

The causes and scope of political egalitarianism during the Last Glacial: a multi-disciplinary perspective

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Abstract This paper reviews and synthesizes emerging multi-disciplinary evidence toward understanding the development of social and political organization in the Last Glacial. Evidence for the prevalence and scope of political egalitarianism is reviewed and the biological, social, and environmental influences on this mode of human organization are further explored. Viewing social and political organization in the Last Glacial in a much wider, multi-disciplinary context provides the footing for coherent theory building and hypothesis testing by which to further explore

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human political systems. We aim to overcome the claim that our ancestors' form of social organization is untestable, as well as counter a degree of exaggeration regarding possibilities for sedentism, population densities, and hierarchical structures prior to the Holocene with crucial advances from disparate disciplines.

Keywords Climate change · Last glacial · Nomadic foragers · Political egalitarianism · Social organization

Introduction

The nature and evolution of ancestral social organization is a source of ongoing debate, yet remains crucial to understanding the course of societal development as well as providing a framework by which modern political systems can be examined. Scholars dispute the ability to generalize about Palaeolithic social structures pointing to different forms of social organization among documented hunter-gatherers (Kelly 1995); or arguing that “social organization is unexcavatable” (Bahn 1990, p. 75). A further complication is that evidence comes from widely disparate disciplines where research agendas may not overlap and findings are slow to diffuse. Relevant evidence can come from modern anthropological studies and political science, biological theory (including evidence from closely related species and the hominid fossil record), reconstructed past environments and climatic change, and the archaeological record of modern and archaic humans. A major challenge is to synthesize this diverse body of research and interpret it toward an understanding of the evolution of human political structures and social organization.

Such an ambitious undertaking is beyond the scope of any single paper. By focusing on a specific time period where the evidence is most abundant, however, this paper brings the goal within reach. The Last Glacial is a climatic period that begins 74,000 years ago and ends 11,500 years ago (by radiocarbon dating, ‘C14’) with the onset of the Holocene epoch (c. 11,500 years ago until present) of the Quaternary (c. 2.6 million years to present). The Late Glacial is the time period within which *Homo sapiens* expanded to successfully inhabit most continents of the world. This timeframe also covers the transitions between the Middle and Upper Palaeolithic (c. 45,000 years ago) and the Upper Palaeolithic and Mesolithic/Neolithic (c. 12,000 years ago), as well as covering transitions from the Middle to Later Stone Age in sub-Saharan Africa. Further, this time period was one of the best-dated and documented periods of Earth history (e.g. NGRIP 2004).

This paper brings together evidence from diverse disciplines within the context of understanding social organization—and the probable scope of political egalitarianism¹—during the Last Glacial. We review evidence for global instability in climate over the Last Glacial and present its expected effects on human groups (see section

¹ Political egalitarianism is a social organization in which decisions are reached through deliberation and consensus; individuals do not command authority over, or coerce, other group members; social status, honor, and positions (if and when they exist) are voluntarily granted or withdrawn, and not inherited; and individuals can freely leave their group peers or residence. Political hierarchy is a social organization with opposite characteristics.

“[Social organization in the Last Glacial: a global climatic change perspective](#)”). We explore comparable systems in contemporary human groups, notably the political structures of nomadic hunter-gatherers (henceforth nomadic² foragers), and interpret these in relation to the palaeo-context (see section “[Social organization among nomadic foragers: a cultural anthropological perspective](#)”). We explore the potential influence of biological dispositions on the development and maintenance of certain societal structures, notably the dispositions to seek high status and rank and to avoid being dominated (see section “[Political egalitarianism: an evolutionary biological perspective](#)”). In this context, an interpretation of fossil records in relation to the development of such social structures is advanced (see section “[Hominids and political egalitarianism: a physical-anthropological perspective](#)”). Archaeological evidence pertaining to political hierarchy and political egalitarianism during the Last Glacial are reviewed, and the links between effects of the climatic change on social organization further explored (see section “[Political egalitarianism: an archaeological perspective](#)”). Finally, we highlight the main factors responsible for the replacement of egalitarian structures with hierarchical structures in the Holocene with inferences drawn about the possibilities of political hierarchy and prevalence of political egalitarianism during the Last Glacial (see section “[Discussion: political egalitarianism and the transition to political hierarchy](#)”).

Social organization in the Last Glacial: a global climatic change perspective

Two generalizations can be made concerning climatic conditions during the Last Glacial and their contrast with the last c. 11,500 years of the Holocene: (1) the prevailing climatic conditions over the Last Glacial were highly unstable over even decadal time-scales and; (2) conditions were more arid and colder than during the Holocene (COHMAP Members 1988; Alley et al. 2003; NGRIP Members 2004). It is widely accepted that “[t]his climate plateau [The Holocene], although modulated by millennial-scale oscillations of $\sim 1^\circ\text{C}$ amplitude, represents the longest interval of stability of climate and sea-level in at least the past 400,000 year” (Zalasiewicz et al. 2008, p. 5; EPICA Members 2004). While this is a global generalization, data from different regions and climate proxy sources the world over lend support for this statement, including reconstructed past lake-levels, tropical and polar ice cores, ocean cores, wind-blown sediments, speleothems and lake sediments. The majority of these archives suggest rapid climate changes worldwide were common during the Last Glacial (Alley et al. 2003; Bond 1995; Broecker 1997; Brook et al. 1996; Cohen et al. 2007; deMenocal et al. 2000; Guthrie and Kolfshoten 2000; NGRIP Members 2004; Richerson et al. 2001; Stevens et al. 2008; Thompson 2000; Wang et al. 2005, 2008).

While this generalization is particularly true for the Last Glacial, it can also be extended to include comparisons with many of the previous warmer ‘interglacial’

² ‘Nomadic’ is here defined as semi-continuous movement after hunting and gathering grounds; ‘semi-nomadic’ is defined as hunting and gathering from a fixed local point or movement between pastures; and ‘sedentary’ refers to yearlong or permanent settlement.

