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Recycling in abundance: Re-use and recycling processes in the Lower and Middle Paleolithic contexts of the central Iberian Peninsula

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ABSTRACT

The central region of the Iberian Peninsula is dominated by Mesozoic and Palaeogene sedimentary deposits in which geochemical processes have provided a wide range of siliceous outcrops. In this context, raw material has been exploited since the Middle Pleistocene, notably at Acheulian and Mousterian sites. Several fieldwork projects have been embarked upon in the last 20 years with a view to studying the human occupation of this area. As a result, several archaeological sites have been found. Of these sites, Cañaveral, Berrocales and Ahijones have provided a significant amount of lithic evidence, which is currently being studied.

In this paper, we present a conceptual discussion of the terms used to understand production levels inside the assemblage, as well as an insight into the reuse and recycling processes detected in the workshop/quarrying sites, that could be considered as evidence for raw material abundance. This approach takes into account a diachronical analysis of the *Chaines operatoires* in Acheulian, and particularly Mousterian sites. As a preliminary hypothesis, the presence of recycling or reuse in these areas of abundance could be due to social or economic reasons. The changes that occurred during the Lower and Middle Paleolithic introduce important developments in social participation in the flint knapping activities and strategies that could contribute towards explaining its presence.

1. Introduction: the Lower and Middle Paleolithic in Madrid and the recycling

On a regional scale, Acheulean and Mousterian chrono-cultural assemblages are traditionally defined by the typological presence or absence of handaxes and Levallois materials. However, this criterion should be applied with certain caution. Our current knowledge of supply and catchment areas suggests that testing pieces, trials, mistakes, or even initial knapping stages may introduce confusion in the typological discrimination between bifacial, discoid and Levallois items. On the other hand, the traditional elements used to differentiate Lower Paleolithic (Acheulean) from Middle Paleolithic (Mousterian) have been revised, thanks to recent archaeological discoveries and new geo-chronological data sequences (Gamble, 1999).

Some collections lacking handaxes, a large number of flaking products (flake *débitage*) or retouched elements from programmed schemes cannot be classified as Acheulean (Boëda, 1989; Baena Preysler and Baquedano, 2004; Cuartero Monteagudo, 2007). The presence of configured material departing from trifacial schemes and the absence of discoid and Levallois *débitage* characterized by the presence of multipolar *débitage* appear to be the best indicators for techno-cultural adscription.

Current data suggests that the traditional classification of Acheulean artifacts from Madrid is based on a number of extremely old collections, amongst others, which are typical of the Middle Paleolithic. It is the MTA and MTB handaxes present in these collections that led to their categorization as Acheulean.

Numerous archaeological sites have been documented in old river basins of the main and secondary terraces (Rus, 1987;

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Baena Preysler et al., 2000). The data gathered in all of these sites has been used in the attempts to systematize and classify the collections according to the French Mousterian facies (Rus, 1987; Rus and Velasco, 1993), resulting in most cases in the assignment of the assemblages to the MTA, solely on the basis of the presence of handaxes. This procedure must be reconsidered, however, especially in the case of the oldest collections, where the control of the material's spatial and stratigraphic position was precarious or simply non-existent (Enamorado Rivero, 1984a, 1984b, 1989; Sanchez, 1985; Rubio and Panera, 2005).

In recent years, the region has experienced a deep urban transformation that has affected the interfluvial areas between the Manzanares and Jarama basins. The development of recent Urban Enlargement Projects (called PAU) has contributed towards the discovery of new Pleistocene archaeological sites. This together with the heritage policy promoted by the Regional Agency responsible for Historical Heritage (*Dirección General de Patrimonio de la Comunidad de Madrid*) has encouraged the development of research projects in such areas. At the beginning of 2007, we carried out the fieldwork study of the archaeological sites of El Cañaveral (Vicálvaro, Madrid) thanks to collaboration between private institutions and the University Autonoma of Madrid. The fact that our archaeological intervention coincided with the constructive boom in Europe in the first decade of the twenty-first century conditioned our possibilities of site recording. Our project has focused on those spaces in which conservation conditions guaranteed the best interpretational possibilities, and covers limited areas in each archeological site.

The El Cañaveral archaeological area, one of the largest and most complex archaeological sites recorded in the region, is home to several sites from different chrono-cultural frames. All of these sites share a great abundance of knapping lithic remains associated with flint outcrops, and thus a similar functionality. This richness of lithic resources is clearly related with a wide range of knapping strategies, in which recycling is an important part.

