Field Notes: A Journal of Collegiate Anthropology

Volume 7 Article 5

2015

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Abstract: In recent years, the distinction between anatomically modern humans (AMHs) and Neanderthals has come into question in light of genetic evidence that suggests they interbred. Some claim that this distinction can be maintained by delineating anatomical, developmental, and behavioral differences between the two species. This paper examines the body of evidence for and against behavioral modernity in Neanderthals by using their capacity for symbolic thought as a proxy for modern behavioral capabilities. Evidence for colorant usage, personal ornamentation, symbolic etchings, and interactions between AMHs and Neanderthals supports the hypothesis that Neanderthals were capable of symbolic thought and thus possessed a behavioral modernity similar to that of early AMHs. The emergence of these behaviors seems to be closely tied to cultural/demographic explanations rather than genetic/cognitive explanations and suggests promising opportunities for future research.

Keywords*:* Neanderthals, behavioral modernity, anatomically modern humans, ornamentation, symbolic capabilities

Introduction

Questions surrounding behavioral modernity are contentious issues in the discussion of modern human origins. Disputes over what constitutes behavioral modernity and how scholars can verifiably identify evidence of behavioral modernity in the fossil and archaeological records have complicated the degree to which one can understand when and how it emerged (Caron et al. 2011:1; Nowell 2010:439). Even when scholars can agree on what might constitute behavioral modernity, methodological concerns and disagreements about the origins of modernity sometimes preclude consensus (e.g., Caron et al. 2011; Klein 2008; Nowell 2010; Roebroeks et al. 2012; Zilhão 2012; Zilhão et al. 2010). Concerns about stratigraphic mixing, for example, have called findings that archaeologists often understand as evidence of behavioral modernity into question (Caron et al. 2011:1, 7). Some scholars suggest that methods of dating such as thermoluminescence and electron spin

resonance rely too heavily on variable, site-specific assumptions, which undermines the validity of evidence older than the beginning of the Upper Paleolithic (UP) and Later Stone Age (LSA) (Klein 2008:270).

Following what Zilhão (2007) and Nowell (2010) accept as archaeological evidence for symbolic capabilities and modern behavior in anatomically modern humans (AMHs), this paper uses Neanderthals' potential capacity for symbolic thought as a proxy for their capability for behavioral modernity. Using capacity for symbolic thought as a proxy for capability for behavioral modernity is appropriate because symbolic thought designates an ability to manipulate the environment in a nonfunctional manner. This paper will examine how the evidence for Neanderthal symbolic behavior in the archaeological record compares with evidence for AMH symbolic behavior, focusing on: 1) the archaeological record of colorant usage, body decoration, personal ornamentation, and art, with an emphasis on data from several key Western European sites, as plausible evidence for symbolic capabilities; and 2) genetic evidence for interactions between AMH and Neanderthal populations.

The decision to use potential for symbolic behavior as a qualitative measure over behavioral or biological traits such as language, anatomy, and development was motivated by a few factors. First, Nowell (2010:439) comments that many researchers' primary aim is to define when AMHs gained something quintessentially "human," and that for many, this achievement is tied to symbolic capabilities. This is a problematic way to work toward a definition for behavioral modernity because it assumes that AMHs are distinct from all other hominins in this sense. Challenging preconceived distinctions between Neanderthals and AMHs—such as those in anatomy, development and life history, linguistic capabilities, and (most important to this paper) symbolic capabilities—might shed light on the reality of Neanderthal capabilities vis-à-vis those of AMHs.

Second, Nowell (2010:439) also observes that many researchers try to define what makes AMHs unique rather than trying to define modernity. This is questionable, as much of the archaeological evidence indicates that a relationship between anatomical and behavioral modernity is weak at best (Nowell 2010:439). This decoupling of anatomical and behavioral modernity supports the potential for symbolic capabilities of Neanderthals because there is no need to think of behavioral capabilities in terms of anatomical traits traditionally associated with behavioral modernity, such as an inverted T-shaped mental protuberance or bipartite superciliary arches, among other features (Tattersall 2009:16018). Third, evidence for symbolic capabilities preserves as material culture, unlike evidence for behaviors such as language use.