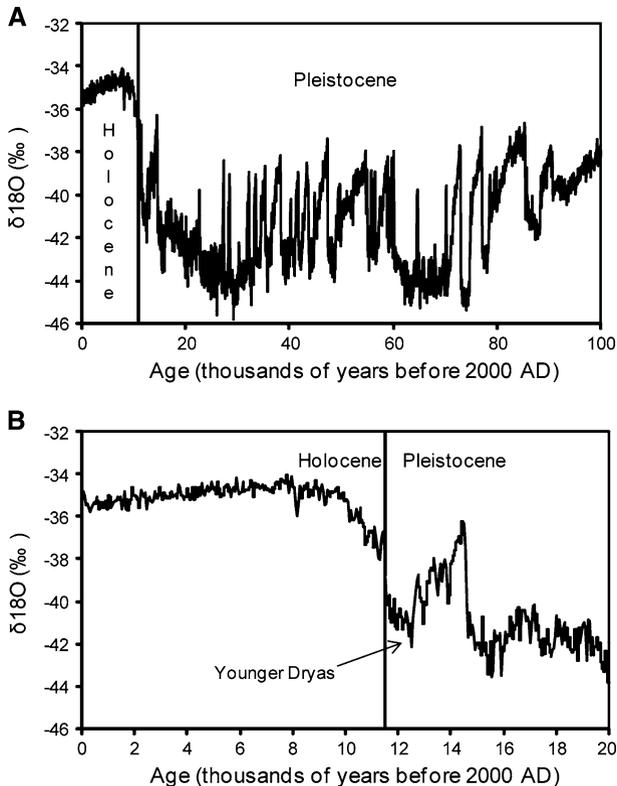


Fig. 1 Variations in oxygen-isotope ratio ($\delta^{18}\text{O}$ per mil) in the NGRIP ice core (NGRIP Members 2004) over the last (a) 100,000 years and (b) detail of the last 20,000 years

periods. For example, ratios of oxygen-isotopes contained within ice cored from Greenland (NGRIP Members 2004), an indicator of past regional temperature changes, highlights the fact that North Atlantic climate was highly unstable from 100,000 years ago—with large shifts in ice oxygen-isotope ratios indicating large temperature changes, occurring over timeframes as short as decades (Fig. 1). After the termination of the Pleistocene 11,500 years ago, and during the subsequent Holocene epoch, roughly coincident with the end of the Paleolithic and the onset of the Neolithic, conditions became more stable.

The transition from the Pleistocene to the Holocene is characterized by a warming in global climate from ‘glacial’ conditions to ‘interglacial’ conditions, characterized by significant reductions in the extent of Northern Hemisphere ice volume (e.g. Shackleton and Opdyke 1973). This warming was more significant in higher latitudes but affected the whole planet. Colder air holds less moisture, so the Pleistocene was generally more arid and this is borne out in a wide range of climate proxy and modeling data from widespread regions (e.g. COHMAP Members 1988; Guiot et al. 1989; Kohfeld and Harrison 2001; Kutzbach et al. 2001; NGRIP Members 2004; Winckler et al. 2008). One of the most crucial aspects of the

hydrological cycle, the monsoon system, was severely weakened during the cold periods of the Pleistocene (Kutzbach et al. 2001; Clift and Plumb 2008; Stevens et al. 2007, 2008; Wang et al. 2005, 2008) and records of increased dust in the atmosphere during the Late Pleistocene support the assertion that climate was more arid (Kohfeld and Harrison 2001; Winckler et al. 2008). Thus, the general change from the Pleistocene to the Holocene was a change from a more arid, cold and climatically unstable period to a warmer, more humid one, which exhibits remarkable stability. Indeed, the change from the Pleistocene to the Holocene is itself characterized by climatic instability. The general increase in temperature is punctuated by an abrupt cooling event of c. 1000–1500 years in length, termed the Younger Dryas or late glacial oscillation, centered around 12,500 years ago (see Fig. 1). While there has been some North Atlantic instability during the Holocene (Bond et al. 2001) the magnitude of variation was greatly reduced compared to that in the preceding Last Glacial.

Reconstructing detailed and long-term records of climatic change over the Late Pleistocene from continental areas is limited by the low preservation potential of terrestrial deposits. Although there is a general global picture of climatic instability during the Last Glacial, the exact regional manifestations of this global trend still remain less clear in some areas. Nevertheless, there is a mounting body of evidence to suggest that many continental regions in the middle and low latitudes (where human groups would have lived) also experienced climatic instability. High temporal resolution records from Asia appear to indicate increased variability during this period (e.g. Oppo and Sun 2005; Wang et al. 2008), as do records from the Americas (e.g. Peterson et al. 2000) and Europe (e.g. Antoine et al. 2009). In southern Europe, where *Homo sapiens* migrated to during the early phases of the Last Glacial, marine records off the Iberian margin suggest that sea surface temperatures were more variable during this time than in previous periods (Martrat et al. 2004, 2007). Trends towards instability during the last glacial can also be found in Africa, although arguably with a sparser record of detailed and relatively continuous climate reconstructions extending over the Late Pleistocene into the Holocene (Leuschner and Sirocko 2000; Thompson 2000).

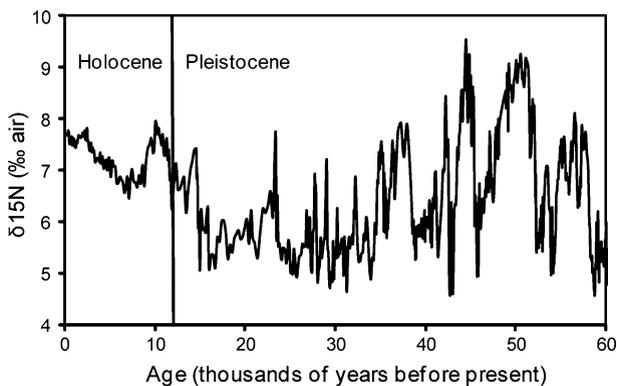


Fig. 2 Variations in nitrogen-isotope ratio ($\delta^{15}\text{N}$ per mil) in ocean core RC27-23 (Altabet et al. 2002)

Precipitation records from 200,000 years to the present from South Africa suggest that multi-millennial scale variation was much greater in the Late Pleistocene but the low resolution of the record precludes any firm conclusions on shorter-term fluctuations. More detailed evidence from an ocean core off the Arabian Peninsula (Altabet et al. 2002) shows that regional monsoon circulation was less variable from the onset of the Holocene (Fig. 2), suggesting this period in Africa may too have been more climatically stable. Monsoon driven speleothem growth in Oman (Burns et al. 2001; Fleitmann and Matter 2009) is restricted to interglacial periods, demonstrating that for the majority of the Pleistocene, climate in this area and most likely adjacent Africa was much more arid than during much of the Holocene. The evidence suggests the climate was cooler, more arid and tended to rapidly fluctuate over timescales ranging from a decade to millennia. Importantly, the abrupt changes may also have been accompanied by changes in seasonality. Evidence from Greenland suggests that the abrupt climate shifts of the Pleistocene were caused primarily by large changes in the intensity of winter (Denton et al. 2005). In most climate archives this is difficult to reconstruct and the theory requires exploration in lower latitude continental regions. Irrespective, it does suggest that the Pleistocene may also have been characterized by rapid increases and decreases in seasonality as it can be inferred that in many regions changes in ‘temperature’ or ‘precipitation’ are tied to atmospheric conditions during one season. For example, in monsoonal areas, changes in precipitation are almost always related to changes in summer circulation patterns, and hence seasonality.

