



# Zoon politikon: The evolutionary origins of human socio-political systems

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## ABSTRACT

We deploy the most up-to-date evidence available in various behavioral fields in support of the following hypothesis: The emergence of bipedalism and cooperative breeding in the hominin line, together with environmental developments that made a diet of meat from large animals adaptive, as well as cultural innovations in the form of fire, cooking, and lethal weapons, created a niche for hominins in which there was a significant advantage to individuals with the ability to communicate and persuade in a moral context. These forces added a unique political dimension to human social life which, through gene-culture coevolution, became *Homo ludens*—Man, the game player—with the power to conserve and transform the social order. *Homo sapiens* became, in the words of Aristotle's *Nicomachean Ethics*, a *zoon politikon*.

We are caught in an inescapable network of mutuality, tied in a single garment of destiny.

Martin Luther King

There is no such thing as society. There are individual men and women, and there are families.

Margaret Thatcher

**C:** On what is power based in chimpanzee society?

**HG:** The physical prowess of the alpha male.

**C:** On what was power based in the societies of our human ancestors?

**HG:** On the power to persuade and to lead creatively.

**C:** How do you know this?

**HG:** The short answer is that humans are extremely gracile and delicate, with only a small fraction of the physical power of other primate species.

For the long answer, read on.

Choreographer interview

## 1. Accounting for human exceptionalism

We deploy the most up-to-date evidence available in various behavioral fields in support of the following hypothesis: The emergence of bipedalism and cooperative breeding in the hominin line, together with environmental developments that made a diet of meat from large animals adaptive, as well as cultural innovations in the form of fire, cooking, and lethal weapons, created a niche for hominins in which

there was a significant advantage to individuals with the ability to communicate and persuade in a moral context.<sup>1</sup> These forces added a unique political dimension to human social life which, through gene-culture coevolution, became *Homo ludens*—Man, the game player—with the power to conserve and transform the social order. *Homo sapiens* became, in the words of Aristotle's *Nicomachean Ethics*, a *zoon politikon*.

Strong social interdependence plus the availability of lethal weapons in early hominin society undermined the standard social dominance hierarchy, based on pure physical prowess, of multi-male/multi-female primate groups, characteristic, for instance, of chimpanzees. The successful political structure that ultimately replaced the ancestral social dominance hierarchy was an egalitarian political system in which the *group controlled its leaders*. Group success depended both on the ability of leaders to persuade and motivate, and of followers to submit to a consensual decision process. The heightened social value of non-authoritarian leadership entailed enhanced biological fitness for such traits as linguistic facility, political ability, and indeed for human hypercognition itself.

This egalitarian political system persisted until cultural changes in the Holocene fostered the accumulation of material wealth, through which it became possible again to sustain a social dominance hierarchy with strong authoritarian leaders atop.

## 2. Models of political power

The behavioral sciences during the second half of the twentieth

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century were dominated by two highly contrasting models of human political behavior. In biology, political science, and economics, a *Homo economicus* self-interest model held sway. In this model, individuals are rational self-regarding maximizers (Downs, 1957; Alexander, 1987; Mas-Colell et al., 1995). Sociology, social psychology, and anthropology, by contrast, embraced a *cultural hegemony* model. In this model, individuals internalize the cultural principles of the society in which they operate. In this view, a dominant culture supplies the norms and values associated with role-performance, and individual behavior meets the requirements of the various roles individuals are called upon to play in daily life (Durkheim, 1902; Mead, 1963; Parsons, 1967). Contemporary research has been kind to neither model.

*Contra* cultural hegemony theory, daily life provides countless examples of the fragility of dominant cultures. African Americans in the era of the civil rights movement, for instance, rejected a powerful ideology justifying segregation, American women in the 1960s rejected a deep-rooted patriarchal culture, and gay Americans rejected traditional Judeo-Christian treatments of homosexuality. In succeeding years, each of these minority counter-cultures was adopted by the American public at large. In the Soviet Union, Communist leaders attempted to forge a dominant culture of socialist morality by subjecting two generations of citizens to intensive indoctrination. This effort was unsuccessful, and was rejected rather decisively, immediately following the fall of the Soviet regime. Similar examples can be given from political experience in many other societies.

There has always been an undercurrent of objection to the cultural hegemony model, which Wrong (1961) aptly called the “oversocialized conception of man.” Lorenz (1963), Ardrey (1997[1966]), and Morris (1999[1967]) offered behavioral ecology alternatives, a line of thought culminating in Edward O. Wilson's *Sociobiology: The New Synthesis* (1975), the resurrection of human nature by Brown (1991), and Leda Cosmides and John Tooby's withering attack in *The Adapted Mind* on the so-called “standard social science model” of cultural hegemony (Barkow et al., 1992). Meanwhile, the analytical foundations of an alternative model, that of *gene-culture coevolution*, were laid by Geertz (1962), Dobzhansky (1963), Wallace (1970), Lumsden and Wilson (1981), Cavalli-Sforza and Feldman (1973, 1981), Boyd and Richerson (1985) and Durham (1991). This gene-culture coevolution model informs our analysis of the evolution of human socio-political systems.

Undermining the self-interest model began in economics with the advent of game theory, which models the behavior of individuals when the payoff to each depends on the strategic interaction of all. Of particular importance was the ultimatum game experiments of Güth et al. (1982) and Roth et al. (1991). In the ultimatum game, one subject, called the “proposer,” is presented with a sum of money, say \$10, and is instructed to offer any portion of this, from nothing to the full \$10, to a second subject, called the “responder.” The two subjects never learn each other's identity, and the game is played only once. The responder, who knows that the total amount to be shared is \$10, can either accept the offer or reject it. If the responder accepts the offer, the money is shared accordingly. If the responder rejects the offer, both players receive nothing. If the players care only about their own payoffs and have no concern for fairness (i.e., they are self-interested), a rational responder will always accept any positive amount of money. Knowing this, a rational proposer will offer \$1, and this will be accepted.

When the ultimatum game is actually played, however, this self-interested outcome is almost never observed and rarely even approximated. In many replications of this experiment in more than 30 countries, under varying conditions and in some cases with substantial amounts of money at stake, proposers routinely offer responders very generous shares, 50% of the total generally being the modal offer. Responders frequently reject offers below 25% (Roth et al., 1991; Camerer and Thaler, 1995; Camerer, 2003; Oosterbeek et al., 2004).

In post-game debriefings, responders who have rejected low offers often express anger at the proposer's greed and a desire to penalize unfair behavior. The fact that positive offers are commonly rejected

shows that responders have fairness concerns, and the fact that most proposers offer between 40% and 50% of the pie shows that proposers too have fairness concerns themselves, or at least understand that responders' fairness concerns would motivate them to reject low offers. Of special interest are those who reject positive offers. The explanation most consistent with the data is that they are motivated by a desire to punish the proposer for being unfair, even though it means giving up some money to do so. While initially considered odd, these and other experimental results violating the self-interest axiom are now commonplace.

These and related findings have led in recent years to a revision of the received wisdom in biology and economics toward the appreciation of the central importance of *other-regarding preferences* and *character virtues* in biological and economic theory (Gintis et al., 2005; Henrich et al., 2005; Okasha and Binmore, 2012). It might reasonably be thought, however, that these behaviors are the product of the culture of advanced complex societies. To assess this possibility, a team of anthropologists ran ultimatum game experiments in which the subject pool consisted of members of fifteen small-scale societies with little contact with markets, governments, or modern institutions (Henrich et al., 2004). The fifteen societies included hunter-gatherers, herders, and low technology farmers.

This study found that many small-scale societies mirror the results of the advanced economies, but others did not. Among the Au and Gnao people in Papua New Guinea, ultimatum game offers of more than half the pie were common. Moreover, while even splits were commonly accepted, both higher and lower offers were rejected with about equal frequency. This behavior is not surprising in light of the widespread practice of *competitive gift giving* as a means of establishing status and subordinacy in these and many other New Guinea societies. By contrast, among the Machiguenga in Amazonian Peru, almost three-quarters of the offers were a quarter of the pie or less and yet there was just a single rejection among 70 offers. This pattern was strikingly different from the standard experiments in advanced economies. However, even among the Machiguenga, the mean offer was 27.5%, far more than would have maximized the proposer's payoffs given the scant likelihood of a rejection.

Analysis of the experiments led to the following conclusions: (a) behaviors are highly variable across groups; (b) not a single group conformed to or even approximated the model of self-interested agents; and (c) despite the anonymous and asocial setting of the experiments, between-group differences in behavior reflected differences in the kinds of social interaction experienced in everyday life; i.e., people generally conform to cultural rules of their societies *even when there is no chance a deviation will be punished*.