The mechanism by which behavioral modernity emerged in modern humans is also a topic of contention. Some scholars believe that the emer-

gence of behavioral modernity occurred in a rapid, revolutionary manner between 80 ka and 50 ka BP, possibly due to a genetic change (Klein 2008:267; Mellars 2007:4). Zilhão (2010:1023) argues for a contradictory cultural/demographic explanation for the emergence of behavioral modernity. This cultural/demographic explanation encompasses causes such as the meeting of groups and population pressure. This explanation can be expanded to account for the origin of symbolic capabilities if cultural/demographic emergence is understood to encompass a gradual spread of symbolically mediated behaviors between groups. This paper will argue that, given the evidence, Neanderthals demonstrated symbolic behavior and thus demonstrated behavioral modernity, even if they did so after contact with AMHs, as is the case if the cultural/demographic explanation is true.

Symbolic capabilities in early anatomically modern humans

Anatomically modern human use of red ochre, which is derived from hematite, is well documented in the contexts of cave paintings and in ritual burials at UP sites (Roebroeks et al. 2012:1889). In Africa, evidence of colorant use consistently dates to the Middle Stone Age (MSA), around 160 ka BP; some examples date as far back as 250 ka BP (Roebroeks et al. 2012:1893). D. Bar-Yosef et al. (2009:311) have interpreted perforated, ochered shells at Qafzeh in the Levant as definitive personal ornaments that date to around 92 ka BP.

Symbolic use of bird feathers in modern human populations exists on six continents and often represents ancestral traditions, especially in tribal contexts (Finlayson et al. 2012:Table S7, 7). This application of feathers as personal ornaments is indicative of symbolic behavior. Finlayson et al. (2012:8) provide examples like the Hawaiian cape, the production of which requires that thousands of individual red and yellow birds be slain so that their feathers can be harvested. This practice is indicative of an arduous task that indicates deliberate symbolic behavior.

The production of art also provides evidence of symbolic capabilities in AMHs. The earliest evidence of rock art dates to approximately 40 ka BP (Rodríguez-Vidal et al. 2014:13301; Zilhão 2007:39). At the cave site of El Conde and rock shelter site of La Vina in Spain, excavators uncovered deep vertical grooves in the stone that probably date to the Aurignacian Period (roughly 35–45 ka BP), but certainly date no later than 24 ka BP (Zilhão 2007:35). Older evidence of engraved geometric designs dates to before the early UP in Europe (Rodríguez-Vidal et al. 2014:13305). This line of artistic evidence is rather uncontroversially tied to symbolic capabilities in AMHs.

Challenges to colorant evidence include examples of non-symbolic

applications of colorant. Red ochre also has documented medical, preservative, hide-tanning, and insect repelling applications in modern hunter-gatherer populations, and it has been identified as an ingredient in compound adhesives (Roebroeks et al. 2012:1889; Roper 1991:289; Velo 1984:674). These examples of non-symbolic applications for red ochre and other colorants complicate the putative link between colorants and symbolic capabilities.

Zilhão (2012:43) suggests that the lack of debate surrounding symbolic interpretations of evidence found in AMH contexts can be attributed to the fact that these kinds of interpretations fit a preconceived model of advanced behavioral abilities in AMHs. In the case of colorants, d'Errico (2003:197) alternatively explains that no modern society uses colorant for strictly technical or non-symbolic applications and deduces that this was true of ancestral societies and cultures. D'Errico (2003:197) also states that, given equal access to reddish and non-reddish pigments, many MSA people showed a strong preference for reddish pigments. This preference for reddish pigments suggests that these people used pigments in a way that was not purely functional.

If evidence that is similar to what has been presented above for AMHs were found in Neanderthal assemblages, it would suggest that Neanderthals possessed symbolic capabilities. Colorant, body ornaments, and art can logically be linked to symbolic behaviors. These material manifestations of culture demonstrate a capacity to manipulate the environment in ways that are not functional and are indicative of behavioral modernity.