The profound climatic changes during the Last Glacial will have had a strong impact on the existence and predictability of fauna, flora and water supplies—especially under conditions of increased seasonality. This global climatic instability will have affected the intensity of regional climate change in a non-linear fashion. For example, in regions such as Saharan Africa a relatively minor shift in the agents that drive global climate change appears to have had a profound effect on the region’s rainfall (deMenocal et al. 2000), while abrupt shifts in precipitation in Northern China appear not to be related to the intensity of the monsoon rains at the rainfall front, but rather small changes in its penetration into continental Asia (Stevens et al. 2008). Relative to the Holocene, the increased aridity of global climate, its instability, and its consequent effects on seasonality during the Last Glacial will have made regional rainfall scarcer and more unpredictable. Under these conditions vegetation would be in shorter supply and animals would have to frequently migrate in search of food and water.

The prevailing conditions would affect human search for water and edible vegetation, as well as hunting animals that migrate, even if human technological innovation put them at a relative advantage compared to other animals (Richerson et al. 2009). These harsh and rapidly changing climatic conditions make agriculture impossible (Richerson et al. 2001). Climate change and associated ecological variation has been widely applied to explain hominid speciation, cultural change and mass migration (e.g. Behrensmeyer 2006; Forster 2004; Laporte and Zihlman 1983; Potts 1999; Stanley 1992; Trauth et al. 2005). The development of agriculture has also been hypothesized and widely accepted to be intrinsically tied to variations in past climate (e.g. Haberle and Lusty 2000; Richerson et al. 2001). Climate and

associated ecological changes have not yet been systematically tied to the origin or maintenance of social organization during the Palaeolithic. It seems likely that a relationship exists between ecological conditions and social organization as environment constrains human subsistence economies and their associated ways of life.

The impact on humans was most likely manifested by periodically enforced nomadism. Unstable ecologic conditions over various timescales will force groups to move semi-continuously in search of supplies. Changes in seasonality are likely to be extremely important in this regard. The degree and type of yearly-cycle nomadism is often affected by the types and quantities of resource sources in the locality of the group. Aridity will limit the abundance of many of these resources and as a consequence will increase the need for migration. Limited resources will also limit group size. Rapid climatic change probably also forced ecosystem species compositions to be 'out of equilibrium' (Richerson et al. 2009), causing an essentially chaotic movement of plant and animal resources. While there was clearly a diversity of ecological biomes during the Last Glacial, unstable and drier conditions appear to be particularly prevalent over this period. Hence, prevailing conditions would most probably necessitate the formation and preservation of small nomadic bands that are easily mobile and rely on hunting and gathering as means of subsistence.

Social organization among nomadic foragers: a cultural anthropological perspective

If the prevailing climate during the Last Glacial was likely to lead to at least periodically enforced nomadism, then as a first order approximation we can infer about models of human political structures over this period via examination of nomadic groups. We focus here on nomadic foragers, rather than non-nomadic or semi-nomadic foragers, as small-scale nomadic foragers are most likely to embody the strategy adopted by *Homo sapiens* in the Last Glacial. This is not to say that documented nomadic foragers are living relics of the past. Documented foragers have been influenced to various degrees by sedentary and modern ways of life (Marlowe 2005). An exception may be some of the San people who have been quite isolated from population migrations and mixing (for a discussion of the San's unique mitochondrial DNA and language see Wells 2002, pp. 56–57; see also Watson et al. 1997; and for a short discussion on the Kalahari debate see Deacon and Deacon 1999, pp. 132–135). Nomadic foraging, however, is a way of living most suitable to cope with unstable ecological conditions. It is in this way that nomadic foragers “are the most relevant analogs for at least Late Pleistocene humans” (Marlowe 2005, p. 65; see also Deacon and Deacon 1999; Leacock and Lee 1982, p. 5; Murdock 1968, p. 13). We emphasize that the climatic conditions experienced by documented nomadic foragers are different than those of previous periods.

A core characteristic of documented nomadic foragers is their political egalitarianism. Nomadic foragers have no hierarchical social stratification and

decisions are reached through deliberation and consensus; leaders (if they exist) have little authority over group members; rotation of roles and functions occur regularly; people come and go as they please; and no person can command or subject group members to act according to one's political aspirations (Barclay 1982; Boehm 1993, 1999, 2003; Cashdan 1980; Gardner 1991; Knauff 1991; Leacock 1978; Leacock and Lee 1982; Lee 1979, 1982; Power 1991; Service 1979; Silberbauer 1982; Tanaka 1980; Turnbull 1968; Woodburn 1982). The connection between political egalitarianism and nomadic foragers is robust. Boehm, who made an extensive survey of nomadic forager societies, asserts that “this egalitarian approach appears to be universal for foragers who live in small bands that remain nomadic, suggesting considerable antiquity for political egalitarianism” (1999, p. 69).

Political egalitarianism among documented foragers is accomplished by leveling mechanisms. Leveling mechanisms are cultural practices which are aimed at controlling over-assertive individuals from exploiting their success, traits, potential status or positions. If a hunter (Wiessner 1996a) or a would-be-chief tries to dominate other group members or to misuse a position of status, group members may ridicule, walk away, disobey, or simply ignore that individual. Other tactics are to rebuke, rebel against, remove, ostracize or expel an over-assertive individual from the group, and in extreme cases execution is also an option. Different forager groups exercise different leveling techniques (Boehm 1993, 1999; Kelly 1995, pp. 295–297; Lee 1979, pp. 244–249, 343–354; Power 1991, pp. 178–186; Service 1979, Chap. 4; Turnbull 1968, p. 24; Wiessner 1996a; Woodburn 1982). Sedentary horticultural societies employ an array of leveling practices as well (e.g. Howe 1978; Mahdi 1986; Mitchell 1978, 1988). Leveling mechanisms help to keep the political system as close to flattened as possible despite the variability in personalities, physical traits and capabilities, and notwithstanding competition between individuals (see section “[Political egalitarianism: an evolutionary biological perspective](#)”).

There remains disagreement about the scope of political egalitarianism and whether it was the only possible form of social organization. Some anthropologists point to the alternative of non-egalitarian semi-sedentary foragers, especially from the examples of Northwest Coast Indian societies (e.g. Ames 1994). This alternative view stipulates a ‘foraging spectrum’ (Kelly 1995) involving semi-sedentary and non-egalitarian societies during the Last Glacial (Hayden 1995). This view ignores the critical role of the harsh climatic conditions of the Last Glacial. Under such conditions, sedentary or semi-sedentary life would be extremely rare if not impossible, especially in North America which was still covered by major ice sheets very close to the end of the Last Glacial, only retreating north of the Great Lakes around 9.5 ka (Dyke et al. 2003). All non-egalitarian modes of social organizations that are proposed as possibilities for the Last Glacial are based on types of subsistence economies which presuppose Holocene-type climate conditions. These sedentary subsistence economies and the novel forms of social organization that accompanied them began appearing only after the Last Glacial. The archaeological record corroborates this perspective (see section “[Political egalitarianism: an archaeological perspective](#)”).

