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THE CRADLE OF THOUGHT:

GROWTH, LEARNING, PLAY AND ATTACHMENT IN NEANDERTHAL CHILDREN

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SUMMARY

Childhood is a core stage in development, essential in the acquisition of social, practical and cultural skills. However, this area receives limited attention in archaeological debate, especially in early prehistory. We here consider Neanderthal childhood, exploring the experience of Neanderthal children using biological, cultural and social evidence. We conclude that Neanderthal childhood experience was subtly different from that of their modern human counterparts, orientated around a greater focus on social relationships within their group. Neanderthal children, as reflected in the burial record, may have played a particularly significant role in their society, especially in the domain of symbolic expression. A consideration of childhood informs broader debates surrounding the subtle differences between Neanderthals and modern humans.

INTRODUCTION

Childhood has received little attention in the evolutionary past despite its importance in influencing cognition, social relationships and culture (Shea 2006, Stepart 2007). However, with apparently critical differences between Neanderthals and modern humans now less clearly defined, the debate over difference has shifted to more subtle aspects and pushed evermore into the social and cultural realm. Given this context, and that the foundations for adult behaviour and society are put in place during childhood, we argue it is now crucial to forward our understanding of children in prehistory.

Neanderthal children rarely appear in our discussions of Neanderthal society despite making up a significant proportion of the population (Shea 2006). Indeed, and as Nielsen (2012, 175) notes, in some quarters it is still debated whether Neanderthals actually had a childhood at all. Of course children are less visible than adults in the archaeological record, both in terms of the preservation potential of bone and the difficulty in identifying material traces of childhood (Derevenski and Sofaer 2000). However, visibility has not been the only issue. It has been a longstanding problem within archaeology that children are perceived as of marginal importance, accorded little attention in key discussions or even disregarded when recovered. It is telling that although the original skeletal material from Engis Cave included the crania of a four year old child, it was the adult Neanderthal that gained fame and detailed study, while the child fossils languished unnoticed in a museum for over a hundred years (Zollikofer and Ponce de León 2010). Similarly, a neonate from Le Moustier also remained unrecorded in a cardboard box for over a century (Zollikofer and Ponce de León 2010), while the remains of two well preserved neonates from Saint-Césaire were only recently discovered within faunal collections, fifteen years after the end of the excavations (Colombert 2012).

Despite this neglect in recovery, there has been some previous work on Neanderthal children. This has taken the shape of primarily biological accounts, detailing any facts that can be easily and robustly established from direct skeletal analysis, such as growth and development. While this clearly lies at the core of much of what we can say about children in prehistory, we must go further and discuss childhood, considering the social and cultural role of children and how they experienced life and were treated during it. The traditional view of Neanderthal children stems from a focus on biological evidence, and perceives childhood as unusually harsh, difficult and dangerous. This view has remained dominant despite the reappraisal of many other aspects of Neanderthal life, including language capacities (Krause et al 2009), genetic descendance (Green et al. 2006; Green et al. 2010) and symbolism (Abadía and González Morales 2010; Finlayson et al 2012; Marquet and Lorblanchet 2003; Morin and Laroulandie 2012; Peresani et al. 2011; Zilhao et al 2010). Trinkaus (1978, 62) even suggests that if a Neanderthal was lucky enough to survive childhood and adolescence then they would already bear the “scars of a harsh and dangerous life”. This view of a “nasty, brutish and short” existence (Pettitt 2000, 362) remains unquestioned, fitting with preconceptions about Neanderthal inferiority and an inability to protect children epitomising Neanderthal decline. However, we argue that a lack of a recent review in this area could mean we are neglecting important insights into Neanderthal life.

Through reviewing the evidence of Neanderthal childhood and the treatment of Neanderthal children, we suggest that our current knowledge negates the traditional perspective. Instead we argue that a close attachment and particular attention to children is a more plausible interpretation of the archaeological evidence, explaining an unusual focus on infants and children in burial, and setting Neanderthal symbolism within a context which is likely to have included children. Subtle differences in the nature of emotional attachment in childhood, as well as a lack of safe affiliative interactions with outsiders, may have had key consequences for Neanderthal society, culture and symbolism.

NEANDERTHAL BIRTH, GROWTH AND DEVELOPMENT

Neanderthals are closely related to our own species (Green et al. 2006; Green et al. 2010; Lalueza-fox et al. 2012) and we are perhaps now in a position to expect a greater measure of similarity than has perhaps previously been conceded. Neanderthal children were, as in modern human offspring, born in a highly altricial state, with much brain growth occurring after birth. Adult brain sizes would have been around 3.3 times the newborn size, in comparison to around 2.5 times in chimpanzees (Neubauer and Hublin 2011; Ponce de Leon et al. 2008). Neanderthal newborns were therefore equally vulnerable, and on the basis of the Mezmaiskaya neonate, would have also made the characteristic half turn at birth (Ponce de León et al. 2008). This implies a comparable risk for Neanderthal mothers during childbirth. Furthermore, an initially slow post-natal growth rate, as well as alloparenting, would reduce energetic demands on Neanderthal mothers, facilitating a reduction in birth spacing relative to other apes (Dean 2007). Looking from the perspective of other great apes, Neanderthal and modern human birth appears essentially the same.

While there is a great array of similarity, those differences which are present, though subtle, may have been significant. Studies of tooth eruption patterns have been taken to imply either a similar period of post-natal development to modern humans (Guatelli-Steinberg et al. 2005; Macchiarelli et al. 2006) or a somewhat faster development in Neanderthals (Smith et al. 2007, 2010). However, these interpretations remain contentious given the variation in tooth eruption patterns across other primates (Zollikofer and Ponce de Leon 2010). Further analysis of crown enamel formation and tooth histology suggests that Neanderthals reached adulthood at around 15 years of age (Ramirez Rossi and Bermudez de Castro 2004), a somewhat faster rate of development and earlier attainment of adulthood than modern humans (Neubauer and Hublin 2011, Smith et al. 2010). Whilst a faster development could have implications for cultural learning and innovation (Hawcroft and Dennell 2000), it is important to recognise the significance of 'cultural age' as well as biological age. The cultural age boundaries for childhood and adulthood have varied for modern humans throughout time. For example, Anglo-Saxon children were considered to reach adulthood at 12 (Crawford 2007) yet there is no question of their cultural knowledge or cognition. The context of development is therefore just as crucial as the biological rate of development. The differing environments in which Neanderthals and modern humans evolved must also be kept in mind when considering this plethora of subtle trait differences.