Symbolic capabilities in Neanderthals

Possibly because early AMH symbolic capabilities do not contradict modern conceptualizations of differences between modern humans and other hominins, there is relatively less controversy surrounding evidence for symbolic capabilities in early AMHs than in other hominins such as Neanderthals. In light of recent evidence, discussion concerning the potential for Neanderthal symbolic capabilities is critical to a fuller understanding of human evolution.

The use of red ochre as a pigment by Neanderthals is well documented through the period of 60–40 ka BP and is indicative of symbolic capabilities when it is interpreted as evidence of personal decoration (Roebroeks et al. 2012:1889; Zilhão 2010:1027). Recent identification of hematite, from which red ochre is developed, in the soil at the Maastricht-Belvédère site in the Netherlands pushes the earliest date of colorant use to around 250–200 ka BP, though the authors conclude that their finding indicates only that Neanderthals manipulated red ochre, not that they manipulated red ochre in a symbol-

ic manner (Roebroeks et al. 2012:1893). While this is not direct evidence for symbolism in Neanderthals, it represents an example of materials found in Neanderthal contexts that scholars consider indicative of symbolic behavior in AMH assemblages (Zilhão et al. 2010:1023).

At Cueva de los Aviones in Spain, archaeologists have uncovered perforated shells with clumps of yellow/red colorants and traces of hematite and pyrite inside shells associated with Neanderthal fossils (Zilhão et al. 2010:1023). These findings undermine an obligatory relationship between behavioral and anatomical modernity. Zilhão et al. (2010:1027) argue for an unequivocal association of these pigments with Neanderthals, as the find was discovered embedded in a matrix of rock that would have precluded intrusions of pigment from AMH-associated levels above or of older Neanderthal remains from below. The Neanderthals who inhabited Cueva de los Aviones were the most likely users of the pigment because their remains and the pigments were both found embedded in the matrix. The discovery of container-like objects with residues of colorants such as pyrite, lepidocrocite, hematite, and natorjarosite inside them, and a bone with pigment residues on the tip at Cueva Antón in Spain suggests that Neanderthals used this pigment as body decoration by applying it with the now broken bone tip (Zilhão 2007:42). This deliberate application of pigment to the body suggests that Neanderthals possessed symbolic capabilities.

There is also evidence that Neanderthals made and used personal ornaments. Zilhão (2007:24–25) explains that archaeologists have uncovered evidence of personal ornaments at French Châtelperronian sites and gives four examples of such sites—Grotte du Renne at Arcy-sur-Cure, Quinçay, Caune de Belvis, and Saint-Césaire—that he considers significant and soundly excavated. The site at Grotte du Renne at Arcy-sur-Cure was arguably the first site excavated with modern archaeological methods such as stratigraphic excavation, area exposure of occupation surfaces, and systematic sieving of deposits (Zilhão 2012:37). At this site, archaeologists found Neanderthal remains in close proximity to symbolic artifacts such as personal ornaments made of perforated and grooved teeth, bones, and fossils; colorants; and bone awls (Caron et al. 2011:2).

Some have questioned the integrity of the archaeological findings at Grotte du Renne. Higham et al. (2010:20234) claim that radiocarbon dating techniques reveal that some mixing between materials in different strata may have occurred. O. Bar-Yosef and Bordes (2010:590) agree that there was significant mixing, which casts some doubt on the association of artifacts with remains at the site. Caron et al. (2011:1) further subjected the findings and methods of the Grotte du Renne site to rigorous independent testing. Their results support a Neanderthal origin for the findings because radiocarbon da-

ting from Grotte du Renne supports the conclusion that displacement is not responsible for evidence of the localization of ornamentation in a Neanderthal context (Caron et al. 2011:9). Based on this evidence, Hublin et al. (2012:18743) show that the Châtelperronian ornamentation postdates AMHs movement into neighboring regions in Europe. This indicates that ornamentation and, by extension, the realization of a capacity for symbolic thought, occurred by or around the time that AMHs were in the process of inhabiting the region. This date supports a cultural/demographic explanation for behavioral modernity.