Nomadism limits the accumulation of personal possessions and wealth as all belongings must be carried by the individual. An individual cannot accumulate large quantities of food, thus food sharing among group members is widely practiced (Testart 1988; Woodburn 1982). Nomadism also restricts the size of the group. Females normally have birth intervals of about 4 years, dictated by the need to carry children up to the age of four until they are capable of walking migratory distances on their own, and accompanied by natural birth control by suppressing ovulation due to up to 4 year lactation periods (Kelly 1995, Chap. 2; Lee 1979, pp. 442–443). These limitations on group size make internal group affairs easier to maintain and hence reduce or eliminate the need to concentrate power in the hands of individuals who can resolve conflicts by coercive authority. Small band-size also enables close communication between, and inspection of, group members and their intentions. This characteristic of small nomadic bands further restricts opportunities of ambitious individuals to dominate others (Hold-Cavell 1996; Lee 1979, p. 246). Nomadism also involves a highly flexible and fluid social composition to the point of making the group label ambiguous (Palmer et al. 1997, p. 300). Individuals pay occasional visits to friends and relatives in varied locations, and marriage across disperse (and fluid) bands is common (Draper 1973; Tanaka 1980, pp. 116–127). This fluidity of band composition makes the domination of others very difficult, and arguably irrelevant. That is to say, an individual may waste important energy, jeopardize social status, and risk injury, trying to dominate individuals who can leave when they please.

Political egalitarianism: an evolutionary biological perspective

Political egalitarianism during the Last Glacial needs to be tied to a larger context of the interplay between environment, biology, and culture. As Richard Alexander remarked, the important issues are “who or what decides which novelties will be perpetuated, and how is this decided? On what basis are cultural changes spread or lost?” (Alexander 1979, p. 73). For our purposes, we can ask why social dynamics among nomadic foragers give rise to politically egalitarian structures and leveling practices, and not to hierarchical ones.

Political egalitarianism among nomadic foragers is a product of a long evolutionary process. *Homo sapiens* evolved from a lineage of hominids. Our closest living relatives from this evolutionary process are the chimpanzee and bonobos. There is no direct evidence about the social organization of our non-human ancestors during the approximately past five million years. What is known is that our primate ancestors evolved through several evolutionary trajectories: skeletons were adapted to a reduction in arboreal life-history; bipedal locomotion (upright walking) emerged (for a variety of explanations for this change see Kingdon 2003); and brain-size increased considerably relative to body size—encephalization (Krogman 1997; McHenry and Coffing 2000). About 2.6 million years ago our ancestors began experimenting with stone tools and later created bifacial hand-axes (Klein 2000). More importantly, hominids experienced a reduction in sexual dimorphism, which serves as indirect evidence about social

organization in hominids (see section “[Hominids and political egalitarianism: a physical-anthropological perspective](#)”).

Given evidence of bi-pedalism, encephalization, and reduction in sexual dimorphism, questions arise about what influence this may have had on social organization in nomadic foragers and how it relates to the apparent universality of political egalitarianism. We argue that evolutionary theory can explain the emergence of an egalitarian social organization. The tendency for dominance behavior and hierarchical structure counterbalances itself when applied to all group members (Erdal and Whiten 1994). An individual in the group will have a biological advantage over other individuals should that individual manage to dominate the social organization. There are considerable fitness advantages to those who monopolize high rank and status in hierarchical structures through enhanced reproductive success, higher progeny survival rates, and increased access to food and safe spatial localities (Boone 2000; de Waal 1982; Pusey et al. 1997; Zahavi et al. 1997; and see also Chagnon 1979; Grammer 1996; Hill 1984; Irons 1979; Kaplan and Hill 1985a,b; Turke and Betzig 1985; Wiessner 1996a, b). Conversely, each individual member also has a biological interest not to be dominated for exactly the same reasons. In other words, individuals strive to achieve high status and rank in their groups to maximize their fitness, and at the same time individuals tend to resist being dominated because this reduces their fitness. This logic also underlies the fierce competition (sometimes to death) between group members (including kin) and also explains why top ranks are highly changeable in many species.

For males, hierarchy leads to few winners and many losers in the reproductive game, as alphas and their coalitions keep lower ranking males from mating opportunities. Yet, females have as much an interest in social organization as males (Hannagan 2008). Hierarchy can create a situation of reproductive constraint and lower offspring viability not only for males but also for females (Gowaty et al. 2007). Therefore, in non-human primates, females often neutralize male interests when they do not coincide with their own, and do so both individually and in coalitions (Hrdy 1981, 1999, 2009; Smuts 1995). Bonobos are an important example of this intra-group dynamic that involves coalitions of females that dominate the social organization (Knauff 1991, p. 386; de Waal 2001; Susman 1987). In the context of human foragers, cooperation in child rearing is an evolutionary beneficial strategy (Hrdy 2009). Female preference of males who not only are competent providers but also willingly share resources adds another dimension to understanding forager social organization. It is not surprising that women in foraging bands often have influence over political decision-making, conflict resolution, and they can also be found in leadership positions (Boehm 1999, pp. 7–9; Kelly 1995; Freedman 1980, pp. 336–337; Leacock 1978; Lee 1979; Power 1991: Chap. 6; Turnbull 1968).

Political egalitarianism among nomadic foragers is not an effortless or static state in which all members accept the egalitarian ethos; it is accompanied by repeated attempts by individuals who test the limits of group norms (Boehm 1993, 1999; Cashdan 1980). Women are as likely as men to curb the deviant behavior of those “upstarts” who attempt to disrupt or violate group norms (Boehm 1999, pp. 8–9;

Power 1991; Erdal and Whiten 1994; Knauff 1991). The prevalence and multiplicity of leveling mechanisms that were noted above is a strong testimony for these two countervailing tendencies. On the one hand, the fact that foragers need leveling mechanisms means that there is an innate tendency of some individuals to exaggerate their rank and status. On the other hand, there exists an innate tendency to thwart others' attempts to gain power because it may become dangerous and harmful to oneself and one's peers (Wiessner 1996a, p. 12).

The existence of these two opposing tendencies in *Homo sapiens* as well as in other species strengthens the idea that political egalitarianism is not a sudden departure from ancient dominance behavior patterns. Political egalitarianism emerged because dominance behavior became more restricted in the course of evolution and because strict hierarchical structures became maladaptive. As Erdal and Whiten (1994, p. 177) put it, "dominance behaviour was not entirely lost in evolution but was balanced by counterdominant tendencies which only evolved because they provided fitness advantages in the ecological and social environments of the time." Individuals can form manifold coalitions that practically prevent any one individual from controlling other band members. The invention of hunting weapons, especially projectile ones, makes physical power an ineffective means of group control compared to social sophistication. Power-hungry individuals who attempt to forcefully dominate others are stopped (either peacefully or forcefully) by other group members who do not share the interest of the former. Upon changing these highly mobile group conditions and group size, the disposition to seek high status and rank may become unchecked and leveling mechanisms may become ineffective, consequently leading to political hierarchy (Cashdan 1980, pp. 119–120). Such were the manifest consequences of the ecological transformations at the end of the Pleistocene, although many foragers and horticulturists continued to maintain political egalitarianism even with sedentary life and under different subsistence economies due to individuals' aversion to being dominated (Boehm 1993, 1999; see also section "[Discussion: political egalitarianism and the transition to political hierarchy](#)").