Neanderthal growth has also been shown to be subtly different in other ways. This species clearly looked different at birth (Maureille 2002), being significantly more robust than modern humans and already showing characteristic features leading to a more prominent face and a lower, wider and more elongated brain case (Zollikofer and Ponce de León 2010, 444). The Neanderthal brain grew faster than the human brain, beginning at around 400cm^3, tripling in volume by age three, and reaching at adult size of around 1500cm^3 (Zollikofer and Ponce de Leon 2013, 30). Differences are also seen in the specific patterns of brain growth and expansion (Gunz et al. 2010). Neanderthal brain shape developed without the pronounced 'globularisation phase' seen in modern humans, which rather than representing cognitive differences, is thought to be associated with subtle differences in perception and functioning, or internal brain differences linked to these domains(Neubaeur and Hublin 2011; Pearce et al. 2013; Zollikofer and Ponce de Leon 2013, 31). Though broadly similar, patterns of Neanderthal biological and cognitive growth are therefore subtly different from those of later groups. However, these differences are at a level in which influence on adult behaviour may have depended on the context of development.

NUTRITION, TRAUMA AND MORTALITY PATTERNS

As already stated, the current view of childhood and the context of development see the life of Neanderthal children as unusually difficult and dangerous. Although the skeletal evidence might initially appear to support these interpretations, closer inspection suggests that their experience of childhood was far less different than previously assumed.

Interpretations of high activity levels and frequent periods of scarcity form part of the basis for this perceived harsh upbringing. However, such challenges in childhood may not be distinctive from the normal experience of early modern children, or hunter-gatherers in particularly cold environments. There is a critical distinction to be made between a harsh childhood and a childhood lived in a harsh environment. Anatomical studies of Neanderthal long bones have shown that survival depended on adapting to high activity levels (Weinstein 2008) and rugged terrain (Wall-Scheffler 2012; Wiggins and Ruff 2011). However, there is little to differentiate Neanderthal physical endurance from that of early modern humans (Stock and Shaw 2012). Both populations display markers for apparently high levels of mobility, as evidenced by hypertrophy of the tibia when compared to modern hunter-gatherers (Stock and Shaw 2012). Equally, whilst periods of nutritional stress are recorded through enamel defects (Ogilvie et al. 1989, Pettitt 2000) and stunted childhood growth (Stapert 2007, 17), this is not necessarily unusual. For example, the recently discovered infant remains from Shanidar, recovered from faunal collections in 2000, has Harris lines showing stress related arrestment of growth at around the age of nine months (Cowgill 2007). However, comparative studies show that such periods of physiological stress are no different from those of modern Inuit (Guatelli-Steinberg et al. 2004). Neanderthal children certainly lived a physically challenging life, but those challenges should not be seen as exceptional in comparison with early moderns or comparable hunter-gatherers.

Trauma patterns and mortality rates are the most widely quoted evidence of a particularly harsh childhood. Neanderthal mortality profiles, derived from the distribution of ages at death of skeletal remains, show a peak in adolescence and young adulthood (figure 1), apparently implying high mortality amongst juveniles and the likelihood of an early death (Trinkaus 1995). Evidence of traumatic injuries has received particular focus as an explanation for this pattern. Interpretations of Neanderthal biomechanics indicate that an inefficiency in throwing may have forced confrontational hunting (Churchill 2003), which coupled with high levels of upper body trauma, have been taken as evidence of frequent hunting injuries (Berger and Trinkaus 1995). More recent revisions of shoulder biomechanics (Maki 2012) have altered this picture somewhat, but nonetheless have lead to a focus on interpersonal violence as an explanation for trauma (Trinkaus 2012). Evidence therefore appears to suggest that children were at particular physical risk from an early age, lacking the experience of older adults and being particularly exposed to dangerous activities, injury or potential death (Trinkaus 1978; 1995; Berger and Trinkaus 1995; Pettitt 2000; Underdown 2004). An adolescence marked by risk and trauma would clearly contrast with the childhood of modern human hunter-gatherers, for whom involvement in dangerous pursuits by children is rare (Kuhn and Stiner 2006). The apparently remarkable attrition of young Neanderthals, whether through hunting or fighting, would be a major selection pressure, also implying a population dominated by children and adolescents with very few older adults. However, a closer inspection of this evidence reveals that this image of violence requires reappraisal.

