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Leiden
The Netherlands

interpreting lithic raw material variability in Middle Palaeolithic contexts: a modeling approach with applications to the Bau de l'Aubesier (Southeastern France)

Pop, C.M.

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Summary

Reliance on tools is a defining characteristic of our genus, and stone artifacts provide the oldest and most frequently encountered evidence for human tool manufacture. The rocks from which such artifacts were made, including but not limited to chert, quartzite, and obsidian, are typically found exposed over a limited extent and at discrete locations. These potential procurement locations often did not coincide with places where stone implements were needed, however, and consequently humans transported rocks over the landscape. Because they share at least part of their geological history with other rocks found today at their place of procurement, mineralogical and geochemical signatures preserved in stone implements recovered at archaeological sites can be used to identify their geographic origin. Such provenance data can thus provide critical clues regarding hominin mobility and environmental interactions over the last three-plus million years of our evolutionary history.

Human mobility was not restricted to trips between rock outcrops and archaeological sites where stone would be immediately discarded, however. Therefore, to be useful, the evidence of the directions and distances over which rocks were transferred, preserved in the static frequencies at which different rock types are represented at archaeological sites, must be interpreted in terms of dynamic human behaviours. Why are certain toolstone sources represented more than others, how were they exploited, and to what extent does their degree of utilization reflect broader patterns of landscape use? When considering artifacts made by individuals belonging to an extinct human species, answering such questions presents an immense challenge because we do not know to what degree our own behaviour, and the cognitive and physical abilities that underpin it, can serve as guide.

Of the known extinct human species, Neanderthals have been the most extensively studied, and are consequently the best understood. Despite being very closely related to us, the evidence we have of their lifeways suggests that these hominins, who are associated with Middle Palaeolithic industries, had a somewhat different relationship to the environment than our anatomically modern ancestors, and it remains unclear to what extent their cognitive processes resembled our own. In spite of this, current approaches to interpreting lithic provenance in Middle Palaeolithic contexts remain based to a large extent on models derived from ethnographic data. In view of better understanding how Neanderthals conceptualized and used their environments, this thesis lays the foundations for an alternative approach. The framework proposed here is based on computer simulations and is designed to maximize the inferential potential of toolstone provenance data while relying minimally on analogies to known present-day human behaviour. Instead of ethnographic data, this framework is developed based on insights gained from a re-evaluation of a neutral agent-based model of raw material procurement first proposed by Jeffrey Brantingham in 2003, as well as the analysis of actual archaeological data from the French Middle Palaeolithic site of the Bau de l'Aubesier.

The central findings reported in this thesis indicate that the hominins who resided at the Bau de l'Aubesier between ca. 200 ka and 100 ka BP had excellent spatial memory and were likely capable of navigating landscapes using cognitively demanding Euclidean mental maps. They appear to have regularly exploited resources reachable within 2.5 – 3.5 hours of walking from the site, scheduling lithic procurement within other primary activities. While provenance data appears to be uninformative with regards to territories exploited by discrete groups that resided at the site, they nevertheless point to the

use of large territories by Neanderthal individuals over their lifetime. They also point to a strictly utilitarian and pragmatic use of stone resources, which were nevertheless targeted with a high degree of selectivity. While these findings have to be confirmed for other contexts, they likely apply to Neanderthals living in other regions as well.