Hominids and political egalitarianism: a physical-anthropological perspective

The biological logic of political egalitarianism is not restricted to social organization during the Last Glacial. Indeed the argument regarding a gradual leveling of our ancestors' social organization (Erdal and Whiten 1994) finds support in evidence from fossil records of hominid braincases, skeletons and teeth. The evolution of these morphological features in hominids, although open to interpretation, suggests early origins of political egalitarian social-organization in the *Homo* genus.

Brain-size, intelligence and political egalitarianism

The fossil evidence leaves little room to doubt that hominid intelligence increased gradually (although potentially in 'bursts' of increased brain size and restructuring)

during the last five million years. There is strong evidence about an increase in brain-size measured from fossil braincases: from *Australopithecus aferensis* (400 Cubic Centimetres); *Homo habilis* (2.5–1.8 million years ago, brain size ranges 650–800 CC); *Homo erectus* (1.8 million years ago, brain size of 850–1000 CC); to modern *Homo sapiens* (1400 CC) (Lewin 2005; McHenry and Coffing 2000). Other indications of an increase in intelligence are the improvement of stone tools between 500,000 and 350,000 years ago, particularly by *Homo erectus*—probably the first species to manipulate fire and to make purpose-made and highly sophisticated hand-axes (bifaces). At least some of these advances in tool use appear to correlate with changes in brain size/structure in hominids. It should be noted, however, that the transition to Mousterian tools and from Mousterian/Middle Paleolithic to Upper Paleolithic/Late Stone Age is very dramatic. The former is likely to be correlated with brain size but the latter is not.

Evidence of increased intelligence also stems from the reorganization of hominids' brain regions and the enhancement of regions thought to be responsible for social interaction and language. More 'primitive' areas of the brain, such as the pons and the medulla, have changed relatively little despite the increase in brain size in hominids, whereas there has been a significant reorganization of the human brain with disproportionately large increases in the size of the cerebellum and neocortex (involved in learning), and the prefrontal cortex (which includes the Broca's and Wernicke's areas), which are strongly associated with language. Interestingly, the main changes in brain organization occurred about 500,000–100,000 years ago, with little change after this period (Johanson et al. 2001), possibly indicating changes in social organization during this former period. Higher intelligence can replace the need for physical force with agility of thought. Individuals who are equipped with better mental capacities to cooperate, to be socially sensitive to their environment, and to maintain coalitions and social networks can have higher reproductive success than individuals who are stronger but less socially sophisticated. Moreover, the evolution of language and social skills allow higher levels of cooperation, and enable leveling processes to become more complex in terms of the number of group members simultaneously involved.

Reduction of sexual dimorphism and political egalitarianism

Fossil records showing changes in body-size ratios between females and males, and changes in canine teeth are indicative of changes of our ancestors' social organizations. Both factors are components of 'sexual dimorphism': the morphological differences between females and males of the same species. A relationship exists between "the levels of sexual dimorphism and the type of social organization—monogamous primates, for example, exhibit relatively little sexual dimorphism" (Lewin and Foley 2004, p. 182) while polygamous hierarchical primates (e.g. gorillas, baboons) tend to exhibit higher degrees of body-size sexual dimorphism (Clutton-Brock and Harvey 1977). The correlation between social organizations and degrees of sexual dimorphism seems to hold true especially among documented non-human primates that are humans' closest evolutionary relatives. Hence, despite its limitations as a generalization with known exceptions,

the degree of body-size sexual dimorphism is the best fossil indicator currently available about our ancestors' social organization.

Degrees of body-size sexual dimorphism have decreased in the evolution of early hominin, with body mass levels remaining similar since the emergence of the genus *Homo* (Larsen 2003). This leads to the hypothesis that social organization may have been leveled-down earlier and refined later. Such an interpretation of the fossil record suggests that an egalitarian social organization could have already originated 1.9 million years ago with *Homo erectus*, a species characterized by a low degree of sexual dimorphism similar to that of *Homo sapiens* (see also Boehm 1999, p. 196). Nevertheless, there are still debates about the actual degrees of sexual dimorphism in later *Australopithecus* compared to *A. afarensis* (Reno et al. 2003; Smith 1996; Plavcan et al. 2005; Reno et al. 2005; Lee 2005). While it is difficult to determine exactly when our ancestor's social organization changed, the fossil record of body-size sexual dimorphism does not lend support for a pattern of hierarchical social organization. By contrast, the fossil record implies that social organization has been leveled-down and that hominids' social organization became more egalitarian.

An additional component of sexual dimorphism that is correlated with different types of social organization is teeth structure. Hierarchical social organization and intense male-male competition over females (among primates and some other mammals) tend to be associated with exaggerated canine teeth in males (Lewin 2005, p. 84). Canines in males may also serve as an indirect indicator for reconstructing our ancestors' social organization. While this aspect of reduction in sexual dimorphism can also be ascribed to changes in diet of hominids and as an adaptation to a more efficient milling system, it is correlated with social organization as well (Lewin 2005, p. 117; Lewin and Foley 2004, p. 185).

A gradual reduction of canine teeth occurred during hominid evolution, possibly at several points and in more than one hominid species. *Homo erectus*' canines, for example, had already become smaller, flatter, more incisor-like in shape, and similar to *Homo sapiens*' (Lewin and Foley 2004, pp. 184–189), while *A. afarensis* already exhibited lower canine dimorphism than modern chimpanzees. In fact, *A. afarensis* had both lower canine dimorphism and low body dimorphism (Larsen 2003; Reno et al. 2003). Canine characteristics thus imply that even the *Australopithecines* may have been more human-like in their behavior than previously assumed. The canine fossil record points to a trend toward more egalitarianism rather than hierarchy. According to this perspective on the fossil record, politically egalitarian structures did not develop independently in *Homo sapiens* but is a homologous social characteristic that humans likely inherited from previous hominids.

