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Review

Can archaeology tell us about the evolution of cognition and language?

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ABSTRACT

Archaeologists are often tempted to make their own contributions to the study of the evolution of cognition and language. At the same time many more researchers in other fields try to find in the archaeological literature the evidence that would disclose the steps in the evolution of these aspects of human nature. On one issue all scholars agree: The so-called Upper Paleolithic Revolution, since some 45,000 years ago, commonly characterized on the basis of Western European archaeological records, fossils and genetic evidence, is the expression of hominins like us. It is generally agreed, although not accepted by all, that due to gene flow and cultural transmissions modern humans came out of Africa and dispersed around the world. The question, however, is how much earlier were the origins of languages and cognition, and can we identify the material remains that reflect the phases that led to today's expressions, within the sequence from 3.3 or 2.6 Myr ago. This paper examines briefly the common stone tool making techniques that are still considered in the literature as a source for providing information about the evolution of cognition, along with very few comments on the pattern of seasonal/annual mobility of past groups of foragers. It reaches the conclusion that when we study not only the records of Europe, western Asia and Africa from a Western view point but also take into consideration the information from East Asia, we are forced to adopt a cautious attitude to the interpretations concerning the emergence of cognition and languages.

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1. Introduction

Since the onset of prehistoric research in the nineteenth century the shaping of stone tools was considered as the marker of human ingenuity and that the tools reflect daily activities. Differences among the stone tone tools that were found in the terraces of European rivers and in caves allowed the founders of prehistoric research to suggest periodic subdivisions as in paleontology. The entire period was called Paleolithic (Old Stone Age) that was further subdivided into Lower (or Early), Middle and Upper (or Late) Paleolithic. In Africa these terms were translated as Early, Middle and Late Stone Age.

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Chronological boundaries between these sub periods remained flexible and the terms are still used as indicators of a relative age. All researchers were interested to discover the skill of prehistoric hunter-gatherers in making usable artifacts from hard rocks but the need to classify the shaped objects led them to employ the rich ethnographic literature of contemporary foragers who still made and used many similar tools.

The discovery of ornate caves, mobile art objects, body decorations in the Upper Paleolithic age of western Europe, and the variable assemblages of stone, bone, antler and ivory artifacts was seen as a major change. As the amount of data sets from the three continents increased in recent decades heated discussions about "modern human behavior" and its roots have raged. Naturally, the search for the origins of language became a major goal often coupled with the wish to understand the evolution of cognition (e.g., Gamble, Gowlett, & Dunbar, 2011). Advancements in primate studies promised a base line for what happened in the last 2.6 or 3.3 million years of hominin evolution. Primate behavior was and still is used for this purpose and recent modern humans are viewed as the long term results achieved through physical evolution. This means that we need to speculate what happened during more than two million years. Undoubtedly, a dauntless task.

In the following pages I will only use the archaeological sources and the potential interpretations for offering a cautionary note on what we can learn from the past. I mainly deal with stone artifacts with only minimal references to social issues such as subsistence strategies and their spatial expressions, as well as demography. Issues related to the so-called term "modern human behavior" have been shown to be an obsolete definition (Shea, 2011) and will not be discussed here. Instead, the probable evidence for the active use of language pertaining to tool making some 500,000 years ago, will be briefly presented (e.g., Dunbar, 2003; Gamble et al., 2011).

The century old idea that only humans made stone tools was abandoned following the investigations of primate behavior initiated in the twentieth century, particularly of chimpanzees,. Observations of chimpanzees and orangutans in their natural habitats exposed the ways in which they make simple artifacts from plants for instant use (van Schaik & Pradhan, 2003). An exception is the West African chimps who employ naturally shaped hammer-stones and large cobbles for nut cracking that leave behind evidence for pounding. In addition, experimental studies of Kanzi, a bonobo, demonstrated that apes do not have the human dexterity in precision (Savage-Rumbaugh & Mintz Fields, 2006). The physical limits of hand movements demonstrate why stone nodules or cobbles were not systematically chipped by primates when compared to the rich assemblages left behind by Pliocene and early Pleistocene hominins. The only case that such behavior did occur was unearthed in West Africa (Mercader et al., 2007). It seems that this difference between hominins and primates is recorded since at least 2.5 Myr ago by the consistency of hominins in making and shaping stone tools.

In addition, we should remember a critical issue when the past two million years are discussed. Uneven and very poor preservation of organic matters (except for bones) in Late Pliocene and early Pleistocene sites such as wooden and/or bamboo objects, which probably were employed by hominins, are only rarely discovered. Rare examples are dated to the last *ca.* 0.8–0.3 Myr such as in Gesher Benot Ya'acov (Goren-Inbar, Werker, & Feibel, 2002) in the Levant and the famous wooden spears from Thieme, 1997 (e.g., Schöch, Bigga, Böhner, Richter, & Terberger, 2015) in northern Germany. Similar finds, from later in the Middle Pleistocene were already known from Lheringen (Germany) and Clacton-on-Sea (UK). The rarity of organic finds causes a major bias in our interpretation of Paleolithic sites. A somewhat similar situation is the state of the evidence for the use of fire that is commonly found in sites younger than 500/400,000 year ago, but rarely in earlier contexts. Among the latter I mention Wonderwerk Cave in South Africa (Pickering, 2015) and Gesher Benot Ya'acov, Israel (Goren-Inbar et al., 2004) of more or less of the same time range of 0.9/0.8 Ma.

It is essential to delve into the issue of what we can learn from tool making during the Pleistocene, because different scholars tried, while relying on stone artifacts, to demonstrate cognitive changes reflecting evolutionary trends among hominins (e.g., Coolidge & Wynn 2005; Gowlett 2009; Stout 2011; Wynn 1981, 2000; Wynn & Coolidge 2011). A brief description of how stone objects were made with a few comments on their use is relevant to the geographic spread of various human groups in the Old World and the discussion on cognition and language presented in the last sections of this paper.

2. Manufacturing stone objects and the social landscape

The basic principle of making stone tools is by detaching a flake (or chip) from a nodule or a cobble by hitting it with another rock (hammer). This action can be repeated several times thus producing flakes with sharp edges. The repeated actions leave a series of scars that mark the process of reduction on the cobble or nodule (now named 'core') on one, two or multiple faces and helps to reconstruct the sequence of decisions made by the knapper. During the last 2.6 Myr various techniques of knapping for obtaining flakes (known as 'blanks') with sharp edges were conducted in several ways. The simpler technique to obtain the flakes, is direct percussion, when the core is held by one hand and being hit by a hammer stone held in the other hand. A Different technique is to use a heavy block and throw it on another block, often known as 'block on block techniques. The third way is to place the core (a nodule) on a rock, an anvil, and hit it directly with a hammer. This kind of detachment is known as 'bi-polar technique' as the flakes (chips) are derived from the two ends of the nodule, from the percussion point and from the other end due to the impact of the anvil. This group of simple knapping rocks can be learned by imitation.

These simpler ways of obtaining sharp flakes, also allows the use the cores as tools, known as choppers or chopping tools, characterize the Lower Pleistocene contexts associated with *Homo habilis*, *H. ergaster*, and *H. erectus*. In addition, the arsenal of stone tools included hammer stones, and polyhedrons (multi-faced, multi-scarred nodules). The exact use of all of these objects is still poorly known, but the sharp edged flakes were probably employed for butchering, cutting, and other activities