Other Châtelperronian sites in France, such as the Quinçay site, have yielded evidence of ornamentation in Neanderthal contexts. Châtelperronian findings here include perforated teeth of *Vuples vuples* (red fox)*, Canis lupus* (gray wolf), and *Cervus elaphus* (red deer) (Granger and Lévêque 1997:539–541). These findings were sealed off from UP levels and intrusions by blocks of limestone several meters long and tens of centimeters thick (Zilhão 2012:41–42). The fact that the findings were sealed off from intrusions from other levels strengthens their stratigraphic association with Neanderthal fossils and supports the possibility that the species was capable of symbolic thought, as does radiographic testing of the ornamental items found in a Neanderthal context at the Saint-Césaire site (Hublin et al. 2012:20234). More recent findings of symbolically mediated behaviors at MP Neanderthal sites in Northern Italy and Southern Iberia add to the body of evidence for Neanderthal symbolic capabilities (e.g., Peresani et al. 2011; Zilhão 2012).

In Italy and Gibraltar, modified raptor and corvid bones found in Neanderthal contexts show that Neanderthals also intentionally removed bird feathers (Finlaysen et al. 2012:4–6; Peresani et al. 2011:3888), which Peresani et al. (2011:3888) posit as evidence that Neanderthals had attained modern behavioral capabilities. Finlayson et al. (2012:7) explain that there is no evidence in the ethnographic literature of a modern human society that eats the meat of raptors or corvids, while there are examples of modern human societies on six continents that use feathers in symbolic contexts. That no known human population eats the meat of these birds implies that it is unlikely that Neanderthals modified the bird bones while preparing meat for consumption and supports the hypothesis that they removed feathers for symbolic applications. Feathers are inedible and are easily degraded by soil; they are thus unsuitable for bedding (Finlayson et al. 2012:7). This reduces the likelihood of other potential non-symbolic applications for feathers. For both Finlayson et al. (2012) and Peresani et al. (2011), this evidence indicates that Neanderthals used feathers in symbolic contexts and were thus capable of symbolic behavior. Recent evidence of etchings at a long-term Neanderthal occupation site, Gorgham's Cave in Gibraltar, suggests that Neanderthals

were also capable of creating abstract patterns (Rodríguez-Vidal et al. 2014:13301). This is the first and only case of a deliberately elaborated, abstract design of Neanderthal origin in the archaeological record. Rodríguez-Vidal et al. (2014:13305) use the associated archaeological level to determine the *terminus ante quem* for the engravings at about 39 ka BP, and explain that given their location in the cave, they were likely created for viewing by both the creator and other community members. Though this line of evidence requires further research, as it is impossible to ascertain the meaning of the engravings, it also suggests that Neanderthals had symbolic capabilities.

Peresani et al. (2011:3888) report that modified bones at the Grotta di Fumane site in Northern Italy date to 44.8–42.2 ka BP, and these researchers suggest that Neanderthals independently achieved behavioral modernity, as evidence of similar symbolic applications of feathers is not found in AMH contexts until later. The authors simply cite the "absence of evidence" for similar uses of feathers in AMH contexts as proof for their timeline (Peresani et al. 2011:3893), which may be questioned on logical grounds. The evidence for Neanderthal use of feathers in symbolic contexts is strong, but given the nascent state of this body of evidence, the relative dating in Peresani et al. (2011) cannot presently be considered over the more established and replicable findings of Zilhão et al. (2010), Roussel and Soressi (2010), Hublin et al. (2012), and Zilhão (2012).

The interpretation of evidence for Neanderthal behavior is fraught with tension. This is evident in the debate between Higham et al. (2010), Mellars (2010), and Caron et al. (2011), among others, concerning the findings at Grotte du Renne. Disputes concerning what constitutes behavioral modernity, the viability of archaeological methods, and the origins of symbolic behavior underlie an inability to reach firm conclusions. Given recent evidence from Roebroeks et al. 2012, however, it is likely that Neanderthals used colorants as early as 250 ka BP. It is also likely that Neanderthals made and used personal ornaments from shells, teeth, and bones. Though some scholars have questioned archaeological excavation methods, rigorous analyses have suggested that personal ornamentation can be accurately associated with Neanderthal fossils in some cases (Caron et al. 2011:1). Though this is not true at every site, there is a difference between widespread use of symbolism and symbolic capabilities. Isolated findings can accurately indicate that Neanderthals had symbolic capabilities, although they are insufficient to determine how frequently these capacities where employed.