Political egalitarianism: an archaeological perspective

Despite the nearly four decades of ethnographic and ethno-archaeological research demonstrating that humans organize their production and structure their space in socially meaningful ways (Binford 1983; Carr 1984; Deacon and Deacon 1999; Gamble and Boismier 1991; Hietala 1984; Hodder 1982; Kent 1987; Kroll and Price 1991; Renfrew 1984; Whitelaw 1989, 1991; Yellen 1977), reconstructing social

organization from archaeological evidence alone remains difficult. Difficulties with taphonomy, ethnographically informed model building and research design are at the fore of a number of issues responsible for these interpretative shortcomings. Notwithstanding these difficulties, archaeology is a fundamental for gaining insight into social organization in the Last Glacial. Some documented societies of nomadic foragers appear to share sufficient material and organizational similarities with archaeological entities to allow inferential insights. It has become clear that the impoverishment of the Palaeolithic archaeological record has been over-stated, and indeed that “[w]ell-preserved, high-resolution sites are known from all periods and regions of the Palaeolithic world...” (Gamble and Porr 2005, p. 1). Thus, if social inequality was a common feature of the Last Glacial we should be able to detect it. We begin by noting the evidence for political egalitarianism, then move to review the evidence of political hierarchy and what this evidence can and cannot tell us about the types and scope of social organization in the Last Glacial.

Evidence of political egalitarianism

Most sites antedating the Holocene throughout the world appear to reflect temporary hunting and gathering camps occupied by groups with egalitarian social organization. These can typically be categorized into site types that represent different phases of hunter-gatherer seasonal rounds, as documented for contemporary mobile foragers throughout the world (Binford 1983; Kelly 1995)—including special purpose/extraction sites (e.g. hunting stands), work sites (e.g. lithic procurement quarries) and residential base camps. There are difficulties inferring social organization during the early millennia of the Last Glacial since world population at that time was relatively small and scattered and their archaeological imprint is subtle. Many sites have not preserved at all, particularly along now-submerged Last Glacial coastlines.

Cave and rockshelter sites typically offer the best preservation and time-depth for establishing regional sequences, but their often complex stratigraphies representing multiple occupations, along with the restrictions they imposed on living space, do not make them ideal for exploring social organization (e.g. Deacon and Deacon 1999, pp. 162–175). Instead, some of the most highly resolved spatial patterning and best opportunities for reconstructing social organization come from open-air locales, particularly when archaeological research designs call for large horizontal exposures (David and Enloe 1992; Enloe and David 1992; Enloe et al. 1994; Gamble 1991; Kroll and Price 1991; Parkington et al. 1992; Nadel 2002; Nadel and Werker 1999; Soffer 1985; Stewart 2008; Roebroeks 1988; Tonner 2005; Van Noten 1978; Van Noten et al. 1980; Yellen 1976, 1977). Most Last Glacial sites of this sort exhibit domestic spatial organization comparable to contemporary nomadic forager camps. Where preservation is particularly good and advanced recovery methods employed, potential exists at these sites to detect behaviors universal to egalitarian societies, such as food sharing (e.g. David and Enloe 1992; Enloe 2003; Enloe and David 1992; Enloe et al. 1994). This level of resolution is rare and most statements about social organization must be inferred on a comparative ethnographic basis from subsistence-settlement patterns and estimates of duration, season of occupation, and group size.

The archaeological evidence suggests that small-scale, highly mobile societies with egalitarian political structures held sway during the Last Glacial, at least among anatomically modern humans (if not archaic *Homo* species as well). Despite the difficulties in reconstructing social organization from the archaeological record, the notable lack of the indicators that archaeologists use as evidence of hierarchy suggests that status differentiations were not prevalent. If we have to draw any generalization from the actual available evidence the best-supported thesis seems to be that of political egalitarian organization. In order to provide a more comprehensive review and to appreciate the scope of political egalitarianism in the Last Glacial, we also review the evidence for political hierarchy.

Evidence of political hierarchy?

Archaeologists typically detect political hierarchy and social stratification by looking for one or a combination of the following: differential burial treatment; differential domestic structure size and/or elaborateness; the presence of monumental architecture; the presence of prestige goods; and evidence for conspicuous consumption of resources (e.g. Hayden 1990; Hayden and Gargett 1990; O’Shea 1984; Peebles and Kus 1977; Renfrew 1973; Shennan 1975; Tainter 1973; Wason 1994). Substantial evidence for any of these phenomena is not forthcoming before the millennia spanning the terminal Pleistocene and onset of the Holocene, while monumental architecture before this time is lacking entirely. This may be a consequence of the poor preservation of organic components that potentially hold the key to discerning status differences (e.g. prestige goods and housing materials made from perishable materials, plant food remains, human burials, etc.). Many Palaeolithic sites that were situated on coasts—resource-rich, stable environments where we might expect political hierarchy to develop (Bailey 2004)—are now underwater. It is difficult to consider these possibilities on empirical grounds, and as such they remain irrefutable theoretical options. Furthermore, if Last Glacial people did develop hierarchical maritime adaptations it is unlikely that evidence to this effect would not have trickled inland above present coastlines due to vast material cultural contact and exchange that existed over Europe and Africa, and also because some uplifting Last Glacial shorelines have been preserved as terraces but have not yielded evidence of hierarchy (Hoffecker 2005).

The indications for political hierarchy during the Last Glacial are too few and inconclusive to lend support to a common presence of this type of social organization. Specifically, a handful of Eurasian archaeological entities dating to between 30,000 and 10,000 years ago may suggest local social structures similar to those of so-called complex or ‘specialised’ hunter-gatherers documented in a variety of resource-abundant ethnographic and archaeological settings (e.g., Ames 1981, 1985, 1991, 1994; Binford 1980; Habu 2004; Hayden 1990; Kobayashi et al. 2004; Koyama and Thomas 1981; Price and Brown 1985; Rowley-Conwy 1983). These entities show varying degrees of social complexity and subsistence intensification, perhaps indicating shifts toward status differentiation or social stratification. However, these shifts appear to be temporary and never develop into full sedentism, food production or long-term hierarchical adaptations.

Between 30,000 and 16,000 years ago a complex culture-trajectory developed in Eastern and Central Europe. Pavlovian (eastern Gravettian) sites in Moravia (30,000–24,000 years ago) show that sophisticated ritual behavior developed alongside long-term river system-oriented settlement choices, highly strategic landscape use, specialized hunting and extended exchange, and/or raw material procurement systems. This evidence suggests possible parallels with ethnographically documented ‘complex hunter-gatherers’ (Svoboda et al. 2000). Sedentism is precluded by the fact that the sites represent multiple rather than single occupations. Most sites seem to have been temporary places of seasonal gathering and celebration (Soffer 2000) as documented for contemporary egalitarian foragers (Lee 1979, p. 367). The affluence of the Pavlovians appears to have been interrupted by the onset of colder conditions around 24,000 years ago, causing major population shifts that ushered in the subsequent Willendorfian-Kostenkian, or Upper Gravettian, period (24,000–20,000 years ago) (Soffer 1985, 1993; Borziyak 1993; Dolukhanov et al. 2001; Grigor’ev 1993). It appears that these societies became more mobile as the climate deteriorated towards the Last Glacial Maximum (Fig. 1), and even abandoned whole regions (Churchill et al. 2000; Guthrie and Kolfschoten 2000). There are also some archaeological examples that may be interpreted as ascribed status during this period, such as burials in which children and adults were interred with rich assemblages of ornaments and ochre (Derev’anko 1998; Kuzmin 1997; White 1999; Vanhaeren and d’Errico’s 2005). But the scarcity of these examples, combined with the lack of evidence for sedentism or cemeteries, makes it is doubtful that they constitute evidence for established, long-standing structures of political hierarchy in Palaeolithic Europe, and such a case has not been made in the literature.