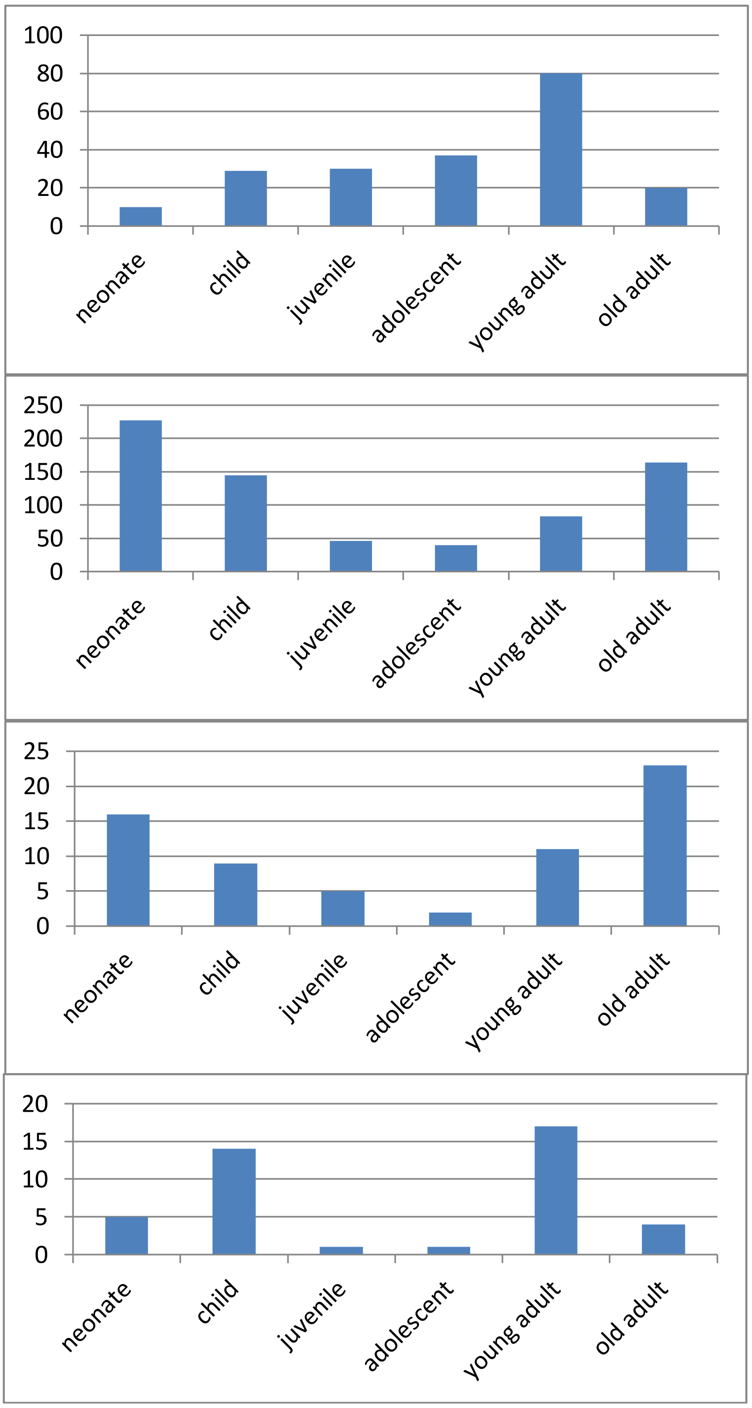

Figure 1: Mortality Profiles of a) Neanderthal skeletal remains (data from Trinkaus 1995), b) Modern foragers, combined Ache, !Kung and Hadza (data from Trinkaus 1995), c) Chimpanzees (data from Trinkaus 1995) and d) Neanderthal burial remains (data from Pettitt 2011).

The evidence for trauma in juveniles is actually relatively slight. Only two of the seventeen individuals studied with upper body trauma were non-adults, and neither displayed evidence for interpersonal violence (Berger and Trinkaus 1995, 848). There are also other previously unrecognised explanations for trauma rates. The majority of Neanderthal skeletal remains come from excavations of occupation sites, particularly rockshelters. Those tending to die 'at home' and enter occupation deposits may not be the 'average Neanderthal'. We have extensive evidence for care of the sick and injured for months or even years amongst Neanderthals, presumably in the domestic context (Spikins et al. 2010). These injured individuals would have been far more likely to die at the occupation site. This potential bias is supported by the occurrence of a number of apparently very elderly Neanderthals, such as Shanidar 1, within occupation deposits. The incidence of trauma in Neanderthals, which are not notably different to that found in Upper Palaeolithic populations (Trinkaus 2012), are more readily attributed to the selective origins of skeletal samples.

Such anthropogenic processes means the representativeness of any mortality profiles based on collections of Neanderthal skeletal remains can also be questioned. Neanderthal mortality profiles contrast markedly from those recorded in any living primate or modern human context, where mortality is clearly lowest in adolescence (figure 1b, c; Klein 2007; Trinkaus 1995, 133; 2011). It also contradicts the age distributions in Neanderthal burial evidence which show a similar low representation of adolescents (figure 1d). Such a mortality profile, with most dying before reproductive age despite many years of parental investment, hardly represents a viable population (Aiello 1994).

A reconsideration of skeletal evidence also suggests that the timing of death at adolescence is questionable. 17% of the skeletal record from which mortality profiles have been derived comes from rather specific contexts, which appear to be a focus for adolescent interment. Of the 206 individuals used in the analysis of Neanderthal mortality profiles (Trinkaus 1995), 36 were recovered from deliberate deposition in natural fissures at Krapina and Vindija in Croatia, where 43% (of 23) and 46% (of 13) were adolescents (Pettitt 2000). Similarly at L'Hortus, very fragmentary remains of around 20 individuals were 'cached' in a fissure, many of whom were young adults (De Lumley 1972; Pettitt 2011). These 'mortuary pits' are likely to be a particular context into which a selected set of individuals were deposited. The origins of this can be seen in earlier groups. For example, the bias of juveniles in the *Homo heidelbergensis* individuals thrown into the pit at Atapuerca in northern Spain have been convincingly argued to be a selected sample, rather than representative of population demography (Bermúdez de Castro et al. 2004).

Although interpreted as randomly discarded elements (and so representative of actual mortality), most of the skeletal material found on sites are likely to have originated in some type of mortuary deposition (Harrold 1980, 197). Post-mortem processing, including excarnation and the reburial of bones, was a common element of Neanderthal treatment of the dead (Pettitt 2011) and results in remains being incorporated in other occupation debris. Other mortuary treatments include dismembering and defleshing, and possible consumption of parts of corpses. The limited evidence for cannibalism is largely restricted to the Quina Mousterian tradition at sites such as Moula-Quercy and Combe-Grenal, suggesting that this pattern has cultural rather than nutritional motivations (Depaepe 2009). Either way, this practice would likely lead to the incorporation of human bones within occupation debris and therefore effect the representation of remains.

Any differences between the age profiles of Neanderthal skeletal remains and those in the Neanderthal burial record (which more closely match modern hunter-gather mortality profiles) may also reflect taphonomic processes acting on fragile bones. Children are notoriously underrepresented in many periods of history and prehistory (Lewis 2007), with preservation bias being a major contributing factor. Except in cases of explicit burial, adolescents and young adult bones are therefore far more likely to be recovered, leading to higher proportions in skeletal remains. In the context of this preservation pattern, the survival of the bones of the very young in rockshelters outside of burial contexts is remarkable. Pettitt even evocatively comments that teeth and small skeletal fragments of infants and juveniles 'litter caves' (Pettitt 2000, 355). The image of children's bones as debris is an influential one, but rather than being cast aside as refuse, bones of neonates and infants in occupation sites are likely to be representative of disturbed burials that were unrecognised or alternative types of mortuary deposition, as at Amud Cave (figure 2). Since chimpanzees can show extensive grief (Biro et al. 2010), on occasion carrying around the corpses of the dead for several weeks, it should not be surprising that Neanderthal infant corpses were the focus of explicit attention, again leading to their differential preservation. When we consider how the archaeological record of Neanderthal skeletal remains formed, the current image of mortality and a dangerous childhood is difficult to sustain. Further to this evidence, a closer look at the more explicit burial evidence also reveals some notable patterns which contrast with this traditional view.

