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Origin of an obsidian scraper at Yabroud Rockshelter II (Syria): Implications for Near Eastern social networks in the early Upper Palaeolithic

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ABSTRACT

Identifying the movement of lithic materials to reconstruct social networks has been a mainstay of research into Palaeolithic cognition and behavior, but such datasets are often predicated on studies of cherts and similar siliceous rocks, the origins of which can be difficult to establish conclusively. Yabroud Rockshelter II (YR2) in southern Syria contained stratified Middle and Upper Palaeolithic layers and, therefore, played a key role in defining the Levantine Palaeolithic. One obsidian scraper was found in Layer 4, which, via techno-typological correlations with nearby sites, dates to ~41–32 ka. Here we report our attribution of this scraper, based on its elemental analysis, to the Komürcü outcrops at Göllü Dağ volcano in central Turkey, ≥700 km on foot. This finding has three important implications. First, the earliest transport of obsidian into the Levant is usually associated with the Epipalaeolithic Natufian cultural complex (~14.5–11.5 ka); however, the phenomenon dates farther back to a period following the Middle to Upper Palaeolithic transition. Second, Layer 4 is roughly contemporaneous with Layer C at Shanidar Cave in northern Iraq, where two obsidian flakes were sourced to eastern Turkey and/or the Caucasus, suggesting similar scales of interaction across the landscape. Lastly, the chert assemblage is presumed to be local (≤10 km), but the obsidian scraper suggests that there are other far-travelled artifacts, underscoring that visual identification of cherts might be underestimating the extent of Late Pleistocene mobility and networks.

1. Introduction

Most arguments regarding cognitive and behavioral differences between Middle and Upper Palaeolithic hominins – commonly presumed to be Neanderthals and anatomically modern humans (AMHs), respectively – are predicated on evidence that readily preserves within the archaeological record. There is, for example, renewed interest in pyrotechnology of the Pleistocene (e.g. Berna and Goldberg, 2008; Daniau et al., 2010; Roebroeks and Villa, 2011; Courty et al., 2012; Twomey, 2013; Bentsen, 2014). Heat treatment of lithic materials and sophisticated adhesive recipes are thought to reflect advanced cognitive capabilities (Wadley et al., 2009; Wadley, 2013; Wadley and Prinsloo, 2014). Contrasting the use of symbolic objects in Upper Palaeolithic (UP) assemblages with Middle Palaeolithic (MP) ones has also been an important – and hotly debated – line of investigation (e.g., Mellars, 1989, 1996; d'Errico et al., 2003, 2005; Botha, 2008, 2010; Zilhão et al., 2010; Peresani et al., 2011; Finlayson et al., 2012; Roebroeks et al., 2012; inter alia). Other research foci include the rate and spread of technological innovations (Mellars, 1998; Klein, 2003; Wynn and Coolidge, 2008) and differences in subsistence practices or technologies (Binford, 1985, 1989; Stiner, 1994; Marean and Assefa, 1999; Villa et al., 2005; Adler et al., 2004, 2006; inter alia).

A mainstay of such research has been identifying the movement of lithic raw materials (and other exotic items) across the landscape in order to investigate the scales of social networks. Given that such networks can function as a means to buffer against resource and climate unpredictability via access to distant ecological zones (Whallon, 1989; McBrearty and Brooks, 2000), a lack of long-distance social connections has been suggested as one factor in the Neanderthals' demise (Gamble, 1999). The evidence, though, is not conclusive. Villa and Roebroeks (2014) note that, in European UP assemblages that record distances > 300 km, nearly all involve the transport of shells, not lithic materials. Many efforts to establish the geographic sources of lithic materials rely on macroscopic identification of chert and similar siliceous rocks (Demars, 1982, 1990a, 1990b; Chadelle, 1983; Geneste, 1985; Turq, 1988; inter alia). Thus, claims of long-distance transport are met with skepticism as a matter of arithmetic. Attributing a chert artifact to outcrops at a distance of 10 km means that one can reliably discern

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sources within the surrounding 300 km^2. When this distance increases to 300 km, the potential source area expands exponentially to 280,000 km^2, larger than all of France. The reliability of source identifications decreases across such a large area, especially when based upon visual means for chert and similar siliceous rocks, which can exhibit low macroscopic diversity over such scales. Thus, long-distance transport is best identified by geochemical means.