The evidence for this latter conclusion is compelling. For example, the Aché in Paraguay share equally among all group members some kinds of food (meat and honey) acquired through hunting and gathering. In our experiment, most Aché proposers contributed half the pie or more. Similarly, among the Lamalera whale hunters of Indonesia, who hunt in large crews and divide their catch according to strict sharing rules, the proposer's average allocation to the responder was 58% of the pie. Moreover, the Indonesian whale hunters played the game very differently from the Indonesian university students who were the subjects in another set of experiments (Cameron, 1999). Indeed, where voluntary public goods provision was customary in real life (for example, the *Harambee* system among the Orma herders in Kenya, whereby individuals contribute resources to build a school or repair a road), contributions in the experimental public goods game were patterned after actual contributions in the actual *Harambee* system. Those with more cattle contributed more. By contrast, in the ultimatum game, for which there apparently was no everyday life analogue, the wealthy and non-wealthy Orma behaved similarly.

### 3. The moral basis of modern political systems

The untenability of the self-interest model of human action is also clear from everyday experience. Political activity in modern democratic societies provides unambiguous evidence. Note that in large elections, the rational self-regarding agent will not vote because the costs of voting are positive and significant, but the probability that one vote will alter the outcome of the election is vanishingly small, and adding a single vote to the total of a winning candidate enhances the winner's political efficacy at best an infinitesimal amount (Riker and Ordeshook, 1968). Thus the personal gain from voting is too small to motivate behavior. For similar reasons, if one chooses to vote, there is no plausible reason to vote on the basis of the impact of the outcome of the election on one's personal material gains. It follows also that the voter, if rational, self-regarding, and incapable of personally influencing the opinions of more than a few others, will not bother to form opinions on political issues, because these opinions cannot affect the outcome of elections. Yet people do vote, and many do expend time and energy in forming political opinions. Although voters do appear to behave strategically (Feddersen and Sandroni, 2006), their behavior does not conform either to the self-interest model (Edlin et al., 2007) or the rational actor model of contemporary decision theory (Savage, 1954).

It also follows from the logic of self-regarding political behavior that rational self-regarding individuals will not participate in the sort of collective actions that are responsible for the growth in the world of representative and democratic governance, the respect for civil liberties, the rights of minorities and gender equality in public life, and the like. In the self-interest model, only small groups aspiring for social dominance will act politically. Yet modern egalitarian political institutions are the result of such collective actions (Bowles and Gintis, 1986; Giugni et al., 1998). This behavior cannot be explained by the self-interest model.

Except for professional politicians and socially influential individuals, electoral politics is a vast morality play to which models of the rational self-regarding actor are not only a poor fit, but are conceptually bizarre. It took Mancur Olson's *The Logic of Collective Action* (1965) to make this clear to many behavioral scientists, because virtually all students of social life had assumed without reflection the faulty logic that rational self-regarding individuals will vote, and will “vote their interests” (Downs, 1957).

Defenders of the *Homo economicus* model may respond that voters believe their votes make a difference, however untenable this belief might be under logical scrutiny. Indeed, when asked why they vote, voters' common response is that they are trying to help get one or another party elected to office. When appraised of the illogical character of that response, the common reply is that there are in fact close elections, where the balance is tipped in one direction or another by only a few hundred votes. When confronted with the fact that one vote will not affect even such close elections, the common reply is, “Well, if everyone thought like that, we couldn't run a democracy.”

Politically active and informed citizens appear to operate on the principle that voting is a prerogative of citizenship, an altruistic act that is governed by the categorical imperative: act in conformance with the morally correct behavior for individuals in one's position, without regard to personal costs and benefits. Such mental reasoning, which is built on our urge to conform and our shared intentionality (Tomasello and Carpenter, 2007), is implicated in many uniquely human cognitive characteristics, including cumulative culture and language (Sugden, 2003; Bacharach, 2006). Shared intentionality rests on a fundamentally prosocial disposition (Gilbert, 1987; Bratman, 1993; Tomasello and Carpenter, 2007; Hrdy, 2009).

### 4. The socio-political structure of primate societies

Humans are one of more than two hundred extant species belonging to the Primate order. All primates have socio-political systems for

regulating social life within their communities. Understanding human socio-political organization involves specifying how and why humans are similar to and differ from other social species in general, and other primate species in particular.

Concerning the latter, there are two major sources of information. First, some traits are distributed widely and linked to other well-known traits, and thus were almost certainly already present before humans evolved. For instance, many primate species, including humans and our closest living relatives, seek to dominate others and are adept at forming coalitions. It is thus likely that their most recent common ancestor also possessed these traits. Dominance-seeking and coalition-formation in humans, then, are not purely cultural. Rather, humans are endowed with the genetic prerequisites for this behavior, as are numerous other primate species (Wrangham and Peterson, 1996).

A second source is similarity with our close relatives, the great apes, and especially the genus *Pan* (chimpanzees and bonobos). Most non-human primate species have great trouble in acting collectively in conflict with neighboring groups (Willems et al., 2013). Chimpanzees are a major exception: they engage in war-like raids where larger parties cooperate closely to target and destroy much smaller ones (Goodall, 1986; Wilson, 2012). War among human hunter-gatherers likewise largely consists of such a raiding strategy (Keeley, 1996), suggesting a shared predisposition to engage in this type of warfare (Wrangham and Glowacki, 2012). Obviously, the dramatic changes in human social organization accompanying the origin of defensible wealth (discussed below) produced major changes in the nature of warfare, linked to additional genetic predispositions, such as insider favoritism (LeVine and Campbell, 1972; Otterbein, 2004; Bowles, 2006, 2009; Bowles and Gintis, 2011).

Using this logic, we can examine the social structure of multi-male/multi-female primate societies (de Waal, 1997; Maestripieri, 2007) to identify the elements of human socio-political organization that were already likely present among the first hominins.

Primates live in groups to reduce the risk of predation (Alexander, 1974; van Schaik, 1983), exchange information about food location (Eisenberg et al., 1972; Clutton-Brock, 1974), and defend food sources and mates against competing groups (Wrangham, 1980). These groups, however, rarely engage in organized collective action. As a result, the primate form of group living has only limited need for leaders, that is, individuals instrumental in initiating and coordinating group-level action with the approval and support of other group members. Instead, individuals vary in dominance based on motivation and pure physical prowess, and dominant males gain fitness at the expense of subordinate members of the group. This is especially true for our closest relatives, the genus *Pan*. As King et al. (2009) stress, other species do often have foraging leaders, but their power is based on hierarchical dominance rather than consensus. Despite the fact that such leaders of the hunt appropriate most of the spoils, followers must stick with the group to avoid predation while grabbing what little of the catch they can (King et al., 2008; Krauss et al., 2009).

In most primate species, both sexes form dominance hierarchies, in which more dominant individuals gain privileged access to food and mates, and as a result tend to have higher fitness (Vigilant et al., 2001; Maestripieri, 2007; Majolo et al., 2012). In many primate species, dominant females depend on alliances to maintain their position, whereas the same is true for males in far fewer primate species (van Schaik, 1996), most notably chimpanzees. Thus dominants rarely perform any group-level beneficial acts. One exception is male displays toward predators, a behavior seen in a variety of primate species, and generally linked to the protection of likely offspring. Another is triadic power interventions (e.g., Boehm, 1994; de Waal, 1996) that end conflicts in apes and certain monkey species.

#### 4.1. The origins of primate socio-political structure

Given the variety of contemporary primate socio-political

structures, what can we say about the social structure of the most recent common ancestor of contemporary primates, the species from which the hominin species leading ultimately to *Homo sapiens* branched off? Our answer is based on the fact that traits shared by several closely related species were very likely shared by their most recent common ancestor. The challenge is that primates exhibit a wide variety of socio-political structures. However, if we limit our sample to species living in woodlands and open savannah that engage in collective defense and confrontational scavenging from large carnivores, which was the probable condition faced by the primates' most recent common ancestor, all extant species live in large, multi-male/multi-female groups.<sup>2</sup> Thus at least from *Homo habilis* on, hominins likely lived in large multi-male/multi-female groups (Foley, 1996; Dunbar, 2005).

