

A minor role for genetics in language evolution

Ana Villar & Antoni Gomila

Human Cognition and Evolution Group, University of the Balearic Islands, Campus Carretera Valldemossa, 07122 Palma, Spain

e-mail: antonigomilla@gmail.com

In their paper, Benítez-Burraco & Barceló-Coblijn (BB & BC, this Forum) make an in-depth analysis of hominin interbreeding -particularly, the presence of Neandertal DNA in anatomically modern humans (AMH)-, and raise the question of its relevance in language evolution. While different arguments are possible in this regard, the simplest way to set the lines is to consider “early” and “late” language evolution scenarios. “Early” scenarios of language evolution contend that language appeared early in the hominin lineage (so that the species in the lineage were all able of language). “Late” scenarios contend that language is a synapomorphic feature of our species and so consequently appeared after the separation of the Neandertal species.

Genetic interbreeding between Sapiens and Neandertals *prima facie* challenges the “late” scenario, according to which language is a “human only” feature which evolved after the split between the two species. If it turns out that such a split was not decisive, or irreversible, since interbreeding was not just possible, but even common, then the idea that language is a late acquisition, linked to the appearance of AMH as a new species, seems to loose support, while the view that Neandertals had the same linguistic abilities as AMH because they were already available to a common ancestor, seems to be more plausible. In fact, the very possibility of interbreeding might even call into question the idea of a “speciation event”, and the well-established assumption that AMH and Neandertals are two different species, rather than just two groups of the same species. since the possibility of interbreeding is constitutive of a common species,

while reproductive isolation is required to establish a new species.

However, this is not the strategy adopted by the authors of the paper we are commenting on. BB&BC, on the other hand, try to resist the interpretation of the evidence regarding genetic interbreeding as support for an “early” scenario, and to defend the “late” scenario for the evolution of language, using several different arguments: a) that the “linguistic genotype” may still be Sapiens only, as long as the Neandertal DNA found in our species is unrelated to language; b) sharing genes is not enough to make sure that those genes are expressed the same way in both species, because this depends on many other genetic changes; and finally, c) that the linguistic phenotype is not determined by the linguistic genotype, because of the importance of development in the acquisition of language.

In our view, the third argument is the strongest, and, when properly developed, it preempts the other two. Put in another way, it seems to us that the authors give the finding of genetic interbreeding more weight than it deserves, just because they assume -along with the explosion of interest in the search for “language genes”-, that there can be such a thing as “the linguistic genotype”. While it is obvious that any human mental capability requires a genetic make-up as long as it is a biological phenomenon, it cannot be simply assumed that there is going to be some part of the genome specialized for every mental faculty, or for language in particular. Not only because genes can be pleiotropic (i.e., involved in very different processes), but also because they don’t work in isolation (their effects very much

depend on when, and with which other genes, they are activated). That language can be affected by some genetic alteration doesn't imply that that part of the DNA is part of "the linguistic genotype". Furthermore, given the fact that babies need to get in contact with language to become linguistic, to talk of "the linguistic genotype" is question-begging, because it makes no sense that part of the genome specialized for language before there was a linguistic community. However, if such a linguistic community was possible at that point, it means that language is possible without this type of genetic specialization.

So in what follows, we propose to develop the third argument, by paying further attention to the development of the linguistic phenotype. This requires paying more attention to the social and symbolic context in which the ontogenetic development takes place, given that language acquisition requires interaction with already linguistic beings. So we will focus on the issue of whether what we currently know about the Neandertal society is enough to infer that it already was a linguistic community. In addition, we also want to raise the question in anthropological terms of how to interpret the interbreeding phenomenon.

To begin with, it must be recognized that Neandertal societies were organized in complex ways, as the spatial layout of the community reveals, for example the Abric Romaní site (Carbonell *et al.*, 1994). More recent excavations at the "Cueva de los Aviones" and "Abrigo Antón" (Zilhao, 2010) have found the use of red, yellow and black pigments which suggest a cosmetic function related to social differentiation. In addition, both the hunting strategies, and the technical dexterity required for Musterian tool fabrication and use (Carbonell & Rossell, 2001), suggest the presence of cognitive abilities such as planning, executive control, and social learning in a process of form optimization and functional specialization (Lind *et al.*, 2013).