In Central and Eastern Europe, the Willendorfian-Kostenkian period culminated after the Last Glacial Maximum in the Epigravettian. Certain Epigravettian groups became very archaeologically visible on the central East European Plain where large, complex sites occur, notable for their intricate mammoth bone structures (Gladkih et al. 1984; Pidoplichko 1969, 1976). Evidence for fixed storage facilities suggests increased residential stability, which is associated ethnographically with reduced mobility, decreased social fluidity and opportunities for surplus accumulation/manipulation (Keeley 1988; Kelly 1995; Price and Brown 1985; Soffer 1989). However, Epigravettian camp sizes and layouts are reminiscent of documented foragers (Hoffecker 2002, 2005), and there is abundant evidence for very extensive interaction networks that imply high mobility and/or long-distance trade (Klein 1973; Soffer 1985). Soffer (1989) posits that sociopolitical hierarchization is implied by intrasite spatial patterning, and it is possible that certain individuals may have disproportionately accumulated seasonally abundant resources. It does not follow that Epigravettian societies developed hierarchical political structures with an intricate internal complexity characteristic of many Holocene groups worldwide. Indeed, concrete evidence for much more sedentary lifestyles and political hierarchy in this region comes only after the climate ameliorated after 12,000 year ago with the appearance of substantial house remains with diverse household goods and cemeteries with unequal grave good concentrations (Hoffecker 2005; O’Shea and Zvelebil 1984). The same is generally true for much of the rest of early-mid

Holocene Europe, where (particularly coastal) Mesolithic societies exhibited degrees of social complexity seemingly unknown among their Last Glacial predecessors (Bailey and Spikins 2008).

Some European Upper Palaeolithic parietal and portable art, particularly the painted, engraved, and sculpted caves of Francocantabria has also been offered as examples of hierarchy. The most richly decorated caves are situated in areas that were presumably used as refugia during harsh glacial conditions (Barton et al. 1994; Gamble 1986; Jochim 1987). Accomplished rock art was created over a 25,000 year period at the end of the Last Glacial (Clottes 1994, 1996), a time of tremendous climatic fluctuation. Yet, even if one accepts that most of this art reflects the activities of shamans experiencing altered states of consciousness (Clottes and Lewis-Williams 1996a, b; Lewis-Williams 1991; Lewis-Williams and Dowson 1988; Pearson 2002) or some other form of role differentiation, it does not follow that these positions involved political hierarchy. Ethnographic studies have already shown that role differentiation exists in fiercely politically egalitarian nomadic foragers. Furthermore, social esteem is granted to shamans and other individuals who benefit the group (i.e. successful hunters) only by group members' consent, and shamans who abuse their role are constrained or even killed (e.g. among Inuit, see Boehm 1993). Though Upper Palaeolithic ritual specialists may have enjoyed influence and respect, it is unlikely that they were allowed to gain hierarchical advantage. Paleolithic art, therefore, cannot by itself be taken as a signal of political hierarchy.

The clearest evidence for the emergence of sedentary life and possible first stages of social stratification in the Pleistocene may be seen in the Early Natufian cultural developments in the 'Levantine corridor' of Southwest Asia (Bar-Yosef and Belfer-Cohen 1992). Here the onset of warmer and wetter conditions around 15,000 years ago encouraged a substantial increase in ecological productivity (Barker 2006; Hillman 1996). Concomitant with these ecological shifts were major material cultural and socioeconomic changes in local forager groups. The most important indicator of social organization among the Early Natufians is burial treatment, which suggests variability in social status (Bar-Yosef 2002). Yet, even the Early Natufian did not lead directly to hierarchical social structures comparable to later Neolithic cultures in the same area. By about 13,000 years ago the gradual climatic downturn that culminated in the Younger Dryas cold stage (Fig. 1) began to seriously impact local forager life, causing a variety of responses including emigrations, decreased population, increased or decreased mobility, and subsistence diversification or intensification (Barker 2006; Bar-Yosef 2002). Although social structures remained stratified in the Late Natufian, only after the climate ameliorated and environmental productivity once again increased with the close of the Younger Dryas did fully sedentary villages develop with strongly hierarchical, complex political structures characteristic of the Neolithic. It should also be noted, though, that despite the fact that sedentism is typically posited as a precondition for hierarchization, we should be very cautious in assuming that big sedentary sites are always hierarchical (Hole 2000).

The rather limited indicators of hierarchy in the context of the very long period of the Last Glacial are, in many respects, the exceptions that prove the rule. When

local and temporary sociopolitical changes did occur in Europe and southwest Asia toward the end of the Last Glacial, these were registered in the archaeological records. The absence of widespread indicators of sedentary life and political hierarchy, therefore, is not simply a matter of poor preservation. There are accordingly two possible general interpretations of the evidence for political hierarchy that was presented in this section. The first interpretation is that at least some of these examples are indeed sporadic glimpses of hierarchical structures or practices, which begin from around 30,000 years ago and are restricted to specific regions in Europe and Southeast Asia. The second interpretation is that these are examples of sporadic social complexity, subsistence intensification and adaptation, and accorded (rather than inherited) social status, which did not involve political hierarchy. Regardless of which interpretation one chooses, a remarkable empirical reality is that beyond these few exceptions, no evidence currently exists for Pleistocene hierarchical structures in Africa (Barham and Mitchell 2008), the rest of Asia (Derev'anko 2005; Derev'anko and Shunkov 2008; Higham 2002) and the New World (Hiscock 2008; Meltzer 2009; Mulvaney and Kamminga 1999).

Discussion: political egalitarianism and the transition to political hierarchy

The spectrum of possible forms of social organization has expanded since the end of the Last Glacial. The onset of the following Holocene geological epoch was marked by the amelioration of the climate to our world's present generally warm, wetter and more stable conditions. The end of the Last Glacial is also marked by the end of the Palaeolithic and the onset of the Neolithic era (although not simultaneously in every continent). This transition is characterized by technological innovations such as the domestication of animals and plants, and the beginning of agriculture, all of which involved a transition to sedentism. The agricultural, or Neolithic, revolution was followed by several other historical periods and various technological innovations and growing social complexity (Scarre 2005). In this final section, we conclude the paper by way of discussing subsistence changes and population growth, which were involved in the transition from political egalitarianism during the Last Glacial to subsequent political hierarchy.

