

## Reply to Vigilant and Langergraber: Patrilocality in Neandertals is still the most plausible explanation

Vigilant and Langergraber (1) challenge the interpretation of the mtDNA analysis in a social contemporaneous group of 12 Neandertals from El Sidrón site (Asturias, Spain) (2) by comparing the data with those obtained from a group of chimpanzees. We think this comparison is not appropriate and not only because of the large evolutionary distance between chimpanzees and Neandertals. Previous research has shown that relatedness in the male chimpanzees is negatively correlated to group size, and this is detected in groups of at least eight males (3). Archaeological evidence (4) indicates that Neandertal social units had, on average, a total of 8–10 individuals; thus, the number of males had to be much lower than in chimpanzee groups. In the case of El Sidrón, there were only three adult males. Therefore, it is likely that relatedness among them was much higher than in chimpanzee groups.

Vigilant and Langergraber (1) speculate that, in case of patrilocality, the male offspring of the females will carry different mtDNA lineages in the group, thus making the male mtDNA heterogeneous after one generation. We know from the spatial organization within some archaeological sites that Neandertal groups likely had seasonal aggregation/disaggregation processes (4); depending on the time of these population dynamics, several scenarios of intragroup diversity can be expected. Nevertheless, the existence of some mtDNA lineages only present in one adult female and in some subadults within the group is exactly what we see at El Sidrón. For instance, three subadults (among them, some males) carry a lineage (A) only present in one of the females, whereas three others (among them, at least one male) have a lineage (C) only present in another female.

Finally, Vigilant and Langergraber (1) criticize our interpretation that male individuals sharing the mtDNA lineage were closely related. We never said the three adult males were brothers; however, having the same mtDNA, they have to be maternally related. Interestingly, this is the same interpretation made for two samples from the Neandertal Genome Project, Vi33.16 and Vi33.26 (5), that have identical mtDNA. Nevertheless, the crucial argument here for patrilocality is not the male sharing of mtDNA haplotypes but the female mtDNA heterogeneity.

Of course, we agree that the exact genealogical relationships among the El Sidrón individuals can only be fully resolved with the massive generation of genomic data. Additionally, strontium isotope analysis could be used for testing higher female than male mobility at El Sidrón. While awaiting this evidence, however, the most plausible explanation for the observed mtDNA diversity within this Neandertal band is still the female mobility among groups.

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