Recently, sophisticated phylogenetic approaches have added precision to these inferences by reconstructing the origin of various kinds of social organization in deep time (Silk, 2011). Shultz et al. (2011) completed a study based on the genetic distances and phenotypic social-structural similarities of 217 extant primate species, the most recent common ancestor of which is far more ancient than the ancestral *Pan*. Shultz et al. show that social organization tends to be similar among closely related species, which implies that social structure is determined largely by genes rather than environment in nonhuman primates. This finding runs counter to the alternative assumption that primate social structure is a response to the distribution of food resources or risks and is not affected by phylogenetic affiliation.

Shultz et al. (2011) conclude that the earliest primates lived some 72 Mya as solitary foraging individuals who came together only for mating. Multi-male/multi-female aggregations appeared some 52 Mya. We can infer from the social structure of contemporary nonhuman primate species living in multi-male/multi-female groups that mating was promiscuous and males formed a hierarchical power structure with a single alpha male at the apex. Indeed, most nonhuman primates that live in multi-male groups today exhibit this living pattern (Chapais, 2008). While this social structure is highly stable and has persisted into the present, when suitably stressed it broke down into two social forms in which a social group included only one male. The first, which may have appeared about 16 Mya, was the single-male harem while the second, appearing about the same time, was single pair-living.

The implication is that the earliest hominids lived in multi-male/multi-female promiscuous social bands, so *Pan* are archetypical species when it comes to reconstructing the origins of the human political system. Dominant male chimpanzees provide little leadership, and they provide virtually no parenting. In many primate species, dominant males have sufficiently high paternity certainty to induce them to provide protection to infants (Paul et al., 2000), but in chimpanzees paternity is much less concentrated in top-ranked males (Vigilant et al., 2001; Boesch et al., 2006), most likely because chimpanzee females prefer multiple matings and cannot be controlled by dominant males. Thus males tend to ignore rearing the young. The only clear service dominant males provide to the group is keeping the peace by intervening in disputes and leading predator mobbing (de Waal, 1997; von Rohr et al., 2012). In short, the political structure of chimpanzee society, like that of primates generally, is largely a system for funneling fitness-enhancing resources to the apex of a social dominance hierarchy based on physical prowess and coalition-building talent. This holds basically for the bonobo as well, where monopolization of matings by particular males is even lower.

<sup>2</sup> The grass- and savannah-living Patas monkey (Hall, 1965) is the single exception to the rule that savannah-living primates exhibit a multi-male/multi-female social structure. They avoid predators by staying in trees as much as possible, cryptic behavior, wide group spread, and rapid, with the alpha male acting as a decoy.

#### 4.2. Primate coalitional politics

Chimpanzee males rely significantly on coalitions and alliances. There are two major types of coalition: rank-changing and leveling (Pandit and van Schaik, 2003; van Schaik et al., 2006). Rank-changing occurs when a male relies on supporters to acquire and maintain hegemony (Goodall, 1964; Nishida and Hosaka, 1996; de Waal, 1998), and hence may not have the highest individual fighting ability (de Waal, 1998; Boesch et al., 1998). Leveling occurs when multiple lower-ranking males form coalitions to prevent the top male or males from appropriating too large a share of the resources. These coalitions do not change the dominance ranks of the participants. Females similarly form such leveling coalitions to counter the arbitrary power of dominant males, especially in captivity (Goodall, 1986).

This pattern of political power based on the hierarchical dominance of the physically powerful along with a system of sophisticated political alliances to preserve or to limit the power of the alpha male (Boehm and Flack, 2010) is carried over, yet fundamentally transformed, in human society (Knauff, 1991; Boehm, 2000).

The best predictor for male-male coalitions among primates is simply the fact that multiple males find themselves together and no single male can fully monopolize all matings (Bissonnette et al., 2014). Thus, there are broad similarities in social dominance and coalition-formation across all multi-male/multi-female primate species. This fact runs counter to traditional political theory. Aristotle's *zoon politikon* notwithstanding, political theorists have widely assumed that political structure involves purely cultural evolution, whereas the primate data show roots to political behavior going back millions of years. The primate evidence is important because it lays the basis for an evolutionary analysis of human political systems (de Waal, 1998). Such an analysis may elucidate the role of basic human political predispositions in reinforcing and undermining distinct sorts of human socio-political structures.

#### 5. The evolutionary history of primate societies

It would be useful to be able to read ancient social structure from the historical record. But we cannot. The fossil record provides the most concrete answers to our evolutionary history, but is highly incomplete. There are, for instance, skeletal records of only about 500 individuals from our hominin past. Moreover, behavior does not fossilize and social structure leaves no direct marks in the earth. This is why we must resort to the relationship between phylogenetic proximity and social organization in living primate species (Shultz et al., 2011).

The hominin lineage branched off from the primate main stem some 6.5 million years ago or earlier (Wood, 2010; Langergraber, 2012). The watershed event in the hominin line was the emergence of bipedalism. Bipedalism is well-developed in *Australopithecus afarensis*, which appeared three million years after the origin of the hominin lineage. *Homo ergaster* (2.0–1.3 Mya) or *Homo erectus* (1.9–0.143 Mya) was the first currently documented specialized biped, having a relatively short arm/leg ratio that rendered brachiation infeasible.

Bipedalism in hominins was critically dependent upon the prior adaptation of the primate upper torso to life in the trees. The Miocene Hominoid apes were not true quadrupeds, but rather had specialized shoulder and arm muscles for swinging and climbing, as well as a specialized hand structure for grasping branches and manipulating leaves, insects, and fruit. When the hominin line was freed from the exigencies of arboreal life, the locomotor function of the upper limbs was reduced, so they could be reorganized for manipulative and projectile control purposes. Both a more efficient form of bipedalism and the further transformation of the arm, hand, and upper torso became possible.

Non-hominin primate species are capable of walking on hind legs, but only with difficulty and for short periods of time. Chimpanzees, for instance, cannot straighten their legs, and require constant muscular

exertion to support the body. Moreover, the center of gravity of the chimpanzee body must shift with each step, leading to a pronounced lumbering motion with significant side-to-side momentum shifts (O’Neil, 2012). The hominin pelvis was shortened from top to bottom and, by the time *H. ergaster* emerged, had been rendered bowl-shaped to facilitate terrestrial locomotion without sideward movement, the hominin leg bones became sturdy, the leg muscles were strengthened to permit running, and the development of arches in the feet facilitated a low-impact transfer of weight from leg to leg (Bramble and Lieberman, 2004). The specialized form of bipedality that arose around 2 Mya thus facilitates running efficiently for great distances, although not approaching the speed of many large four-footed mammals.

Today we celebrate specialized bipedality as the basis for human upper-body physical and psychomotor capacities for crafting tools and handicrafts. But another major contribution of these capacities, as we explain below, was for fashioning and using lethal weapons.

## 6. Fire and social sharing

The hominin control of fire cannot be accurately dated. We have firm evidence from about 400,000 years ago in Europe (Roebroeks and Villa, 2011), and about 800,000 years ago in Israel (Alpers-Afil, 2008), but it is likely that this key event had originated in Africa much earlier (Gowlett and Wrangham, 2013). The control of fire had strong effects on hominin cultural and phylogenetic evolution. First, the transition to specialized bipedality is much easier to understand if the hominins that experienced this transition had control of fire (Wrangham and Carmody, 2010). Prior to the control of fire, humans almost certainly took to the trees at night like most other primates, as a defense against predators. Because predators have an instinctive fear of fire, the control of fire permitted hominins, who were already bipedal, to abandon climbing almost completely.

Second, the practice of cooking food was a related cultural innovation with broad gene-culture coevolutionary implications. Cooking favors a central location to which the catch is transported, and hence requires abandoning the competitive, socially uncoordinated “tolerated theft” distribution of calories typical of food-sharing in nonhuman primate species, in favor of a distribution based on widely agreed-upon fairness norms (Isaac, 1977; Blurton-Jones, 1987). This major socio-psychological transition was probably made possible by the adoption of some form of cooperative breeding and hunting among hominins that had begun by the time *H. erectus* emerged (Burkart and van Schaik, 2010). In sum, while the early advent of cooking is not yet firmly established, it is likely that the control of fire and the practice of cooking were an important precondition of the emergence of a human moral order.

Hominins with access to cooked food did not require the large colon characteristic of other primates, which allowed them to reduce the amount of time spent chewing food from the four to seven hours a day characteristic of the great apes, to about one hour per day. With a smaller gut, less need for chewing, and more rapid digestion, hominins were liberated to develop their aerobic capacity and perfect their running ability (Wrangham and Carmody, 2010).