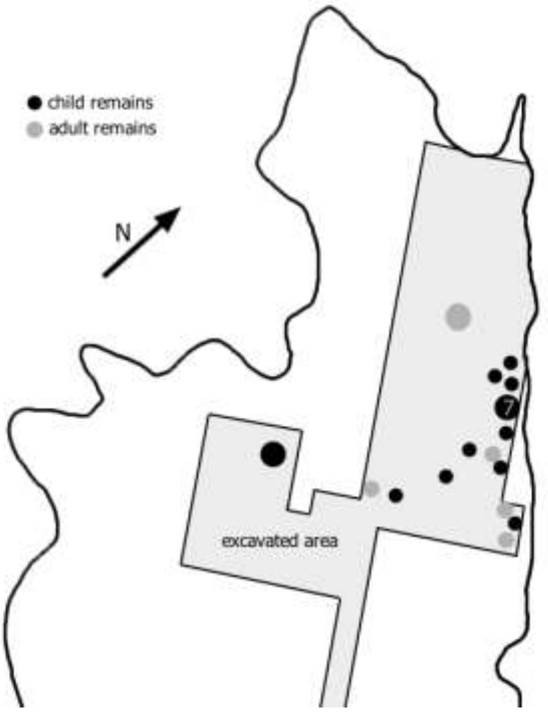

Figure 2. Plan of Amud Cave showing the distribution of all Neanderthal skeletal remains from the site, including burials (large circle) and disarticulated remains (small circle; drawing by Gail Hitchens, redrawn from Hovers et al. 1995).

NEANDERTHAL CHILDREN AT DEATH

Though Neanderthal adult burials often receive the greatest focus in archaeology, a closer consideration of child burials reveals that the young may have been given particular attention when they died. In contrast to the underrepresentation of child burials in other periods (Lewis 2007), including modern humans of the Palaeolithic (Zilhao 2005), more than a third of Neanderthal burials are those of children aged under four.

Over twenty child burials in total have so far been recovered (table 1; figure 3), typically illustrating great care of the very young at death.

Figure 3: Figure 3. Map of the Neanderthal burial sites (circle) and other mortuary sites (triangle) discussed in text (Gail Hitchens).

For example, at Meizmaiskaya cave in the Caucasus, a newborn was carefully laid on its left side for burial, whilst an infant under four months at Le Moustier was buried in the lower shelter (Defleur 1993, Maureille 2002, Pettitt 2011). Alongside other individual burials, there are numerous examples of infants and juveniles found associated in varying proportions with collections of adults. Perhaps the most famous example is the 'cemetery' of La Ferrassie, which presents the clearest evidence of a particular attention to children. Here two newborns, La Ferrassie 4 and La Ferrassie 5, were buried in oval depressions, the former associated with three flint scrapers. Of the seven individuals buried at the site, only two are adults, the others being a two year old (La Ferrassie 8), a three year old (La Ferrassie 6) and a ten year old child (La Ferrassie 3) buried next to one of the newborns (figure 4). Most recently, the buried remains of a child and two adults have been recovered from Sima de las Palomas in south-eastern Spain. The Neanderthal child remains (SP-97) were associated with burnt horse bones and flints, and also found immediately above an adult female, which had been laid out carefully on a scree slope (figure 5; Walker et al. 2012). Other mortuary contexts also reveal a strong presence of children. At Krapina, dating to around 130,000 BP, at least 23 individuals were deposited in natural fissures, including four juveniles and five infants (Trinkaus 1995). Despite the great time depth and the tendency for children's remains to degrade faster than those of adults, children are well represented in Neanderthal burial and appear to have been accorded specific treatment.

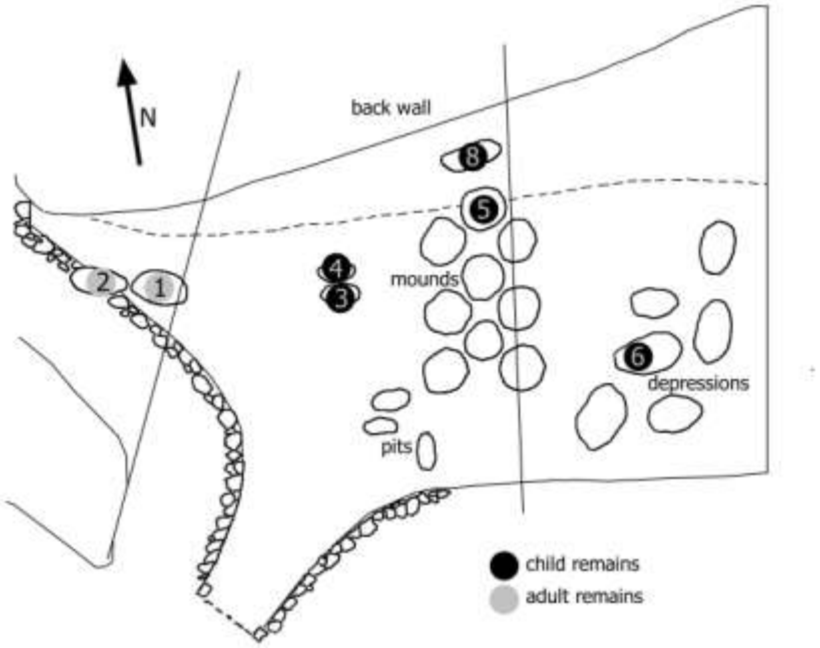

Figure 4. Plan of La Ferrassie 'cemetery' with the position of five child burials and two adult burials (drawing by Gail Hitchens, redrawn from Heim 1982).