Mellars (2010:20147) considers two different explanations for the existence of items indicative of cultural behavior previously thought to be unique to AMHs at Neanderthal sites. The first is the independent development of similar cultural pieces in Neanderthals, which Mellars calls the

"impossible coincidence" (2005:12) that Neanderthals exhibited symbolic capabilities and AMHs moved into Europe around the same time without any contact. The second explanation is inter-populational contact leading to cultural diffusion, which supports the cultural/demographic explanation detailed above. Data concerning timing and the types of artifacts found in Neanderthal contexts further suggest that the emergence of symbolic behaviors can be linked to cultural/demographic causes. Even if Neanderthals did develop symbolic capabilities as a consequence of acculturation, their capacity to develop them indicates that they possessed behavioral modernity in the framework of this paper.

Beyond Neanderthals: symbolic capabilities in *Homo erectus*

In light of the prominent conceptualization of behavioral modernity as a uniquely modern human trait, the potential for symbolic capabilities in other species of the genus *Homo* is even more provocative than that in Neanderthals. Joordens et al. (2014:228) analyze shell assemblages found in *H. erectus* contexts at Trinil on Java and conclude that *H. erectus* used these shells as tools and carved geometric designs on them. Joordens et al. (2014:230) date the shells to 380 ka to 480 ka BP. As with the Neanderthal engraving from Gorgham's Cave, it is not possible to determine the meaning of these geometric designs, but their existence indicates that *H. erectus* also potentially had the capacity for symbolic thought.

This emergent evidence presents a complication to processes behind symbolic behavior. If *H. erectus* were capable of modifying external objects in an abstract manner, one might conclude that this kind of symbolic behavior was inherited from a common ancestor to Neanderthals and AMHs because it existed in both these lineages and that of *H. erectus*. However, since the use of pigments and body ornaments is evidenced no earlier than 250 ka BP in the hominin lineage but is not demonstrated in *H. erectus*, one might conclude that the capacity to use pigments and body ornaments symbolically was the result of either a cultural diffusion between Neanderthals and AMHs or a genetic change occurring later (Roebroeks et al. 2012:1893). In other words, while *H. erectus*'s capacity to modify objects in an abstract manner indicates that Neanderthals and AMHs likely inherited the capability for symbolic thought from a common ancestor, this does not contradict a conclusion that Neanderthal use of colorants and ornaments has cultural/demographic origins through contact with AMHs.

Genetic arguments

Klein (2000:19, 2008:276) suggests that a genetic mutation that occurred without anatomical change was the origin of modern behavioral capabilities. Genetic arguments like Klein's, while somewhat outdated, are hardly forgotten by recent work on Neanderthal genetics and genomics. In an early study of the Neanderthal genome, Krause et al. (2007:1908) determined that Neanderthals and AMHs shared the same derived variant of the *FOXP2* gene, which is closely tied to language capabilities in modern humans. This evidence, while it is interesting, is not very compelling given the lack of material evidence for language use. Even with technologies that allow scientists to access ancient genomes, the incomplete understanding of the complex array of genes that affect symbolic capabilities makes genetic/cognitive origin of behavioral modernity extremely difficult, if not impossible, to prove. Still, the recent genetic evidence for interbreeding despite some biological incompatibilities raises questions of Neanderthal and AMH difference and similarity. Green et al. (2010:721) and Prüfer et al. (2014:49) have shown that Neanderthals and AMHs interbred. Sankararaman et al. (2014:356) also accept the evidence for interbreeding, but these authors explain that reduction of Neanderthal ancestry on the X chromosome and in genes that are highly expressed in the testes of AMHs means that male hybrids likely had decreased fertility. This suggests that Neanderthals and AMHs were not very biologically compatible, even though they did interbreed.