## 7. From gatherer to scavenger

Beginning around 2.5 million years ago there was a major forking in the evolutionary path of our possible ancestors. The Australopithecines branched in at least two—perhaps more but the fossil record in this area is quite incomplete—very different evolutionary directions. One led to the robust Australopithecines and a genetic dead-end by about 1.4 million years ago, and the other very likely led to the first humans.

These diverging evolutionary paths appear to have been the response to novel environmental challenges. Coinciding with this hominin divergence was a shift in the global climate to frequently fluctuating conditions. Early hominins succeeded by learning to exploit the

increased climatic instability (Potts, 1996, 1998; Richerson et al., 2001; O’Connell et al., 2002).<sup>3</sup> The resulting adaptations enhanced hominin cognitive and socio-structural versatility. “Early bipedality, stone transport, ... encephalization, and enhanced cognitive and social functioning,” Potts (1998) argues, “all may reflect adaptations to environmental novelty and highly varying selective contexts.”

A diet based significantly on the flesh and bone marrow of large animals provided a niche for emerging hominins quite distinct from that of other primates and thus selected for the traits that most distinguish humans from apes. This much was clear to Darwin in *The Descent of Man* (1871). However, until recently, most paleoanthropologists assumed that prey was acquired through hunting from the Australopithecine outset (Dart, 1925; Lee and DeVore, 1968; but see Binford, 1985). In fact, it now appears that early hominins, in the transition from the Pliocene to the Pleistocene, were more likely scavenger-gatherers than hunter-gatherers, of which there is firm evidence dating from 3.4 Mya (McPherron, 2010).

The first proponents of early hominins as scavengers believed that the scavenging was “passive,” in that small groups of hominins took possession of carcasses only after other predators, upon being sated, abandoned their prey (Binford, 1985; Blumenshine et al., 1994), but more recent evidence suggests the prevalence of “competitive” or “power” scavenging, in which organized groups of humans sporting primitive weapons chased the killers and appropriated carcasses in relatively intact shape (Dominguez-Rodrigo and Barba, 2006). The implicit argument is that the combination of coordinated collective action and the lethal weapons of the period were sufficient to drive off other predators, and hence presumably to kill certain live prey as well. While a large prey can be driven off a cliff or trapped in a box canyon, it requires powerful weapons to cripple or kill a large predator. Before the advent of poisoned stone-tipped spears and arrows, the active pursuit of large prey was likely impossible (Sahle et al., 2013). The earliest known use of wooden javelins (Keeley and Toth, 1981; Thieme, 1997) suggests medium-size prey.

Flaked stone toolmaking, butchering large animals, and expanded cranial capacity all appear around 3.4 Mya (McPherron, 2010), but there is no evidence that Australopithecines hunted large game. *Australopithecus* and *H. habilis* were in fact quite small, adult males weighing under 100 pounds and females about 75 pounds. Their tools were primitive, consisting of stone scrapers and rough hammerstones. They therefore lacked the sophisticated weapons for hunting large and swift-moving prey, and hence are unlikely to have hunted effectively, but they could well have scavenged. Modern chimpanzees and baboons are known to scavenge the kills of cheetahs and leopards (Medina, 2007), so this behavior was likely in the repertoire of the earliest hominins. With highly cooperative and carefully coordinated maneuvers by use of weapons, they could have chased away even the most ferocious predators.

Hunting and scavenging small animals is not cost-effective for large nonhuman primates, while scavenging large animals requires group participation and efficiently coordinated cooperation, both in organizing an attack on predators feeding on a large prey, and protecting against predators while processing and consuming the carcass (Isaac, 1978). Moreover, use of stones as weapons that might be used to scare off other predators and scavengers (Isaac, 1978) has been questioned (Whittaker and McCall, 2001), but most likely there was an array of tools made of softer materials, very probably including wooden spears,

<sup>3</sup> deMenocal (2011) notes that Darwin (1859) long ago speculated on the role of climate change in human evolution, as did Dart (1925), and that modern findings support the importance of climate-based selection pressures (Vrba, 1995; Potts, 1998), and specifically, climate variability. Potts (1998) examined the environmental records of several hominin localities, finding that habitat-specific hypotheses are disconfirmed by the evidence. By contrast, the variability selection hypothesis, which states that large disparities in environmental conditions were responsible for important episodes of adaptive evolution, was widely supported.

suitable for making bluffing attacks.

Unlike wooden weapons, stones could have been carefully amassed at strategic sites within a large scavenging area, so that when a scouting party located an appropriate food object to scavenge, it could call others to haul the stones to the site of the carcass, as a strategic operation preceding its appropriation (Isaac, 1977). These could have been the first lethal weapons, but carrying wooden spears or clubs would have served equally well to intimidate competing predators, and also would have been useful in killing small game.

## 8. Primitive lethal weapons

Stones are used today in certain contexts by hunter-gatherers as found-objects, and possibly as fashioned projectiles. Isaac (1978) studied stones used by recent foragers, also found in concentrations at Olduvai sites by Leakey (1971), some of which were carefully finished spheroids. She observes that the size and shapes of the Olduvai stones render them appropriate, to use for throwing. Recent foragers do use found-object stones quite effectively as fighting weapons. Isaac (1987) has documented devastating attacks by hunter-gatherers against early encroaching Europeans, when intensive stoning actually proved more effective than musketry in rapidly inflicting serious casualties. This took place at contact in various parts of the world, so the traditions were likely pre-existing.

In Africa, behaviorally modern humans could have used long-range projectile weaponry (atlatl darts and arrows) in conflict for at least 50,000 years (Shea, 2006; Ambrose, 2008; Wadley et al., 2009; Wynn, 2009; Wilkins et al., 2012; Roach et al., 2013). The recent hunting evidence includes a Levalloisian spear point embedded in a prey skeleton (Boëda et al., 1999). Group conflict likely accounts for the limited sampling we do have for humans of Pleistocene death-by-projectiles (Keeley, 1996; Thorpe, 2003), which includes at Grimaldi a child with a point embedded in its spine (27,000–36,000 BP), in the former Czechoslovakia weapons traumas and cranial fractures on adult males (24,000–35,000 BP), in Egypt an adult male with a point embedded in his arm (20,000 BP), and a Nubian cemetery where 40% of the interred exhibited weapon traumas (12,000–14,000 BP). Tacon and Chippendale (1994) have documented Australian rock art dating back to 10,000 BP that depicts armed combat, with increasing numbers of combatants by 4000 BP. In the Holocene armed combat is well-documented and widespread, as in the work of Lambert (1997) on the remains of California Indians which exhibit plentiful head injuries and parrying fractures.

If behaviorally modern human beings have used long-range projectile weapons against prey for at least 50,000 years, doubtless they sometimes turned such weapons against other humans over the same period. A special instance of weapon use is documented in art from Spain's Remigia cave. Human stick figures are shown standing with bows held about their heads while a male lies on the ground with the same number of arrows pincushioning him. There are ten men in the largest of the groups. This may express a group execution theme, or possibly a raid carrying out an act of revenge (see Otterbein, 2004). This art appears to date to the early Neolithic.

Technological developments such as atlatls, bows and arrows, shields, and body armor are all relatively recent. It has been widely suggested that the advent of the spear-thrower (atlatl) arrived rather late, about 30,000 BP, and the bow and arrow later still (e.g., Klein, 1999). But there are recent reports (Lombard and Phillipson, 2010) suggesting that bows and arrows may have been in use as early as about 60,000 BP. Some contemporary groups use poisoned projectiles, and their use in prehistory is now susceptible to study (d'Errico et al., 2012), but further research is needed.

This picture of Pleistocene weapon use is supported by the fact that

the fossils of large animals that have markings on bones indicating hominin flaying and scraping with flaked stone tools are often found with stones that originated several kilometers away. Contemporary chimpanzees carry stones to nut-bearing trees that they use to crack the nuts (Boesch and Boesch-Achermann, 2000), so this behavior was likely available to Australopithecines. Chimpanzees, however, carry stones only several hundred meters at most, whereas *H. habilis* scavengers carried stones as far as ten kilometers, probably because they had invented portable containers (McGrew, 1992).

Neither the Oldowan tools of the early period nor the later and more sophisticated Acheulean tools, which are found from the early Pleistocene up to about 200,000 years ago, show any sign of being useful as hunting weapons. However, besides stones, human power scavengers of 500,000 years ago probably had sharpened and fire-hardened spears to ward off competitive scavengers and threatening predators, at least after the domestication of fire (Thieme, 1997). These weapons could also have been used against conspecifics. By contrast, nonhuman primates use tools, but they do not use weapons in conflictual encounters (Huffman and Kalunde, 1993; McGrew, 2004). In these species there is simply no record of a fashioned or found-object weapon being used to injure or kill a conspecific.