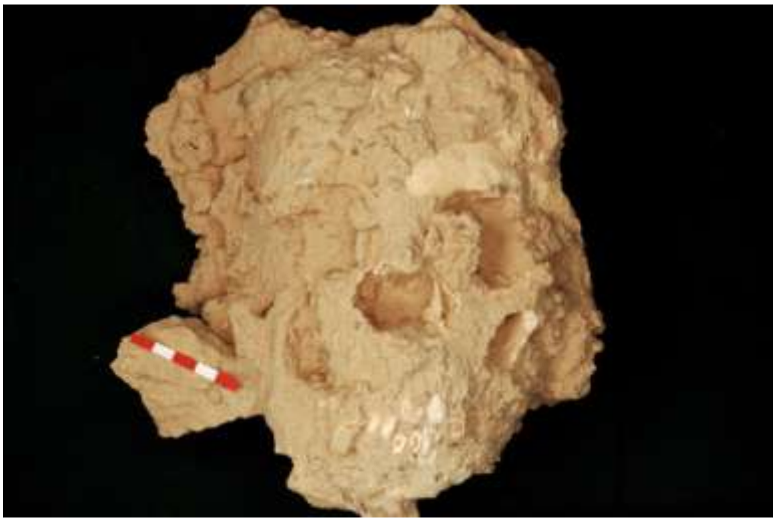

Figure 5. The skull of SP-97, a child burial recovered from Sima de las Palomas, above the burial of an adult female (photograph taken by Jon Ortega Rodrigáñez and reproduced from Walker et al. 2012 courtesy of Michael Walker).

Amongst the more recent excavations, several individual child burials have been recovered from within occupation sites. At Roc de Marsal, France, a partial skeleton of a 7-11 year old child was found within a clear grave cutting at the centre of the cave (Defleur 1993), whilst at Amud Cave, an infant of about seven months was deposited carefully in a crevice in the cave wall (Rak et al. 1994). Another example is Dederiyeh Cave in Syria, where two infants of around two years of age were buried at the rear of the cave (Akazawa et al. 1995a; 1995b). One (Dederiyeh 1) lay on its back with its arms extended and legs flexed, and was found associated with a triangular piece of flint on it's chest and stone slab next to its cranium (figure 6). The other (Dederiyeh 2) was in a partial and fragmentary state, and found with faunal remains, lithic implements and over a hundred pieces of lithic debitage (Akazawa et al. 1995a; Akazawa et al. 1995b).

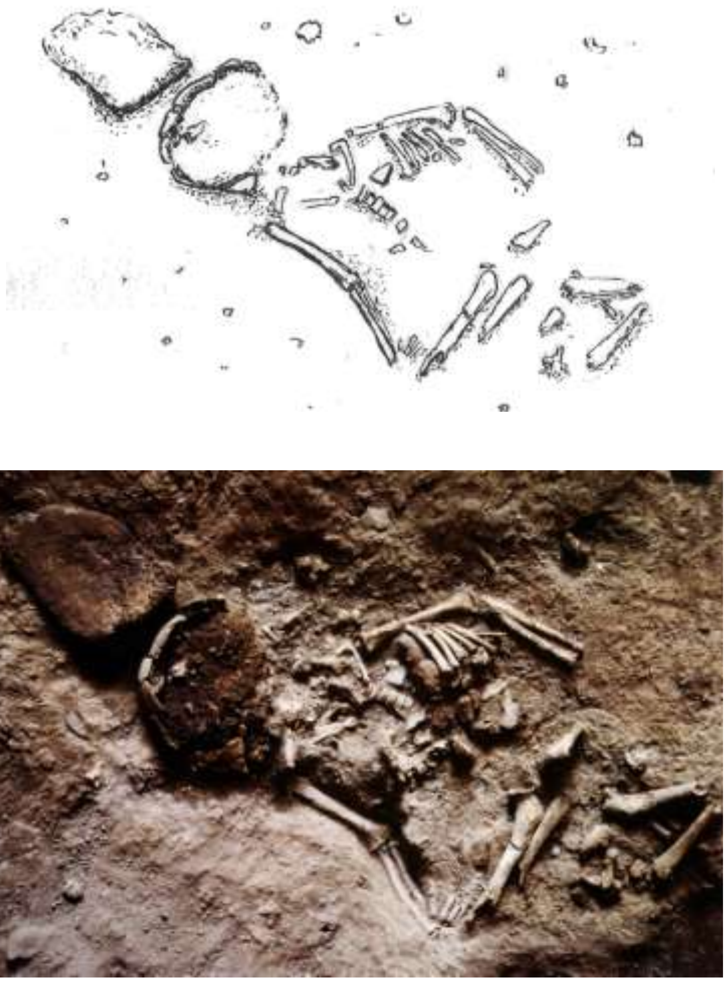

Figure 6. Dederiyeh 1, a two year old child found with a triangular flint on its chest and a stone slab next to its head (photograph courtesy of Takeru Akazawa).

In addition, far more child burials have been found associated with artefacts and bones when compared with their adult counterparts. This includes the examples already mentioned, such as the newborn at La Ferrassie with three flint scrapers and the Dederiyeh 1 infant with a triangular flint resting over its chest. The 10 month old infant from Amud Cave is also clearly associated with a red deer maxilla (figure 7), whilst the infant at Teshnik-Tash was placed in a shallow grave surrounded by goat horns (figure 8; Okladnikov 1949 cited Gargett 1999, 168), along with a small limestone slab argued to have been in place to support its head (Movius 1953, 25 cited Gargett 1999, 168). Neanderthal grave goods have always been and indeed remain a contentious issue within Palaeolithic archaeology, with some regarding the artefacts and bones found with these individuals as not 'special' enough to constitute a deliberate or symbolic trace (Chase and Dibble 1987; Klein 2009). However, Hovers et al. (2001) have convincingly countered this position with evidence from the child buried at Amud cave. In contrast to the well preserved deer maxilla found with the child, the majority of animal bones recovered from the cave and in the vicinity of the skeleton were highly fragmentary. This suggests that the maxilla was placed and protected intentionally. Furthermore, because the bone was deliberately placed in direct contact with the pelvis of Amud 7 we can be sure the inclusion was purposeful (Hovers et al. 2001). Regardless of the debate over symbolic grave goods, it is still notable that the artefacts and bones recovered from Neanderthal contexts are far more likely to be found in association with children.

Figure 7. The child burial from Amud Cave found with a deer maxilla on its pelvis (reproduced with permission from Erella Hovers).