Their culture was symbolically rich and its burials reveal an awareness of individual death. The sites of Dederiyeh, Shanidar, or Kebara suggest the practice of rituals and behaviors similar

to those of AMH. The floral tomb of Shanidar (Leroi Gournham, 1975), the detached skull of Kebara (Bar Yosef & Vandermeersch, 1993), and the infantile remains of Dederiyeh (Akazawa, 1995), all suggest the practice of symbolic burial rituals by Neandertal groups. In conclusion, archeological evidence clearly indicates that both cognitively and culturally, Neandertals and AMH were similar. In both cases, the availability of a system of intergenerational transmission of knowledge, and of communication of social meanings, seems to be a condition of possibility of their respective lifeforms. Evidence also shows that both species were capable of speech (Barceló-Coblijn, 2011).

Now, is there any evidence that suggests that Neandertals were different from AMH in their capabilities for language? Two hypotheses can be mentioned in this regard. One concerns the pattern of ontogenetic development in Neandertals (Smith *et al.*, 2010). According to this proposal which is based on studies of teeth growth, Neandertal babies matured much faster than AMH and so their infancy was shorter. Therefore, they had less time than AMH for "getting tuned" to the intricacies of their communities. The other proposal interprets the Upper Paleolithic archeological evidence of the origin of knotting techniques (such as binding by knotting, in harpoons, smears, and arrow heads; and tying of bracelets and wristbands) and knotting crafts (nets, basketry, and textile weaving), which are not found in Neandertal sites, as indication of a cognitive enhancement in AMH given they were able to manage hierarchically organized structures, such as knots, which could be instrumental in making syntactic structures possible (Barceló-Coblijn & Gomila, 2012). Knotting techniques, just as sentences, require hierarchical structure and recursive patterning.

According to this view, then, it is the capability for hierarchically structured language that is exclusive to AMH, as the "late" scenario contends. It also accommodates the fact that such a complex form of language was made possible by some genetic change, linked to the appearance of our species, but without requiring a simple

correspondence between a “linguistic genotype” and a “linguistic phenotype”. It also allows us to make anthropological sense of the phenomenon of genetic interbreeding: for all we know about Paleolithic groups, it was not unusual for some individuals to change ethnic group, maybe as the result of a conflict. Women, in particular, are known to have been a precious booty. Now the question is: even if hierarchically structured language was barren for Neandertals, the son of a mixed couple could socialize in a group of AMH, and be able to communicate sufficiently, so that the differences in genetic make-up didn't amount to a complete barrier or handicap. In successive generations, Neandertal DNA could have been transmitted each time to a lesser degree. As long as it was not a massive phenomenon -and it seems it was not, given the low amount of Neandertal DNA found-, it may have been of marginal effect.

References

- Akazawa T., Muhesen S., Dodo Y., Kondo O. & Mizoguchi Y. 1995. Neanderthal infant burial. *Nature*, 377: 585-586.
- Barceló-Coblijn L. 2011. A biolinguistic approach to the vocalizations of *Homo neanderthalensis* and the Genus *Homo*. *Biolinguistics*, 5: 286-334.
- Barceló-Coblijn L. & Gomila A. 2012. Evidence of Recursion in Tool Use. *Behav. Brain Sci.*, 35: 17-18.
- Carbonell E., Giralt S. & Vaquero M. 1994. Abric Romaní, (Capellades, Barcelone, Espagne): Une importante séquence anthropisée au Pléistocène Supérieur. *Bulletin de la Société Préhistorique Française*, 91: 47-55.
- Carbonell E. & Rosell J. 2001. Neandertales y re-socialización. Complejidad en las ocupaciones humanas del Abric Romaní. *Zephyrus*, 53-54: 143-152.
- Leroi-Gourham A. 1975. The flower found with Shanidar IV, a Neanderthal burial in Iraq. *Science*, 190: 562-564.
- Lind J., Lindenfors P., Ghirlanda S., Lidén K. & Enquist M. 2013. Dating human cultural capacity using phylogenetic principles. *Sci. Rep.*, 1785: 1-60.
- Smith T.M., Tafforeau P., Reid D.J., Pouech J., Lazzari V., Zermeno J.P., Guatelli-Steinberg D., Olejniczak A.J., Hoffman A., Radovic J., Makaremi M., Toussaint M., Stringer C. & Hublin J.J. Dental Evidence for ontogenic differences between modern humans and Neanderthals. *Proc. Natl. Acad. Sci. U.S.A.*, 107: 20923-20928.
- Vandermeersch B. & Bar-Yosef O. 1993. El hombre moderno de Oriente Medio. *Investigación y Ciencia*, 201: 66-73.
- Zilhao J. et al. 2010. Symbolic Use of marine shells and mineral pigments by Iberian Neandertals. *Proc. Natl. Acad. Sci. U.S.A.*, 107: 1023-1028..

Associate Editor, Rita Vargiu