The cognitive potential to invent and use lethal weapons is likely present in the two *Pan* species. However, in nature bonobos and chimpanzees fashion tools for extraction of insect or plant foods, while in both species intimidation displays merely involve found objects being brandished or dragged. Chimpanzees use sticks fashioned from tree branches to impale bushbabies in their tree hollow hiding places (Pruetz and Bertolani, 2007; Gibbons, 2007), so the use of sharpened sticks was thus likely within the cognitive capacity of *H. habilis*. However, there is a considerable distance between using sharp sticks as impaling devices and as well-aimed projectiles (Nishida, 1973).

The first dedicated and unambiguously lethal weapons to appear with excellent preservation in the archeological record are the multiple all-wooden spears documented by Thieme (1997) at Schöningen, with over a dozen butchered wild horses and some bison located nearby. These javelins are both streamlined aerodynamically and well-balanced for effective throwing so they were projectile weapons capable of bringing down medium-sized game at a distance. They also provide a defense against dangerous prey, and they offer hunters a means of threatening other predators away from their kills. These considerations suggest that a paleo-record of lithic weaponry alone is seriously incomplete. What the lithic record does suggest, in its Acheulean continuity, is that this tradition of making wooden spears might also have had great longevity (see Kelly, 2005). The emergence of lethal weapons was likely important in the evolution of hominin social organization (Roach et al., 2013). In hunter-gatherer conflicts hunting weapons quickly become lethal, and even an outnumbered victim can inflict casualties (Lee, 1979; see also Churchill and Rhodes, 2009). Bingham (1999), Gintis (2000), Bingham and Souza (2009), and Boyd et al. (2010) stress the importance of the superior physical and psychomotor capacities of humans in clubbing and throwing projectiles as compared with other primates, citing Goodall (1964) and Plooij (1978) on the relative advantage of humans. Darlington (1975), Fifer (1987), and Isaac (1978) document the importance of these traits in human evolution. Bingham (1999), Boehm (1997), and Okada and Bingham (2008) document that humans have developed the ability to carry out collective punishment against norm violators, thus radically lowering the cost of punishing transgressors. Calvin (1983) argues that humans are unique in possessing the neural machinery for rapid manual-brachial movements that both allows for precision stone-throwing and lays the basis for the development of language, which like accurate throwing depends on the brain's capacity to orchestrate a series of rapidly changing muscle movements. Indeed, Roach et al. (2013) showed that

*H. erectus* had evolved this capacity for accurate overhead throwing, and recent work suggests that the origins of human language are also much older than commonly assumed (Dediu and Levinson, 2013), originating in all likelihood more than 700,000 years ago.<sup>4</sup>

## 9. Warfare

Fighting between groups ranges from single revenge killings, to careful raids in which safety of the raiders is as important as inflicting damage on the enemy, to intensive warfare with genocidal attacks and face-to-face large-scale battle (Keeley, 1996; Kelly, 2000; Otterbein, 2004; Boehm, 2011). Fighting involves assessments of the relative fighting power of adversaries and of risk (Wrangham and Glowacki, 2012), and the array of weapons available to each side obviously enters into these assessments. The result is an ethnocentric species (LeVine and Campbell, 1972) whose members are predisposed to assume the risks associated with aggression, especially against outsiders, but also strive to minimize those risks.

All contemporary foragers arm themselves with lethal hunting weapons, and at times these weapons are deployed by individuals against within-group adversaries and by the group in executing serious deviants (Knauff, 1991; Boehm, 1997). Both types of homicide, while rare, are well documented despite a universal ethos that strongly discourages killing a group member (Brown, 1991). To keep their systems of social cooperation viable, foragers strive to peaceably adjudicate conflicts within their midst (Boehm, 2000).

These moral inhibitions are relaxed when inter-group rivalry comes into play. The use of weapons between groups can entail massive casualties when desired cooperative relations among groups fail and conflict gains the upper hand (Wiessner, 1977). However, even given a pattern of recurrent ethnocentric fighting between groups, hunter-gatherers may succeed in managing these conflicts (Boehm, 2013). While the active management of hostilities is universal within bands, such between-group efforts remain both sporadic and unpredictable. Weapons render forager bands very dangerous to one another, and some groups live with such hostilities with little effort expended to curtail them.

The history of human warfare remains a hotly controversial topic among anthropologists. The basic facts themselves are vigorously contested (Turchin, 2015). Some argue that prior to the appearance of settled agriculture, humans approximated the “noble savage” picture drawn long ago by Jean-Jacques Rousseau. This view was definitively put to rest by Lawrence Keeley’s *War Before Civilization* (1996), but continually pops up in the anthropological literature (Fry, 2013). The opposing view is the Hobbesian picture of the distant past known as the “war of all against all” (Hobbes, 1968; Hobbes, 1968[1651]). The evidence against this view is the documentation of extensive trade networks in hunter-gatherer societies (Adams, 1974). Lying behind this controversy is the notion that if war is ancient, then making war is part of human nature, whereas if war is modern, then it is a purely cultural and environmental phenomenon that can be successfully countered by appropriate cultural changes.

But this is surely an illegitimate dichotomy. The idea that behavior is either innate or culturally determined was given up by sociobiologists long ago. As we have argued, early humans developed powerful lethal weapons, developed the skeletal and muscular morphology to use them skillfully, and learned how to cooperate in collective endeavors through creative politics and leadership. Moreover, anger and aggression are

<sup>4</sup> The fossil evidence indicates that hominins developed speech on the order of one Mya. The hyoid bone is a key element of speech production in humans. Martinez et al. (2008) show that hominin hyoid bones from 540,000 years ago are similar, and hence were inherited from their last common ancestor, *Homo rhodesiensis*, which was from 700,000 to 1,000,000 years ago. Martinez et al. (2004) use evidence from the acoustical properties of Middle Pleistocene fossil remains of the hominin inner ear to argue that hominins of this period had auditory capacities similar to those of living humans.

strong human predispositions. These human capacities allow humans to make war when ecological and social conditions render war profitable. Ancient or modern, war is part of how humans are defined as a species. War can be contained and controlled, but it cannot be ignored, whatever cultural structures govern future human societies.

## 10. Dominance and reverse dominance hierarchies

Woodburn (1982) classified hunter-gatherer societies into *immediate-return* and *delayed-return* systems. In the former, group members obtain direct return from their labor in hunting and gathering, with food lasting at most a few days. The tools and weapons they use are highly portable. In delayed-return foraging societies, individuals hold rights over valuable assets, such as means of production (boats, nets, beehives, and the like), and processed and stored food and materials. These societies exhibit forms of social stratification akin to those in modern societies: social dominance hierarchies in the form of lineages and clans. However, the fossil record suggests that delayed-return human society is a quite recent innovation, appearing some 10,000 years ago, although in ecologically suitable locations, it may have existed earlier (most such locations are now below sea level). *H. sapiens* thus evolved predominantly in the context of immediate-return systems.

The important factor in “delayed return” is not the cognitive capacity for delayed gratification or long-range planning, which certainly existed in immediate return societies, but rather the availability of cumulable material wealth. Material wealth allows those who seek social dominance to control allies and resources and thereby thwart the capacity of subordinates to disable and kill them. As long as the material gains from a position of social dominance exceed the cost of coalition-building and paying guard labor, social dominance of the sort common in other primate societies can be reestablished in human society. In fact, the appearance of farming and private property in land led to high levels of political inequality in only a few societies, and states with a monopoly in coercive power emerged only after a millennium of settled agriculture. Nor were early farming societies more economically stratified than hunter-gatherer societies (Borgerhoff Mulder et al., 2009). The accumulation of material wealth is thus merely a precondition for the reestablishment of social dominance hierarchies. To avoid confusion, we will call societies that lack forms of material wealth accumulation *simple*, rather than *immediate-return*, societies.

Simple societies, Woodburn (1982) suggests, are “profoundly egalitarian ... systematically eliminat[ing] distinctions ... of wealth, of power and of status.” Fried (1967), Service (1975), Knauff (1991) and others likewise comment on the egalitarian character of simple hunter-gatherer societies. The simple vs. delayed-return dichotomy is in fact somewhat overdrawn, as there is in fact a continuous range of variation between the two archetypes. Many Pleistocene humans used some storage even if they were nomadic and they remained strongly egalitarian. The majority of the 58 “Late Pleistocene Appropriate” foraging societies coded by Boehm (2012) (see discussion below), including the !Kung considered by Knauff (1991), are of an intermediate type. What factors are responsible for such unusual egalitarianism? Here, we will argue it is due to the combination of interdependence and ability to punish transgressors.

