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The visuo-spatial capacities of Neanderthals seen through material culture

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The hypothesis by Bruner & Lozano (JASs *forum* 2014, vol. 92: 273) suggests that species from the neanderthal lineage suffered a mismatch between cultural and neural complexity resulting from insufficient visuo-spatial integration processes. This hypothesis is based on the high percentage of individuals with cut marks on the frontal teeth, a fact that has been interpreted as the result of using the mouth as a third hand. If we accept that the three hand hypothesis is correct, we should ask ourselves why such particular behavior was necessary, given that it seems to be so risky for teeth health. We can consider two different anwers to this question, or the use of the third hand is the result of insufficient visuo-spatial integration, a purely biological constraint; or it is a cultural choice, a useful response to activities where two gripping points and an active force are necessary (for example stretching a sinew in order to cut it correctly, or holding dry meat for slicing). These two possibilities are very difficult to test with the information we have available regarding fossil specimens and old cultures, but this is the arena where archaeologists and paleontologists should be debating. In this context, the effort made by Bruner & Lozano (2014) is of great value because it opens up new areas for discussion. I will try to follow this discussion while paying attention to other lines of evidence that are useful to test the visuo-spatial integration of the neanderthal lineage, namely the material culture.

Too small to be true?

Flint knapping is a complex activity where visuo-spatial integration is absolutely necessary. A good knapper must have a good assessment of geometry and he must be able to predict the way the stone is going to break in order to plan a complex reduction sequence. Furthermore, he must also have a good coordination between the hand which holds the hammer and the hand holding the core, and he must be accurate enough to hit the rock in the designated place in order to get the expected result. Of course, knapping a core opportunistically in order to get some flakes is very different from preparing the core to get desired products. The Levallois flaking system, according to different authors, is a complex knapping system that needs planning, good morphological assessment and developed knapping skills.

Furthermore, in recent years, the so called microlevallois technology was discovered in the archaeological record from several Middle Paleolithic sites in Western Europe (Dibble & Mc Pherron, 2006; Rios-Garaizar *et al.,* 2014). The trend of small flaking production can be traced back to the Lower Paleolithic in different parts of the world (Burdukiewicz & Ronen, 2003; Parush *et al.,* 2014) but it is not until the late Middle Paleolithic that the production of small flakes through the adoption of complex methods, as Levallois, appear. The production of these small flakes is a good example of high precision knapping. The cores are really small, even tiny (some examples from Amalda or Axlor are smaller than 3 cm) and the preparation of percussion points is very precise, with detailed faceting. The resulting production is continuous, giving small flakes (< 3 cm) with thin platforms (< 3 mm) and quite regular shapes. This cores

and products are "too small to be true", using the words in the famous paper by Goren-Inbar (1988), and, as has been demonstrated in several analyses, it is not the result of an opportunistic exhaustion but rather a desired product (Dibble & McPherron, 2006; Rios-Garaizar, 2012). Of course, the necessary precision in the gestures required to produce such a kind of small flake is very high and difficult to achieve through flintknapping. To strengthen this argument, the use-wear analyses carried out on this kind of flake show that they were hand-held, and that small retouches were used to improve the ergonomic features. Moreover, they were used in precision activities (Lemorini *et al.,* 2014, Rios-Garaizar 2010; Villaverde *et al.,* 2012).

Targeting

Distance hunting could also represent a second example of good visuo-spatial coordination in neanderthals and their lineage. For this activity, which is very important in hunter gatherer societies, prey targeting, distance guessing and good aiming are necessary for a successful throw. Of course, visuo-spatial coordination is crucial for this activity. Naturally, this is not such a cut and dried debate like the question of small flake production. We have good examples of hunting weapons both for *Homo heidelbergensis* and Neanderthals (Thieme, 2007; Villa & Soriano, 2010) but the question of whether they were used at close range or in distance hunting is far from being resolved. The biological capacity for throwing has been long discussed in past decades, with arguments for and against (Churchill & Rhodes, 2009), but recent discoveries suggest that the Neanderthals could have also been adapted for distance hunting (Faivre *et al.,* 2014; Shaw *et al.,* 2012; Trinkaus, 2012)

Maybe the reason for this kind of resistance is that there is a certain prejudice in accepting the possibility that Neanderthals were also using distance weapons because this would mean closing the gap between Neanderthals and Modern Humans little more. There is no controversy regarding the fact that distance hunting was adopted by Upper Paleolithic Modern Humans, but the evidence available which supports this claim is also similar for Neanderthals: lithic (and bone) points with impact fractures. In the case of Neanderthals, while it is true that we have no evidence of complex propulsion systems such as atlatl or bows, it must, however, be said that there is no trace of these articles in the archaeological record until the end of Upper Paleolitic (Cattelain, 1997). It has also been argued that the points used by the Neanderthals were too clumsy to be thrown (Shea & Sisk, 2010). This question has been discussed in recent papers because there are some Mousterian sites with light points (Rios-Garaizar, 2012; Galván *et al.,* 2011) that are well suited for throwing (Rios-Garaizar, in press), and several experiments are being developed in order to demonstrate that this kind of point was effectively thrown, and the impact fractures that can be seen on them are the result of distance hunting episodes (Roots & Plisson, 2014, Iovita *et al.,* 2013).

Alternative hypothesis

Neanderthal material culture analysis has given us two examples of well suited visuo-spatial coordination, both of which are related to daily activities such as tool making or hunting. In fact, there is no evidence, regarding material culture, that Neanderthals had less visuo-spatial capacities than Modern Humans. There are also other examples that demonstrate these capacities, such as for example landscape management (Burke 2006; Rios-Garaizar & García-Moreno, 2015) or habitat organization (Bourguignon *et al.,* 2004; Vaquero *et al.,* 2012). Therefore, how can we explain the teeth damage pattern observed by Lozano and Bruner? In order to answer this question, I think we should look for explanations in cultural and technological developments. For example, we should consider the lack of technology or collaborative behavior when developing concrete tasks, or specific ways of food preparation and consumption.

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