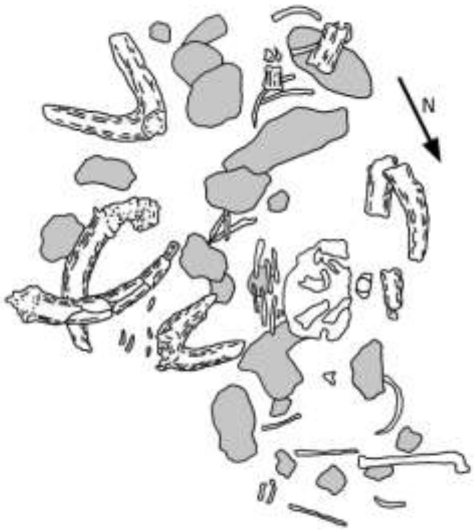

Figure 8. The child burial from Teshik-Tash surrounded by goat horns (drawing by Gail Hitchens, redrawn from Defleur 1993).

The domestic context might have been seen as a more ‘protective’ area in which to bury infants who were seen as vulnerable, much as young infants tended to be buried within ‘homes’ in later contexts. Adolescents on the other hand are much more likely to be treated in other ways, such as entering mortuary pits or crevices further away from ‘home’. Given that burial evidence shows a particular focus on children, and that a closer look at biological evidence negates the traditional view of an unusually harsh upbringing, it is now crucial to consider other forms of evidence that may enlighten our view of Neanderthal childhood and the context of development.

NEANDERTHAL FAMILY STRUCTURES

Neanderthal groups have largely been interpreted as small and relatively isolated, which would have important implications for the social and emotional context of childhood. Whilst some larger and more clearly spatially structured sites have recently been highlighted, this pattern generally holds true as more evidence accumulates. Rather than seeing this as just a more simply organised society, other factors might better explain the distinctive family structures present in Neanderthals.

Potential evidence for the makeup of a Neanderthal group comes from the remarkable site of El Sidrón cave in northern Spain. Here an entire Neanderthal group died as a result of a natural catastrophe, perhaps a rock fall, commonly held to be around 37-41,000 BP (though see Wood et al. 2013 for critique and potential new date). The highly fragmented remains of six adults (three males and three females), three adolescents (possibly all male), two juveniles (5-6 and 8-9 years) and an infant were recovered. Genetic results indicate that the child of 8-9 years was the offspring of one of the female adults, and the child of 5-6 years was the offspring of another of the females (Lalueza-Fox et al. 2010; Lalueza-Fox et al. 2012). In addition, the three adult males were likely brothers. If proven representative, the El Sidrón material would imply a more balanced population structure than suggested by mortality profiles, with small group sizes, presumably focused around related males. While caution is necessary in relying on one site, other lines of evidence, from raw material studies to ecology and intra-site patterning, support the notion of Neanderthal populations structured into small, relatively isolated groups.

The archaeological record of Neanderthal sites shows certain contrasts with that of later modern groups. They have been interpreted as generally smaller (Pettitt 1997; Pearce et al. 2013) with group sizes correspondingly small at around 25 people in a group (Burke 2006; Hayden 2012). These sizes are not incompatible with hunter-gatherers in very cold environments (Hayden 2012), although Neanderthals also occupied Europe during interglacials, as well as wooded and tundra-like environments. A potential maximum might be seen at larger sites such as Abric Romani (Vallverdú et al. 2010), which has been argued to represent the activity of up to 28 individuals on the basis of floor areas and hearth orientation (Hayden 2012, 4). However, this does assume a single occupation and small groups therefore still appear to be the norm. This tendency for a small group size and society would have had important implications for the size of peer groups in development.

Evidence from raw material movements supports the suggestion that interactions between groups may have been infrequent. Raw materials are typically local, such as within the Dordogne (Depaepe 2009), or almost exclusively within the Vercors basin for example (Bernard-Guelle 2005). In cases where raw material does move somewhat greater distances, such as on the relatively open central European plain, these movements are very infrequent. This suggests either only occasional long distance movements, or largely unrepeated interactions with other groups (Feblot-Augustins 1993). Though there are materials in southern Italy that have travelled from further north (Spinapolice 2011), such movements are the product of the unique situation of a dearth of available resources in the south. These examples indicate that Neanderthals had the ability to exploit more distant raw materials when necessary, but appear to have had little to no motivation to do so.

Neanderthal group size and pattern of landscape exploitation can be related to their ecology. The pronounced robusticity of Neanderthals implies relatively high energy demands (Steegman et al. 2002), apparently met by a high dependence on meat (Richards and Trinkaus 2009). Although other food resources would have been important (Hardy 2010, Hardy and Moncel 2011), both a high meat diet and high energy requirements implies that the 'energy footprint' of Neanderthals was greater and group sizes smaller by necessity. Moreover the rugged terrain occupied by Neanderthal groups

not only lead to biological adaptations (Wall-Scheffler 2012), but also implies a more constrained topography within which connections to other groups would have been infrequent and difficult to maintain. Small groups with relatively large ranges imply that territories were unlikely to have been defended (Croxall and Sterck 2012). The tendency not to interact with neighbours therefore need not imply competition. A lack of motivations to develop affiliative relationships between groups may have implied that any intergroup movement, as most common in other higher primates and social mammals, may have been selective, such as predominantly the domain of females without infants.
Within this ecological context of rugged constraining terrain, which favoured small groups within large territories, there will have been little selection pressure on overcoming the tendency to avoid outside groups and the natural emotional focus on close internal connections. Although far from unsocial, small and relatively isolated groups may have been significant in the development and maintenance of a particularly inward focused social and emotional connection in Neanderthals. This focus would have important implications for the context of development and as a consequence, Neanderthal society and culture in general.