Cut marks on bones suggest that a major investment in large game hunting increased decisively only 250,000 years ago (Stiner, 2002) and delegating sharing to a single butcher began 200,000 years ago (Stiner et al., 2009). In establishing timing of this transition to heavy reliance on medium-sized game in humans, Stiner (2002) uses multiple indices including the age structure of prey and cut marks to suggest that at this time ungulate hunting became prominent in human subsistence. However, cut marks on bones may not be a reliable indicator of how meat is shared (Lupo and O’Connell, 2002). Indeed, if Wrangham and Carmody (2010) are correct in dating the control of fire by hominins

and the cooking of meat, the problem of the fair distribution of meat among families, especially important in hard times when only medium- and small-size prey were available, may well have been solved much earlier. This was likely an early source of egalitarian sentiment, as well as providing the material substrate for the development of a social morality. Contemporary hunter-gatherer societies are often violent and competitive (Potts, 1996), but they almost always distribute large game peacefully, if sometimes contentiously, based on a commonly accepted set of fairness principles (Kaplan and Hill, 1985b; Kelly, 1995; Boehm, 2004).

The human ecological niche requires food sharing not only daily, but also on a longer-term basis due to the occasional injuries or illnesses to which even the best hunter or gatherer may be subjected (Sugiyama and Chacon, 2000; Hill et al., 2011). Thus each individual forager, especially in the immediate-return form of foraging, is utterly dependent on the others in their camp, band, or even wider sharing unit. This strong interdependence dampens the tendency to free-ride on others' efforts, and favors strong individual tendencies toward egalitarianism, as well as sophisticated fairness norms concerning the division of the spoils (Whallon, 1989; Kaplan and Hill, 1985a).

Collective hunting in other species does not require a fairness ethic because participants in the kill simply eat what they can secure from the carcass, and because dominants are evolved to tolerate subordinates to a point that all the hunters are adequately nourished. However, the practice of bringing the kill to a central site for cooking, which became characteristic of hominin societies, is not compatible with uncoordinated sharing and eating. In the words of Winterhalder and Smith (1992),

... only with the evolution of reciprocity or exchange-based food transfers did it become economical for individual hunters to target large game. The effective value of a large mammal to a lone forager... probably was not great enough to justify the cost of attempting to pursue and capture it... However, once effective systems of reciprocity or exchange augment the effective value of very large packages to the hunter, such prey items would be more likely to enter the optimal diet. (p. 60)

Fire and cooking thus coevolved with the emergence of a normative order and social organization based on ethical behavior.

The second element is that egalitarianism is imposed by the community, creating what Boehm (1999) calls a *reverse dominance hierarchy*. Hunter-gatherers share with other primates the striving for hierarchical power, but among mobile foragers, social dominance aspirations are successfully countered because individuals do not accept being controlled by an alpha male and are extremely sensitive to attempts of group members to accumulate power through coercion. When an individual appears to be stepping out of line by threatening or killing group members, he will be warned and punished. If this behavior continues and ostracism does not work, the group will delegate one member, usually a close relative of the offender, to kill him. Boehm's message in *Hierarchy in the Forest* (1999) is that "egalitarianism... involves a very special type of hierarchy, a curious type that is based on antihierarchical feelings."

We can regard this phenomenon as an extension of the leveling coalitions seen among primate males (Pandit and van Schaik, 2003). Female chimpanzees in captivity act collectively to neutralize alpha male bullies (de Waal, 1996), wild chimpanzees form large coalitions to banish, badly wound, or even kill high-ranking males. Bonobos in the wild have been observed to behave similarly. By comparison with humans, however, leveling coalitions among primates are limited to the genus *Pan* and generally quite small.

Because of the extremely long period during which humans evolved without the capacity to accumulate wealth, we have become constitutionally predisposed to exhibit these antihierarchical feelings. Of course, in modern democratic societies, there is still enough willingness to bend to authority in humans to ensure that a marked or tyrannical

social dominance hierarchy remains a constant threat and often a reality.

Capable leadership in the absence of a strong social dominance hierarchy in band-level societies is doubtless of critical importance to their success, and leaders are granted by their superior position, and with the support of their followers, with fitness and material benefits. Leadership, however, is based not on physical prowess, but rather on the capacity to motivate, persuade, and help the band to reach a consensus. This account of the growth of intelligence is an elaboration on the Machiavellian Intelligence Hypothesis (Jolly, 1972; Humphrey, 1976; Byrne and Whiten, 1988) that stresses the effect of encephalization on enhancing the mean fitness of group members, not simply advancing the interests of the leader. For recent evidence on leadership in hunter-gatherer societies, see von Rueden (2015) and von Rueden et al. (2014).

Reverse dominance hierarchy is documented in Boehm (2012). Boehm located 339 detailed ethnographic studies of hunter-gatherers, 150 of which are simple hunter-gatherer societies. He coded first fifty, and later sixty-five of these societies from around the world. He calls these simple hunter-gatherer societies "Late Pleistocene Appropriate" (LPA). Despite the fact that these societies have faced highly variable ecological conditions, Boehm finds that their social organization follows the pattern suggested by Woodburn (1982) and elaborated by Boehm (1997). The LPAs exhibit both reverse dominance hierarchy and subscribe to a common human social morality. This morality operates through internalized norms, so that individuals act prosocially because they value moral behavior for its own sake and would feel socially uncomfortable behaving otherwise.<sup>5</sup>

How do we explain this unique pattern of socio-political organization? Woodburn attributes this to humans' access to lethal weapons that neutralize a social dominance hierarchy based on coercion. "Hunting weapons are lethal," he writes, "not just for game animals but also for people. Effective protection against ambush is impossible... with such lethal weapons" (p. 436). Woodburn adds that "in normal circumstances the possession by all men, however physically weak, cowardly, unskilled or socially inept, of the means to kill secretly anyone perceived as a threat to their own well-being... acts directly as a powerful leveling mechanism. Inequalities of wealth, power and prestige... can be dangerous for holders where means of effective protection are lacking" (p. 436).

Boehm (2012) argues that his LPAs inherited from our ancient hunter-gatherer forbears the capacity to control free-riders through collective policing, using gossip and informal meetings as the method of collecting information concerning the behavior of group members. Moreover, according to our best evidence, the hunter-gatherer societies that defined human existence until some 10,000 years ago also were involved widespread communal and cooperative child rearing (Hrdy, 1999, 2000, 2009) and hunting (Boehm, 1999, 2012; Boyd and Silk, 2002; Bowles and Gintis, 2011), thus tightening the bonds of sociality in the human group and increasing the social costs of free-riding behavior.

Nonhuman primates never developed weapons capable of definitively controlling a dominant male. Even when sound asleep, a male chimpanzee reacts to being accosted by waking and engaging in a physical battle, basically unharmed by surprise attack. In *Demonic Males* (1996) Richard Wrangham recounts several instances where even three or four male chimpanzees viciously and relentlessly attack a male for twenty minutes without succeeding in killing him (but see Watts et al.,

<sup>5</sup> The notions of norms and norm internalization (Durkheim, 1902; Parsons, 1937) are common in the social sciences. According to the socio-psychological theory of norms, appropriate behavior in a social role is given by a social norm that specifies the duties, privileges, and expected behavior associated with the role. Adequate performance in a social role normally requires that the actor have a *personal commitment* to the role that cannot be captured by the self-regarding "public" payoffs associated with the role (Gintis, 2003; Gintis and Helbing, 2015).

2006). The limited effectiveness of chimpanzees in this regard can mainly be ascribed to their inability to effectively wield potentially dangerous natural objects, for instance stones and rocks. A chimpanzee may throw a large rock as part of a display, but only rarely will it achieve its target.

The human lifestyle, unlike that of chimpanzees, requires many collective decisions, such as when and where to move camp and which alliances to sustain or cut. This lifestyle thus requires a complex sociopolitical decision making structure and a sophisticated normative order. Many researchers incorrectly equate dominance, as found among chimpanzees, with leadership. In some species, such as gorillas, dominants can indeed initiate or influence group movements, because others rely on the dominant male as the main protector and value his proximity. In most human foragers, there are no such dominants.

