

EMPIRICALLY ASSESSING LINGUISTIC ABILITY WITH STONE TOOLS

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A recent stone knapping experiment is presented which supports that language does indeed fossilize, in the sense that it leaves impressions in stone. It links a) modes of cultural transmission in stone tool manufacture to b) required theory of mind ability to c) correlated linguistic ability. This includes specific syntactic and semantic features such as word reference, mental-state verbs, and complementation.

Discriminating between modes of cultural transmission (CTs) in the archaeological record is important because it identifies cognitive abilities which must be present to operate. Theory of mind (ToM) is the ability to attribute mental states such as knowledge or beliefs. It is the ability to think about thoughts (ToM-1) or the ability to think about thoughts about thoughts (ToM-2), etc. Emulation, imitation and teaching are three CTs that require ToM to different degrees: Emulation (ToM-0) is when an individual copies the end-state or 'goal' that a conspecific has produced, without theorizing about the conspecific's behaviour in production (Huang & Charman, 2005). Imitation (ToM-1) is process-oriented, and copies a conspecific's behaviour in order to produce a goal (Tomasello, 1996). It requires theorizing a relationship between the intended actions and goal. Teaching (ToM-2) is the intentional conferring of knowledge to a conspecific. The author argues that it requires theorizing that another is capable of thinking about the teacher's thoughts.

The relevance for detecting language in stone tools is that ToM and language are intimately linked, both functionally and developmentally, to the point that they are predictive of the other's ability (Miller, 2006); some suggest a likely coevolution (Malle, 2002). Language by its very nature is grounded in ToM, as "we cannot make sense of communicative interactions without presupposing that the interlocutors possess mutual knowledge of relevant beliefs and intentions." (Baldwin & Moses, 1994). ToM makes word reference possible, since it requires a shared knowledge of a linguistic symbol to be anchored to a referent. Identifying ToM-1 in the archaeological record is therefore argued to denote the ability for word reference. Developmentally, humans do not acquire grammatical language without the scaffolding provided by ToM. Mental-state verbs (such as 'know', 'think', 'remember'), as well as the complement structure to organize

mental-state verbs, is key in ToM-2's maturation (de Villers, 2007); therefore, it is argued that ToM-2 in the archaeological record denotes the presence of complementation and lexical items to describe mental states.

In this way, ToM can be used as a proxy for language ability in the archaeological record. An experiment has therefore been constructed to assess the different morphological characteristics of stone tool manufacture transmitted by emulation, imitation, and teaching. Twenty novice knappers replicated handaxes in one of three aforementioned CTs. The 160 resulting handaxes were then 2D scanned and their outlines traced, then uniformly rotated and scaled for shape comparison. The coefficient of variation (CV) was then calculated from the XY data. The CV shows that the shapes were less similar to each other in the emulation group (higher copy error), while the most standardization occurred in the teaching group (lower copy error). This suggests that CTs influence the level of variability in the shape of stone tools. This information can be used to determine what level of standardization can be reached only by higher fidelity CTs, and the ToM it implies.

To summarize, if language ability and ToM ability are correlated, and ToM enables different CTs, and CTs impact rates of copy error in material culture, we can measure stone tool assemblage variability to deduce language ability amongst Palaeolithic stone tool makers. In this way, through its impact on morphological variability, language can in a sense be said to fossilize.

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