LEARNING, PLAY AND FORGING SOCIAL BONDS

As children we learn not only how to behave as adults but also how to think and feel, meaning that the particular inward focus of Neanderthal society could be significant. Harry Harlow notoriously demonstrated that even lower primates are deeply disturbed by a lack of appropriate contact as infants (Harlow 1964). Emotional connection, as well as opportunities to learn, would have been as essential for Neanderthals. A lengthy childhood is clearly significant in social and cognitive terms, providing an opportunity to develop emotionally and socially and to learn complex subsistence practices as well as social and cultural traditions. Not only will explicit learning have been important for adult socialisation, but also play. Play takes place when conditions are 'safe' and promotes positive affiliative emotions towards others (Gervais and Wilson 2005, 395-430). For humans and other great apes, play is essential in demonstrating safety, encouraging group cohesion, reducing aggressiveness and promoting exploration (Cordoni and Pelagi 2011). Peek-a-boo (a form of mother/parent play) and various throwing and swinging play occurs in great apes as well as humans (Cardoni and Pelagi 2011, 1), and, albeit by implication, perhaps also in Neanderthals. Across these species peer-peer play is also important, and contributes to normal social development in monkeys and children, even where parental play is lacking (Spijkerman et al. 1997; Suomi and Harlow 1972). We can reasonably assume that such features of mother/carer-infant and infant-infant play also characterized a lengthy Neanderthal infancy and childhood. Nielsen (2012, 177) speculates that fully developed childhood may have been a late evolutionary adaptation, not appearing until the Middle Palaeolithic. Play has potentially important benefits to society, stimulating creativity and innovation (Nielsen 2012, 176).

The context of child development influences adult behaviour through various means. One of these is cultural differences. Culture is not only able to shape our ideology, but also our social emotions (Markus and kitayama 1991). In the collectivistic culture of Spain, for example, an evolved and cross-cultural capacity for shame is developed into a culture-specific sense of group shame, *'verguenza alena'*, which encourages conformity. Likewise in Japan, love for others is culturally shaped into '*amae*', a sense of sweet dependence on others (Markus and Kitayama 1991, 237; Parkinson et al. 2005). Individual pride is also discouraged in Japan, whereas in individualistic cultures, such as America, it is encouraged. Such a different focus for internal or external social emotions affects in-group support as well as attitudes towards outsiders (Gómez et al. 2000, Triandis 2001). Individualistic societies are more open to external collaboration for example, at the expense of the lengths gone to support these ties. Culture also influences our beliefs about the world and what we perceive as natural. Neanderthal ‘cultures’, suggested by at least three different geographical-genetic groups (Fabre et al. 2009) and documented in the different styles of flint knapping and mortuary practices, probably also provided distinctive higher level explanations of the world.

Most of the influences on who we become as an adult are ‘closer to home’. Our basic capacities to be able to learn a language or to feel the same essential range of emotions are hard-wired, with social emotions like compassion and empathy having roots which lie much before Neanderthals (Hublin 2009, Spikins et al. 2010). It is those close to us in childhood that provide the 'secure' attachments and care to enable normal development and cognitive and emotional maturity. A lack of such care in opportunities to learn can cause language delay or other cognitive constraints whilst emotional insecurity (remarkably common in modern societies, reaching levels of 30% within many populations) leads to either too great an anxiety to act on another's behalf or an indifference to other's wellbeing (Mikulincer and Shaver 200a; 2005b). Rossano (2010) suggests that Neanderthals are likely to have been emotionally insecure leading to cognitive impairments, particularly in working memory. This is based on an apparent lack of older adults who might help with the care of the young, as well as the persisting view of a particularly risky and dangerous childhood. We argue that since this traditional perspective of demography and childhood can no longer be sustained, it is instead attachment *security* that is likely to have been a key feature of the life of a Neanderthal child.

Further to the reappraisal of trauma and mortality patterns outlined above, there is good evidence for a remarkable willingness to care for the vulnerable amongst Neanderthals and also in earlier species. For example, a *Homo heidelbergensis* child found at Sierra de Atapuerca had been given equal support despite suffering from craniosynostosis and probable mental retardation (Gracia et al. 2009). At the same site, a man of at least fifty was also looked after regardless of many years of extreme walking difficulties (Bonmati et al. 2011). By the time of the Neanderthals, survival of serious injury through group support was common (Spikins et al. 2010). Shanidar I had severe injuries to his arm and leg and probable blindness, yet was still supported for up to twenty-five years. An individual from Saint-Césaire was also found with a serious but healed head wound. Recent molecular analysis of dental calculus from El Sidrón has also revealed evidence of potential medicinal plant use by Neanderthals (Hardy et al. 2012). Evidence therefore points to a society that cared for the vulnerable and in which adults were secure enough to be able to extend themselves to the wellbeing of others. This further supports the notion that children would have been securely attached to those around them.

Archaeological evidence also provides us with tantalising glimpses of adult involvement in children's learning and emotional development. Through refitting, Bodu (1990) identified three levels of flint knapping skill at the Chatelperronian levels of Arcy-sur-Cure, including not only experts, but also advanced learners and one or two beginners, interpreted as children. Stapert (2007) also identified children’s knapping through high percentages (86%) of cores showing hinges, steps, face battering and stacked steps at Site K, Maastricht-Belvédère (307-218,000 bp). Stacked steps are indicative of pointless and frustrated battering of a spot where flaking cannot be achieved and is rarely produced by expert knappers, yet these traces appear on 59% of the cores at this site. Several unusual artefacts from the site of Rhenen (250,000 bp) are also interpreted as the work of children attempting to replicate adult tool forms (Stapert 2007). Such analyses suggest a structured pattern to learning, whereby children were not only taught various techniques but also had the opportunity to copy adult behaviour.

Recent hunter-gather populations frequently make small children’s artefacts, including miniature bows and arrows or other ‘toys’. This is not only to teach the practical techniques of use, but also to allow children to become familiar with the cultural, social and emotional context of using such objects (MacDonald 2010, 373). There is also evidence of chimpanzees using sticks as ‘dolls’ (Kahlenberg and Wrangham 2010), suggesting a long ancestry for the use of such objects, far earlier than Neanderthals. In the Lower Palaeolithic, three miniature handaxes were recovered from Wansunt Pit, and one from Foxhill Road in southern Britain (figure 9). Though the former were heavily retouched and may represent the final stages of use of an artefact, the latter fits an interpretation of a toy more clearly, and was interpreted as so by the excavator (Pettitt and White 2012, 200). A Middle Palaeolithic example comes from Rhenen, where a 4.4cm long handaxe was recovered and interpreted as a child's 'toy' (Stapert 2007, figure 10). Although handaxes may be retouched to a small size, they characteristically change shape. The exceptionally small size and replication of a standard tool shape, plus the abundance of flint material for producing a larger functional tool, therefore supports the proposal that this was made for a child. Learning how to make and use handaxes may have been part of adult sculpting of emotional self control in children (Spikins 2012).