Capable leadership in the absence of a social dominance hierarchy in egalitarian human societies is of critical importance to their success. However, despite their exceptionally generous treatment of band members, human leaders are granted by their superior position, and with the support of their followers, with certain material benefits and fitness (Price and Van Vugt, 2014), such as superior mating opportunities. Leadership, as we have seen, is based not on physical prowess and coercion, but rather on the capacity to motivate and persuade. Eibl-Eibesfeldt (1989) and Wiessner (2006), among many others, have stressed the importance in hominin societies of leadership based on persuasion and coalition building. In discussing mobile foragers, Wiessner (2009) remarks, “Unlike nonhuman primates, for whom hierarchy is primarily established through physical dominance, humans achieve inequalities through such prosocial currencies as the ability to mediate or organize defense, ritual, and exchange” (pp. 197–198). Interestingly, our closest living relative, the chimpanzee, shows a tendency in the same direction, which is unusual among primates: successful top-ranked males are good social strategists (Goodall, 1986; Nishida and Hosaka, 1996).

It is important not to confuse reverse dominance hierarchy, which is based on a predisposition to reject being dominated, with a specific predisposition for egalitarian outcomes. Rather, persuasion and influence become a new basis for social dominance (Clutton-Brock, 2009), which tends to be no less powerful for its subtlety. Wiessner (2006) observes that successful small-scale societies “encourage the capable to excel and achieve higher status on the condition that they continue to provide benefits to the group. In no egalitarian institutions can the capable infringe on the autonomy of others, appropriate their labor, or tell them what to do” (p. 198).

### 11. Are there egalitarian nonhuman primates?

If there were a multi-male/multi-female primate society lacking a social dominance hierarchy and lacking lethal weapons, yet exhibiting reverse dominance hierarchy, the propositions offered in this paper would be compromised. Does such a society exist? Here, an important distinction can be drawn between egalitarianism flowing from weak social interaction and a low level of social contestation on the one hand, and egalitarianism stemming from a high level of interdependence and some form of subordinate leverage over dominants (Sterck et al., 1997).

While there are clear behavioral patterns in nonhuman primates that serve as the basis for human reverse dominance hierarchy, all multi-male/multi-female nonhuman primate societies are in fact based on strongly expressed social dominance hierarchies. There may be variation in the degree to which female or male dominance relations are decided and thus their dominance hierarchies are more or less steep, depending on the strength of contest competition for resources (Sterck et al., 1997). It is often argued that bonobos (*Pan paniscus*) are

more egalitarian than chimpanzees and more like humans (de Waal, 1997; Hare et al., 2007). However, except for a female dominance hierarchy in feeding access for infants, the pattern of dominance in bonobos strongly resembles that of chimpanzees (Furuichi, 1987, 1989, 1997), although estimates of the steepness of dominance hierarchies among males and females are not consistent across studies (Stevens et al., 2007; Jaeggi et al., 2010).

Similarly, reports indicate rather thoroughgoing egalitarianism among woolly spider monkeys, or muriquis (Strier, 1992), which also live in sizeable multi-male/multi-female groups, much like those of bonobos and chimpanzees. They are highly promiscuous and males hardly compete for matings (Milton, 1984; Strier, 1987). In all the primate examples of egalitarianism in sizeable groups, there is a clear reduction in the intensity of male contest competition as a result of female reproductive physiology that leads to unpredictable ovulation and thus low potential monopolization of matings, and thus paternity concentration, by top-ranking males (van Schaik et al., 2004). Thus these egalitarian social relations are the result of scramble-like competition.

In none of these societies do we find the interdependence that we observe in human societies. The closest analogs are the societies of cooperative breeders, as in callitrichids, but these are rarely multi-male/multi-female. Among non-primates, wild dogs and wolves, which are both cooperative breeders and hunters (Macdonald and Sillero-Zubiri, 2004), came closest, but even there we mostly, though not always, have a single breeding pair rather than multiple cooperating pairs. We conclude that, on the basis of available evidence, there are no multi-male/multi-female egalitarian primate societies except for *H. sapiens*.

### 12. Governance by consent

Following the development of lethal weapons and the suppression of dominance hierarchies based on physical prowess, successful social bands came to value individuals who could command prestige by virtue of their persuasive capacities. While it was by no means necessary that this behavior emerge from the collapse of a social dominance hierarchy based on force, it did in fact emerge in the human line, and no other solution to the problem of leadership has been observed in the primate order. As suggested in the Choreographer interview at the head of this paper, the triumph of the gracile human skeleton over the robust Australopithecines and other hominids is a strong indication that brain and not brawn was conducive to individual fitness and best enhanced the fitness of human groups as well.

The human egalitarian solution emerged in the context of bands insisting that their leaders behave with modesty, generosity, and fairness (Boehm, 1993). A sagacious and effective leader will attempt to parley an important social position into material and fitness benefits, but not so much as to induce followers to replace him with a less demanding leader. Persuasion was the name of the game, and excessive exercise of power would reverse the leader's fortunes. Persuasion depends on clear logic, analytical abilities, a high degree of social cognition (knowing how to form coalitions and motivate others), and linguistic facility (Plourde, 2010). Leaders with these traits could be effective, but one intemperate move could lead to a fall from power. Thus in concert with the evolution of an ever more complex feeding niche (Kaplan et al., 2000), the social structure of hunter-gatherer life in typical gene-culture coevolutionary fashion contributed to the progressive encephalization and the evolution of the physical and mental prerequisites of effective linguistic and facial communication. In short, two million years of evolution of hyper-cooperative multi-family groups that deployed lethal weapons to hold down hierarchy gave rise to the

particular cognitive and socio-political qualities of *H. sapiens*.

The increased encephalization in humans was an extension of a long primate evolutionary history of increased brain size, usually associated with increased cognitive demands required by larger group size (Humphrey, 1976; Jolly, 1972; Byrne and Whiten, 1988; Dunbar et al., 2010).<sup>6</sup> The argument presented here, which invokes coordinated collective action in cooperative foraging, made possible by a combination of interdependence and lethal weapons, extends this analysis to explain human exceptionalism in the area of cognitive and linguistic development.

This development in promoting egalitarian multi-male/multi-female bands explains the huge cognitive and linguistic advantage of humans over other species. The early students of human evolution interpreted human hypercognition as a process of runaway sexual selection, in which intelligent individuals were more successful in attracting mates but did not otherwise contribute to the fitness of band members. This was the favored theory of Darwin (1871) and Fisher (1930), and more recently of Geoffrey Miller (2001). However, runaway selection is rare, and if it exists, it is generally a short-term deviation from fitness-maximizing behavior (Gintis, 2009; Pomiankowski, 1987). Explaining human intelligence as a product of runaway sexual selection is a first-class just-so story, of the type so eloquently critiqued by Gould and Lewontin (1979). Our reading of the evidence suggests that human hypercognition, despite the extreme energy costs of maintaining a large brain, was fitness-enhancing because of increased cognitive and linguistic ability, which entailed heightened egalitarian leadership qualities. These leadership qualities increased the fitness of band members, who responded by ceding enhanced fitness benefits to leaders (Price and Van Vugt, 2014).

The mating success of high cognition males was thus grounded in their contribution to the mean fitness of band members, and hence in the long run, to the evolutionary success of ancestral humans. In a sense, hominins evolved to fill a *cognitive niche* that was relatively unexploited in the early Pleistocene (Tooby and DeVore, 1987; Pinker, 2010).

### 13. Cooperative mothering: the evolution of prosociality

In cooperative breeding, the care and provisioning of offspring is shared among group members. The standard estimate is that some 3% of mammals have some form of allomaternal care, but in the order Primates, this frequency rises to 20% or more (Hrdy, 2009, 2010). In many nonhuman primates and mammals in general, cooperative breeding is accompanied by generally heightened prosociality, as compared with related species with purely maternal care (Burkart et al., 2014). The most plausible explanation is that cooperative breeding leads to a social structure that rewards prosocial behavior, which in turn leads to changes in neural structure that predisposes individuals to behaving prosocially (Burkart et al., 2009; Burkart and van Schaik, 2010). An alternative possibility is that there is some underlying factor in such species that promotes prosociality in general, of which collective breeding is one aspect.