Fu et al. (2014:448) set the time of a Neanderthal–AMH admixture event to 50–60 ka BP. This predates the first evidence of AMHs in Europe. The act of mating involves a certain degree of closeness that is unlikely to be realized between species that are drastically different behaviorally. Evidence for interbreeding 50–60 ka BP suggests that Neanderthals and AMHs had achieved some degree of proximity, even in isolated instances, by that time and could thus influence the culture and behavior of the other group. This supports the impossibility of Mellar's "impossible coincidence" (2005:12) that Neanderthals exhibited symbolic capabilities and AMHs moved into Europe around the same time without any contact. Findings that AMHs and Neanderthals interbred restrict the conclusions that can be drawn about differences between the species. In light of such findings, it is unlikely that the two species were vastly different in terms of behavior, which supports the conclusion that Neanderthals possessed behavioral modernity and that behavioral modernity has a cultural/demographic origin.

Discussion

The ambiguity of creating a definition for behavioral modernity makes understanding its function in early AMHs, Neanderthals, and even in recent human populations, extremely difficult. This paper has considered evidence of colorant usage, body ornaments, and art as evidence for symbolic capabilities, following the models put forth by Zilhão (2007) and Nowell (2010). As noted previously, the effort to distinguish AMHs from all other hominins is not grounded in meaningful distinctions. What seems more appropriate than a categorical separation of AMHs and all hominins is what Nowell (2010:437) refers to as a "decoupling" of modern anatomy and modern behavior.

Zilhão et al. (2010:2017) decouple the emergence of evidence for symbolic behavior from a single regional source by demonstrating that such behavior emerged in different hominin lineages in different regions. Roebroeks et al. (2012) support this through demonstrating coeval usage of colorants in early AMH and Neanderthal populations. Contemporaneous colorant use by Neanderthals and AMHs aligns with Mellars's (2010:20147) acculturation-oriented model and a cultural/demographic explanation for the putative emergence of symbolic capabilities in Neanderthals. Zilhão et al. (2010:1027) also suggest that the emergence of symbolic behavior is more strongly linked with cultural/demographic causes than with genetic/cognitive ones. This is in direct conflict with Klein (2008:271), who suggests a revolutionary/single-species emergence of behavioral modernity related to genetic change.

Recent genetic evidence, somewhat ironically, supports a cultural/demographic origin of behavioral modernity. From evidence of interbreeding, one can infer a certain degree of behavioral similarity and cultural sharing between the species. This is further supported by evidence that interbreeding between Neanderthals and AMHs occurred 50–60 ka BP (Fu et al. 2014:448). This admixture event predates AMH movement into Europe and accounts for the presence of evidence of symbolically mediated behaviors in European Neanderthal assemblages, such as at the Grotte du Renne at Arcy-sur-Cure site, within the cultural/demographic framework.

Conclusion

Assuming that symbolism can indeed serve as a proxy for behavioral modernity and that colorant usage, personal ornaments, and art are examples of plausible evidence for symbolic capabilities, Neanderthals most likely possessed behavioral modernity. This conclusion is based on the comparisons

between AMHs and Neanderthals in terms of the criteria for symbolic behavior laid out above. The conclusion also considers that the presence of evidence supporting symbolic capabilities shows that Neanderthals were behaviorally modern—even if symbolic behaviors were not executed frequently—and accepts evidence for interbreeding between Neanderthals and AMHs as evidence for a degree of behavioral compatibility and similarity between them.

Additional evidence of Neanderthal use of personal ornamentation or colorants would strengthen this paper's argument. Alternative evidence decoupling Neanderthal remains from evidence of personal ornamentation or colorants due to stratigraphic mixing, definitive evidence of non-symbolic applications of the colorants found in Neanderthal contexts, or evidence that shows a genetic origin of symbolic capabilities or behavioral modernity would weaken its argument. Further evidence that *H. erectus* could symbolically alter external objects would suggest that this type of symbolic behavior was inherited from a common ancestor to AMHs and Neanderthals, though this would not challenge the conclusion that the capacity to use colorants and ornaments has cultural/demographic origins. Future research is crucial to developing an understanding of Neanderthal symbolic capabilities and symbolic capabilities of other members of the hominin lineage. Ultimately, this genre of research will shed light on questions of compatibility and difference between modern humans and other closely related species such as Neanderthals.

Acknowledgments
I thank Tanya Smith for her encouragement and comments. Bridget Alex, Hannah Wexner, and five anonymous reviewers also provided helpful comments and suggestions.

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