Figure 9. Both sides of handaxe no. 168 that was interpreted as a child's toy and recovered in the 1903 excavations at Foxhill Road (photograph courtesy of Mark White).

Tools and artefacts made for children may be responsible for more elements of Neanderthal material culture than we first assume. In this context, though Pettitt describes the Roche-Cotard mask as potentially the ‘art of an infant’ (Pettitt 2003), the facial proportion of this artefact suggest that it may actually be art made *for* an infant (figure 11). With facial proportions of a new born baby, this piece of ‘art’ fits the ‘evolved’ proportions of teddy bears which have been selected through time for increasingly infant-like forms (Hinde and Barden 1985). These forms are selected by adults to encourage caring responses in the young, rather than by young children, who much prefer adult facial and body dimensions (Morris et al. 1995).

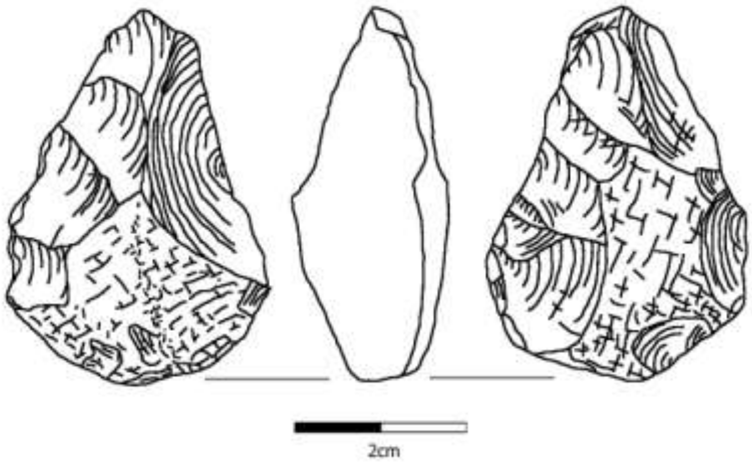

Figure 10. A miniature handaxe from Kwinteloojjen sandpit, Rhenen, measuring only 4.4 cm long and weighing just 17g. It may have been an instructive toy for a child (drawing by Gail Hitchens, redrawn from Stapert 2007).

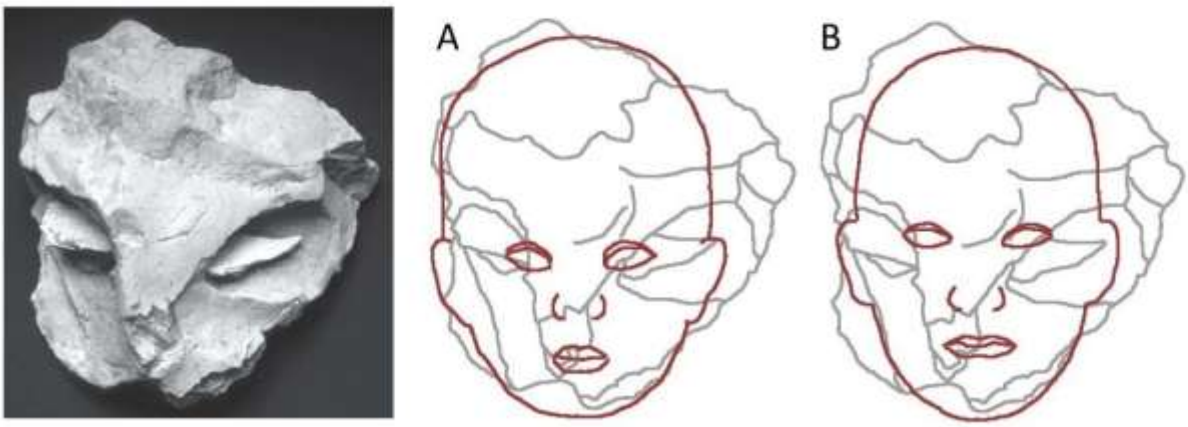

Figure 11. The La Roche-Cotard mask superimposed with A) baby proportions and B) adult proportions (Gail Hitchens).

Rather than being insecure, an inward looking focus to Neanderthal society more plausibly reflects secure childhoods within an evolutionary trajectory focusing on internal bonds at the expense of external bonds. A different emphasis on the use of symbolic objects supports this concept. While symbolic objects were made by Neanderthals, they are relatively rare. Where there is little motivation to impress outsiders, symbolic objects would instead play a distinctive internal role, one perhaps more focused on the involvement of children.

CONCLUSIONS

Despite childhood development forming the basis for adult attitudes and behaviours, there has been surprisingly little attention in understanding Neanderthal childhood and how it may have been distinctive. Traditional views of Neanderthal childhood have persisted and have been widely perceived as difficult, short and dangerous. Life was rarely easy for any early hominins, but there is no evidence that life of a Neanderthal child was unusually 'brutish'. A review of the evidence reveals that Neanderthal societies were highly collaborative and cohesive, emotionally motivated to care for others who were vulnerable, including children. Neanderthal children may have experienced frequent periods of scarcity but not notably so in the context of other groups, nor is there good evidence for unusually high rates of adolescent injury or high mortality. Neanderthal children were unlikely to be insecure, and moreover were accorded particular attention in death which may reflect particularly close attachments in life.

The differences between emotional connection to others in Neanderthals and other human groups are likely to have been subtle. Nonetheless we argue that the emphasis of emotional attachments in Neanderthals may have been distinctive from those in modern human groups, with social emotions being more inward focused than outward. Adult emotional relationships in this context are likely to have emphasized internal cohesiveness and conformity at the expense of external links. Apparent differences in the expression of symbolic material culture or other elements of cognition may not reflect different cognitive capacities, but instead this inward emotional focus.

Neanderthal childhood is therefore recognisable, but is not the same as those of later societies, and may have had far reaching effects on the nature of Neanderthal culture and society. The origin of such differences are best explained through the focus of emotional attachments, developmental experience and the contexts of safe affiliative play in Neanderthal childhood.

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