We understand the complex nature of concepts such as reuse and recycling. The differentiation between both concepts depends on factors such as time breakage (rupture of the reduction process), and the intentions of authors. Even if we are able to identify ruptures in the *chaine operatoire*, some authors have introduced the concept of "teleological" proposed in those breaks (Bourguignon et al., 2004). With regards to recycling, most authors refer to the behavior that leads to successive steps of modification or change in the use of the same stone tool as a result of particular economy of raw materials (Kelly, 1988; Close, 1996; Amick, 2007; Galup, 2007; Hiscock, 2009; Rezek et al., 2011) or immediate needs (Amick, 2007; Galup, 2007).

Recycling or reuse processes could be studied through the refitting and the spatial distribution of materials (Vaquero, 2011), but also through analyzing the changes in functionality of each material (Gibaja Bao, 2009; Thiébaut et al., 2010). Generally speaking, recycling is identified by the patina rupture, the best way to recognize the existence of a discard period in the piece (Vaquero et al., 2012a). Changes in the surface of the pieces could be produced by fire, weather, or other factors (Debenath, 1992; Sergant et al., 2006; Barkai et al., 2009; Vaquero, 2011).

Impact traces in lithic surfaces have been considered as another example of evidence of recycling (Keeley, 1993; Mitchell, 1998; Moncel, 1999; Boëda et al., 2004). Their presence in lithic categories not directly involved in percussion activities indicate changes, with or without temporal break up, in the function of tools (Claud et al., 2010; Thiébaut et al., 2010).

From our point of view, 'recycling' is a broad concept that integrates several sub-ideas, and we will use this term with this general interpretation. In all the cases it must be defined by the presence of a discard phase between the different functional (in a broad sense) episodes. At the same time, reuse must be related to cycling processes in which tool function does not change. Although it could be questioned, we also introduce the sub-category of 'application'. Close to the idea of recycling, it is used to refer to those items generated by an expedient morpho-potential selection of fragments (resulting from previous knapping actions) whose morphology is close to the final needs. This strategy is similar to the reuse or recycling of other categories.

However, from our point of view, recycling must be produced by the same "cultural" agents that generate the discard episodes or contexts, and thus in a discrete temporal gap. Otherwise, we could sub-define other concepts such as a secondary catchment strategy or lithic scavenging (Hayden, 1979; Amick, 2007) on occupational deposits. As pointed out by Amick, aspects such as the temporal variable, the motivation of the changes, and the particular circumstances of the occupation amongst other factors are crucial (Amick, 2014), and introduces in almost all cases a high degree of uncertainty.

For Cañaveral sites, we suppose that the recurrent visit to the same areas, the existence of similar functional activities, the use of similar percussive tool strategies, the similarities in all the reduction processes, in addition to some refitted relations particularly from Area 3, indicate the absence of a great "cultural" discontinuity in the occupations. However, we must be very careful when using this concept.

2. Materials and methods

2.1. Geoarchaeological context

The geological context of the site is the Madrid basin, part of the larger morpho-structural Tajo basin (Baena Preysler et al., 2011). It is bordered by the Central System and Gredos mountains to the northwest, the Iberian Range to the northeast, and the mountains of Toledo to the south (Pérez-González, 1994) (Fig. 1). The Miocene processes lead to three large sedimentary stages, which were associated with three large stratigraphic units in relation to flint formation are as follows: Lower Unit (Middle Rambliense–Aragoniense), Middle Unit (Middle Aragoniense–Lower Vallesiense) and Upper Unit (Upper Vallesiense–Turoliense) (Calvo et al., 1996).

The Lower Unit is made up of massive and sharply folded gypsum with green clay interbeds, the Intermediate Unit comprises clays, dolomites and flint, and the Upper Unit is made up of detrital and carbonate materials ("Paramo" limestones).

The Intermediate Unit is divided into two components. The lower component is 12 m thick and contains green folded clays interspersed with muddy clays, some centimeters in depth. Above it is the upper component, made up of sharply folded and multicolored clays with some local carbonates and flint nodule horizons (Fig. 2) (Bárez and Pérez-González, 2007). The Intermediate Unit shows frequent deformations caused by karstification processes of the Lower Unit and some collapses, as well as the resulting deformation from the 'reflect effect' in the Intermediate Unit. The study of this Neogene stratigraphic series has been of great importance because of its impact on the genesis and archaeological preservation.

Throughout the course of the works we were able to recover evidence that a wide Quaternary sedimentary series existed throughout the area. These sediments are colluvial quartz and feldspathic sands, originally of fluvial and aeolian origin. The thicknesses vary and sometimes reach 9 m. One of the causes of these various thicknesses is the development of Quaternary karst