Human prosociality was strongly heightened beyond that of other primates living in large groups, including cooperative breeders, by virtue of the niche hominins occupied, involving coordination in scavenging and hunting, and sophisticated norms for sharing meat. This combination might account for the degree of cooperative breeding in the hominin line. As hominin brain size increased, the duration of immaturity did as well (Barrickman et al., 2008), and immatures had to learn an increasingly large number of foraging and other skills (Kaplan

et al., 2000; Schuppli et al., 2012). Hominins evolved a unique system of intergenerational transfers that enabled the evolution of ever more complex cognitive abilities to support ever more complex subsistence skills (Kaplan et al., 2007). Our uniquely prosocial shared intentionality (Tomasello et al., 2005) can be traced back to the psychological changes involved in the evolution of cooperative breeding, and additionally, hunting (Burkart et al., 2009).

### 14. Lethal weapons and modern egalitarianism

The interplay between lethal weapons and our distinctive human politics continues. In the Holocene, some Big Man societies have been relatively egalitarian, such as those of highlands New Guinea, where the Big Man serves the group in out-feasting other groups and cannot transmit wealth or prestige to descendants. Other Big Man societies are much more hierarchical, with prestige and power being transmitted to future generations. The latter could have led to chiefdoms (Service, 1975; Flannery and Marcus, 2012).

The slow but inexorable rise of the state, both as an instrument for exploiting direct producers and for protecting them against the exploitation of external states and bands of private or state-sanctioned marauders, was a synthesis of these two types of Big Man socio-political systems (Andreski, 1968; Gies, 1984). Moving to the Middle Ages, we find that the hegemonic aspirations of states peaked in the thirteenth century, only to be driven back by the series of European population-decimating plagues of the fourteenth century. The period of state consolidation resumed in the fifteenth century, based on a new military technology: the use of cannon. In this case, as in some other prominent cases, technology becomes the handmaiden to establishing a social dominance hierarchy based on force.

In *Politics*, Book VI, Part VII, Aristotle writes, “There are four kinds of military forces—the cavalry, the heavy infantry, the light armed troops, the navy. When the country is adapted for cavalry, then a strong oligarchy is likely to be established [because] only rich men can afford to keep horses. The second form of oligarchy prevails when the country is adapted to heavy infantry; for this service is better suited to the rich than to the poor. But the light-armed and the naval elements are wholly democratic... An oligarchy which raises such a force out of the lower classes raises a power against itself.”

The use of cavalry became dominant in Western Europe during the Carolingian period. The history of warfare from the late Middle Ages to the First World War was the saga of the gradual increase in the strategic military value of infantry armed with longbow, crossbow, hand cannon, and pike, which marked the recurring victories of the English and Swiss over French and Spanish cavalry in the twelfth to fifteenth centuries (Turchin and Korotayev, 2006). Cavalries responded by developing dismounted tactics when encountering infantry, using heavy hand weapons such as two-handed swords and poleaxes. These practices extended the viability of cavalry to the sixteenth century in the French and Spanish armies, but gradually through the Renaissance, and with the rise of Atlantic trade, the feudal knightly warlords gave way to the urban landed aristocracy and warfare turned to the interplay of mercenary armies consisting of easily trained foot soldiers wielding muskets and other weapons based on gunpowder. Cavalry remained important in this era, but even in the eighteenth and nineteenth century, cavalry was used mainly to execute the coup de grace on seriously weakened infantry.

The true hegemony of the foot soldier, and hence the origins of modern democracy, began with the perfection of the hand-held weapon, with its improved accuracy and greater firing rate than the primitive muskets of a previous era. Until that point, infantry was highly vulnerable to attack from heavy artillery. By the early twentieth century, the superiority of unskilled foot soldiers armed with rifles was assured. World War I opened in 1914 with substantial cavalry on all sides, but mounted troops were soundly defeated by men with rifles and machine guns, and thus were abandoned in later stages of the war. The

<sup>6</sup> Group size is certainly not the whole story. Multi-male/multi-female monkey groups are often as large as or larger than ape groups, although the latter have much larger brains and are considerably more intelligent. The full story concerning cephalization in mammals in general, and primates in particular, remains to be told (Navarrete et al., 2011).

strength of the political forces agitating for political democracy in twentieth century Europe was predicated on the strategic role of the foot soldier in waging war and defending the peace (Bowles and Gintis, 1986), simply because conscripted armies of foot soldiers lacked the moral resolve to defend a society from whose governance they were systematically excluded.

### 15. The long-term evolution of human sociality

It is tempting to focus on the past several thousand years of human cultural history in modeling human socio-political organization because the changes that occurred in this period so radically and rapidly transformed the character of human society (Richerson and Boyd, 2004; Pagel, 2012). However, the basic genetic predispositions of humans underlying socio-political structure were forged over a much longer period of time, whence the million plus year perspective offered in this paper.

The framework developed here is applicable to many spheres of human social life, although we have applied it only to the evolution of socio-political structure. The central tool is *gene-culture coevolution*, which bids us pay close attention to the long-term dynamic interplay between our phylogenetic constitution and our cultural heritage. The second important conceptual tool is the socio-psychological theory of norms (Gintis, 2016). Many social scientists reject this theory because it posits a causal social reality above the level of individual actors. This position is sometimes termed *methodological individualism*. Methodological individualism is not a philosophical, moral, or political principle, but an assertion about reality. As such, it is simply incorrect, because social norms are an emergent property of human society, irreducible to lower-level statements (Durkheim, 1902; Gintis, 2009). All attempts at explaining human culture without this higher-level construct fail.

In this context, we have suggested the following scenario for the long history of human socio-political dynamics. Our primate ancestors evolved a complex socio-political order based on a social dominance hierarchy in multi-male/multi-female groups. Enabled by bipedalism, environmental changes made a diet of meat from large animals fitness-enhancing in the hominin line. This, together with cultural innovation in the domestication of fire, the practices of cooking, and of collective child-rearing created a niche for hominins in which there was a high return to coordinated, cooperative, and competitive scavenging, as well as technology-based extractive foraging. This development was accompanied by the likely use of clubs, spears, and long-range projectiles as lethal weapons, and also led to the spread of specialized bipedalism and the reorganization of the upper torso, shoulders, arms, and hands to maximize the effectiveness of these weapons. There was also a growth of new neural circuitry allowing the rapid sequencing of bodily movements required for accurate weapon deployment.

The hominin niche increasingly required sophisticated coordination of collective meat procurement, the occasional but critical reliance on resources produced by others, a complementary willingness to provide others with resources, and procedures for the fair sharing of meat and collective duties. The availability of lethal weapons in early hominin society could have helped to stabilize this system because it undermined the tendencies of dominants to exploit others in society. Thus two successful socio-political structures arose to enhance the flexibility and efficiency of social cooperation in humans and likely their hominin ancestors. The first was the reverse dominance hierarchy, which required a brain large enough to enable a band's rank-and-file to create effective coalitions that could definitively put an end to alpha male hegemony and replace this with a lasting egalitarian order. Leaders were kept weak, and their reproductive success depended on an ability to persuade and motivate, coupled with the rank-and-file ability to reach a consensus with such leadership. The second was cooperative child rearing and hunting, which provided a strong psychological predisposition toward prosociality and favored internalized norms of fairness. This system persisted until cultural changes in the later

Holocene fostered material wealth accumulation, through which it became once again possible to sustain a social dominance hierarchy based on coercion.

This scenario has important implications for political theory and social policy, for it suggests that humans are predisposed to seek individual dominance when this is not excessively costly, but also to form coalitions to depose pretenders to power. Moreover, humans are much more capable of forming large, powerful, and sustainable coalitions than other primates, due to our enhanced cooperative psychological propensities. Such coalitions also served to reinforce the moral order, as well as to promote cooperation in hunting, warding off predators, and raiding other human bands. This implies that many forms of socio-political organization are compatible with the particular human amalgam of hierarchical and anti-hierarchical predispositions that can result in either independent egalitarian bands or well-amalgamated large societies.

In particular, this implies that there is no inevitable triumph of liberal democratic over despotic political hierarchies. The open society will always be threatened by the forces of despotism, and a technology could easily arise that irremediably places democracy on the defensive. Perhaps the most important threat to freedom and democracy would be the development of robots that could replace foot soldiers in war and crowd management. The problem with current robot models is insufficient energy storage—nothing like mitochondria and ATP exist in the non-organic world (Gintis, 2015). Nevertheless, the future of politics in our species, in the absence of concerted emancipatory collective action, could well be something akin to George Orwell's 1984, or Aldous Huxley's *Brave New World*. However, humans appear constitutionally indisposed to accept a social dominance hierarchy based on coercion unless the coercive mechanism and its associated social processes can be culturally legitimated. It is somewhat encouraging that such legitimation is difficult except in a few well-known ways, based on patriarchy, popular religion, or principles of liberal democracy.

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