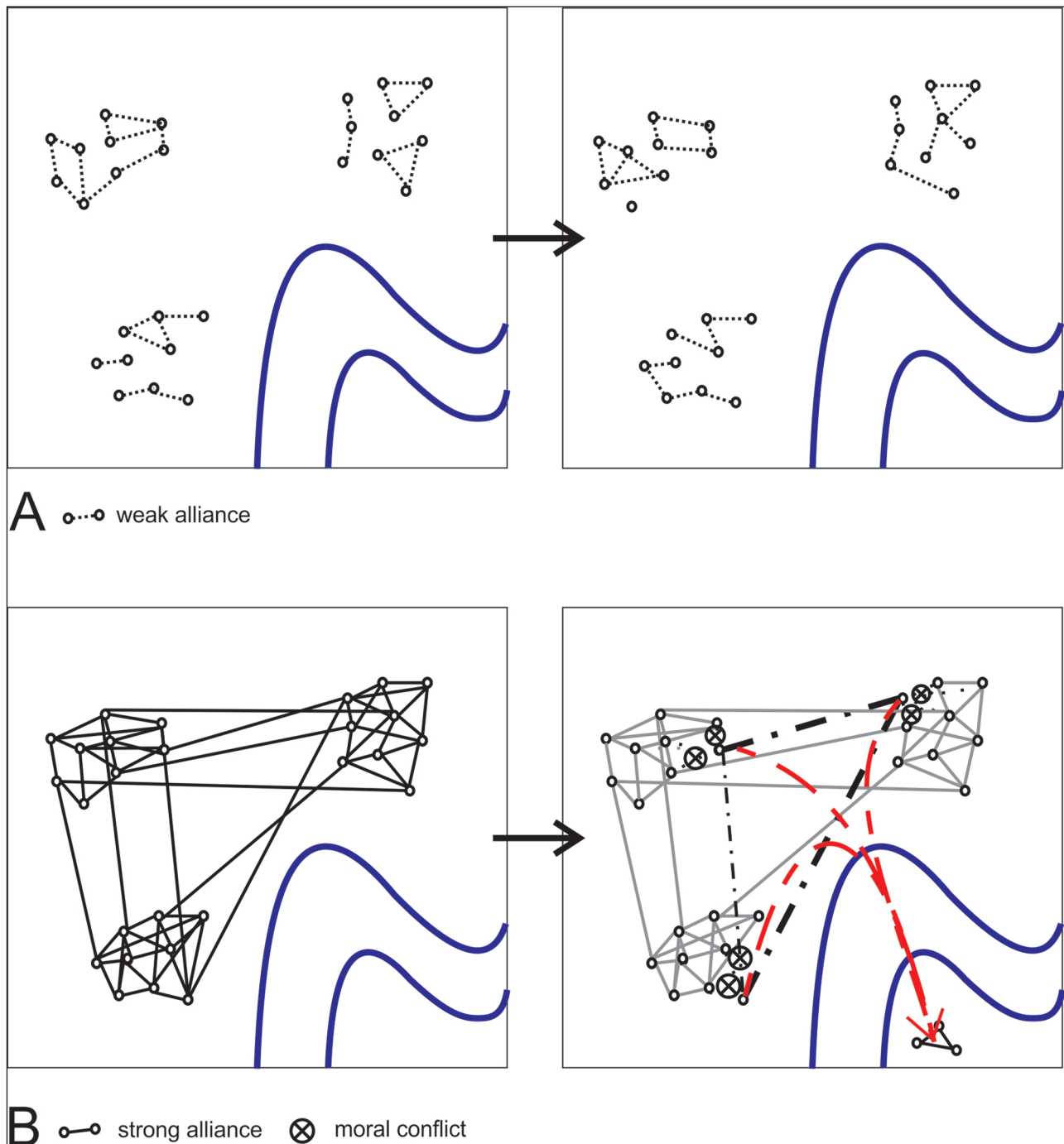


Figure 2: The effect of nature of alliances on dispersal. A) *Social relationships prior to widespread emotional commitments and emotional complexity:* Weak alliances are often and easily broken. Few if any alliances between groups and very limited mobility. B) *Social relationships based on widespread emotional commitments and emotional complexity:* Strong alliances are rarely broken, but result in strong motivations to repel those who have 'betrayed' commitments when they are. Alliances between groups, and much mobility. Motivations to repel (or create distance from previous allies) can prompt the creation of new colonies.

emerging in Africa, were simply more emotionally complex than other species, and that this alone allowed them to pass a transition point where widespread egalitarianism based on complex moral emotions and commitments was the norm. This may well have been the case. Certainly the social structures of archaic species seem to have been notably less fluid. Neanderthals appear to have practiced patrilocal residence for example (with only females moving between groups, Lalueza-Fox et al. 2011)

as well as frequent, and presumably pragmatic, inbreeding (with matings often between half-siblings, Prüfer et al. 2014). However it is equally possible that archaic humans were prevented from moving into widespread egalitarian dynamics by other factors such as a low population density. Equally such societies may have been emotionally complex but in their own way. Neanderthals and other archaics may have found other solutions to collaboration and have danced to their own tune in emotional terms

(Spikins et al. 2014). More evidence and a better understanding of archaic social dynamics may make the transition to societies based on widespread and dynamic moral commitments, along with their darker side, better understood.

Conclusions

'Heaven has no rage like love to hatred turned, Nor hell a fury like a woman scorned'

William Congreve (1697) *The Mourning Bride* (Act III, Scene VIII)

Betrays of trust are strong motivators of behaviour. The resultant moral disputes and associated 'dark side' of collaboration are argued to provide the missing factor to understanding Late Pleistocene dispersal. Strong motivations which form part of egalitarian dynamics can push previous allies who appear to have betrayed commitments into putting some distance (or barriers) between themselves and an origin population and provide an explanation for the enigmatic speed and character of human dispersals after 100,000 years ago. Such repulsion events, whilst rare within the timescales of ethnographic study, become frequent over archaeological timescales. Active colonisations, such as a sea crossing to Australia, are difficult to explain through immediate pragmatic choices, but easy to explain through the episodic rise of the strong motivations to harm others even at one's own expense which widespread emotional commitments bring. Moral conflicts provoke substantial mobility, added to which the furious ex ally, mate or whole group with a poisoned spear or projectile intent on seeking revenge or justice are a strong motivation to get away, and to take almost any risk to do so.

Whilst we view the global dispersal of our species as a symbol of our success part of the motivations at the heart of such movements more probably reflect a darker, if no less strictly collaborative, side to human nature.

Competing Interests

The author declares that they have no competing interests.

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