Sedentary life, subsistence economies, and social organization

The transition to sedentary and semi-sedentary life has had far reaching effects on human subsistence economies which impacted the spectrum of forms of social organization and the frequency and magnitude of hierarchical forms (Price 1995; Scarre 2005). Sedentary economy of food storage allows the accumulation of wealth both in the sense that it is physically possible to gather food in one location for long durations and to manipulate delayed-return subsistence economy and food sharing (Hayden 1995; Testart 1988; Woodburn 1982). The stability of resources enables sedentary life and a whole new mode of competition and costly signaling for status characterized by harvest methods and prime-resource defense, as exemplified in the evolution of hierarchy in Northwest Coast Indian societies (Ames 1981, 1985, 1991,

1994; Bliege Bird and Smith 2005, p. 234). Namely, some individuals are better than others at hunting, gathering, herding, cultivating land and so on, and those differences can translate into economic inequality if the ecological setting is stable enough (Bliege Bird and Smith 2005, pp. 233–235; Hayden 1995).

The reality of economic inequality and social stratification may make leveling mechanisms ineffective and enable some individuals to exploit opportunities that affect the distribution of political power (Cashdan 1980; Hayden 1995). A clear case study for such a pattern is Richard Lee's study of the fiercely egalitarian and nomadic bushmen, the !Kung San, whose old mechanisms proved inadequate upon the transition to sedentary life in term of subsistence economy and also "necessitated the emergence of new kinds of political relations, new forms of leadership, and new methods of resolving disputes" (Lee 1979, p. 369; see also Shostak 1981, pp. 193–197). The fact that a whole new spectrum of subsistence economy, which is dependent upon sedentary life, has been a main factor in the eventual emergence of political hierarchy during the Holocene leads to the conclusion that social organization during the Last Glacial was generally politically egalitarian.

Population growth and social organization

Population density is a second central factor that is strongly associated with the formation of political hierarchy. In nomadic groups, small and dispersed groups are necessitated due to limited and unpredictable food and water supplies. It is easier to maintain internal affairs in smaller groups that can split when tensions rise. With the transition to dense sedentary life, however, conflicts become more frequent, more effort is required from group members (especially from food suppliers), and increased degrees of cooperation and coordination are essential (Boehm 1999; Draper 1973; Lee 1979, pp. 354–369; Shostak 1981, p. 194). Conflicts over limited or prime resources (e.g. fishing grounds) may lead to intergroup conflict (see also Smith and Wishnie 2000, p. 505). Hence, increased group size may facilitate the concentration of political power in the hands of individuals who can resolve with authority the inevitable problems of sedentary groups. Population growth may also have the effect of creating direct dependency between those who have and those who do not have resources. When the number of offspring is no longer confined by the constraints of nomadic life, the main limiting factor on population growth becomes food supplies. Given that resources are not always abundant enough to support all group members, and combined with the natural variation in personal skills, food supply by those who have more of it to those who do not have enough can transform from a matter of right (as in nomadic foragers) to a matter of debt, dependency, submission and political hierarchy. Some group members, for example, may be unable to reciprocate "gifts" and hence be driven into lower status and rank (Hayden 1995; Service 1979, p. 18; Shostak 1981, pp. 193–197). Dense populations can also 'increase possibilities for a division of labor and hence open possibilities for social stratification.

That political hierarchy has been primarily generated by rapid population increase in dense sedentary societies is yet another line of supportive evidence to the

conclusion that political hierarchy was unlikely during the Last Glacial. Prior to the end of the Pleistocene the world's human population was much smaller (estimates of only a few millions) and distributed in low densities over the planet. Evidence of declines in human population densities in the Last Glacial are reflected in genetic research indicating genealogical lineages that were probably the result of population bottlenecks, genetic drift, and gene flow (Behar et al. 2008; Boone 2000; Churchill et al. 2000; Hawks et al. 2007; Klein 2000; Mellars 2006a, b; Morin 2008; Wells 2002). Moreover, recent analyses of Mitochondrial DNA suggest migration rates of between about 300 m to 1,000 m a year from Africa to Australia, and similar estimates of about 1,000 m a year from Beringia to Chile (Forster 2004; Mellars 2006a, b). Similarly, within Africa migration rates towards western Africa are estimated at about 200 m a year (Behar et al. 2008; Forster 2004). In Upper Paleolithic Europe, analyses of cranial morphology, body and shape stature, and robusticity of limbs also provide indirect evidence on micro-evolutionary trends which disclose a surprising degree of morphological similarity across very distant and diverse regions. This suggests that European populations during the Last Glacial were characterized by a high degree of mobility and contact with each other, resulting in gene flow and cultural exchange (Churchill et al. 2000).

Conclusion

While variability of social organization remains a theoretical possibility, it is very unlikely that the social organization spectrum during the Last Glacial contained substantial, if any, political hierarchy. It is hard to see how such a form of social organization could have been generated and sustained under the ecological conditions of that period that would not have permitted enough time for sedentary forms of living and agriculture to be established (see Richerson et al. 2001). The subsistence economies and social organization forms of complex foragers are therefore unlikely models for reconstructing Last Glacial human life. The attainment of prestige and status in the Last Glacial would have also been confined to, and constrained by, the modes of subsistence economy characterizing egalitarian nomadic foragers (see also Bliege Bird and Smith 2005, pp. 233–235). While ethnographical models have offered new tools for modeling political structures according to internal (social and ideological) rather than external (ecological and demographic) factors as prime movers in political change (Price and Feinman 1995), ethnography has also engendered a real sense of how significant the role played by the environment is to this process (Hayden 1990). For the development of hierarchical social structures, for example, social factors are essential but not sufficient—high degrees of resource abundance and stability are also essential. As recent data shows, at least one dramatic change in the environment most probably occurred within a decade or less in the span of a mature person's life. This surely encouraged highly mobile, flexible, fluid, and most probably egalitarian forms of social organization. There is indeed little convincing archaeological evidence demonstrating that human beings maintained year-round settlements or structured political hierarchy during the Last Glacial.

This synthesis of research sets the stage for cross-disciplinary discussions as well as more focused hypotheses testing. After all, the role of theory is both to interpret existing data and guide the search for new pertinent data. Our hypothesis that social organization during the Last Glacial was predominantly politically egalitarian may affect interpretation of social behavior and organization in earlier Homo fossils as suggested in section “[Hominids and political egalitarianism: a physical-anthropological perspective](#)”. The question whether egalitarian social organization predominated human evolution is also relevant to hypothesis testing in evolutionary psychology (Tooby and Cosmides 1992) and in particular for drawing attention to cognitive mechanisms which may be associated with the maintenance of political egalitarianism, such as mediating responses to over-assertive individuals (e.g. Larimer et al. 2007). Lastly, a multi-disciplinary perspective such as the one presented in this paper can help revitalize stagnated discussions and old debates within isolated disciplines, and inject them with a more comprehensive understanding of the nature and evolution of human social organization.

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