From 1930 to 1933, German archaeologist Alfred Rust excavated a series of rockshelters in the Skifta Valley, near the town of Yabroud (sometimes transliterated as "Yabrud" or "Jabrud"), ~60 km northeast of Damascus. Collectively, these shelters comprise a nearly complete archaeological record of the Palaeolithic in the Levant (Rust, 1933, 1950). Yabroud Rockshelter I contained Lower Palaeolithic (LP) and MP layers, Rockshelter II contained MP and UP layers, and Rockshelter III had Epipalaeolithic (EP; in particular, Natufian) layers. More than 10,000 lithic artifacts were recovered from Rockshelter I alone. Yabroud Rockshelter II (hereafter "YR2"), which is the focus of our study, contained a sequence of stratified layers, ~3 m deep, with dense lithic deposits as well as intact ash concentrations (i.e., combustion remnants, most likely hearths), attesting to little post-depositional disturbance. As a result of Rust's excavations, this locality played an important role in defining the Levantine Palaeolithic (e.g., Bordes, 1955, 1962; Heinzelin, 1966; Solecki and Solecki, 1966, 1986, 2007, inter alia; Farrand, 1970; Ziffer, 1981; Gilead, 1991; Pastoors et al., 2008; Bretzke et al., 2011; Bretzke and Conard, 2012; Shimelmitz et al., 2016). Rust's assemblages are housed at the Institute of Prehistoric Archaeology, University of Cologne (Germany), where they have long been a focus of research (Bakdach, 1982; El-Kassem, 2001; Frank, 2004; Hauck et al., 2014).

In YR2 Layer 4, Rust (1950) reported the presence of a single obsidian artifact ("das einzige Stück Obsidian aus dem Gesamtinventar," 80) along with pigment (ochre), adhesive (bitumen), and grinding stones as well as bone tools, perforated shells, and a hearth. Regarding the obsidian tool, identified as a scraper ("Obsidianschaber"), he discussed its potential origins:

> Es ist dies das einzige Stück Obsidian aus den Jabruder Kulturschichten. Dieses vulkanische Glas kommt am Orte nicht vor, doch stehen in südlicher und südöstlicher Richtung in einer Entfernung von etwa 100 km große Lavafelder an. Es ist mir allerdings unbekannt, ob dort Obsidian vorliegt. Jedenfalls läßt sich das Glasartefakt bisher keineswegs für eine Wanderungsoder Handelsweghypothese auswerten.
> [This is the only piece of obsidian from the Yabroud cultural strata. This volcanic glass does not occur in the region, but there are lava fields in the south and southeast at a distance of about 100 km. It is, however, unknown to me whether there is obsidian. In any case, the glass artifact cannot be evaluated by any means for a migration or trade route hypothesis.]

Thus, Rust (1950) recognized that this raw material was non-local; however, at the time, he had no way of knowing its volcanic origins were much farther than – and in nearly the opposite direction of – the Eṣ-Ṣafā basalt flows to the southeast. Ziffer (1981:78–79, 90) also discusses the obsidian scraper and other finds from YR2 Layer 4:

> It is a rich assemblage in lithic material (507 tools and 374 waste blanks), as well as in bone tools (5 bi-conical points) and pierced snails… There are also, for the first time in the site, ochre and bitumen (asphalt) remains, beside some grinding stones probably used with relation to these materials. Rust suggested the bitumen remains as a [basis] for handling certain flint tools. There is also a piece of obsidian in the collection. The flint in general is very colorful, with red, [violet], brown, and yellow shades dominating… The intensity of hearths used in all the layers and their position, one over the other, together with quite a large quantity of lithic material in all of the layers, the existence of bone-tools, shells, and obsidian fragments in layer 4, all make Yabroud II [an] intensive settlement, and maybe a "base-camp" site, during the Upper Palaeolithic period in Syria.

Gilead (1991:142) similarly noted the significance of these finds (although he erroneously referred to "a few flakes of obsidian" rather than a single obsidian scraper):

> A few flakes of obsidian from Level 4 of Yabroud II, found with perforated shells, ochre, bitumen on a few flint tools, and grinding stones, are also important indicators of long-distance transport… The only sources of obsidian in the Near East are near Lake Van in Eastern Anatolia and the Çiftlik area of Central Anatolia, so the obsidian of Yabroud II had been transported some 600–900 km. Only during the early Neolithic do we find obsidian artifacts distributed over comparable distances.

Indeed, the development of obsidian sourcing by Colin Renfrew and colleagues (Cann and Renfrew, 1964; Renfrew et al., 1965, 1966, 1968; Dixon et al., 1968; Cann et al., 1968, 1969; Renfrew, 1969) coincided with the "Neolithic Revolution," especially the origins of agriculture and urbanism, as an emerging topic of interest. Hence, obsidian sourcing became linked to "Neolithization" in the Near East. It was hoped that the spread of the "Neolithic package" could be traced via the transport and trade of obsidian. Early results implied that Neolithic villages were far from isolated. As obsidian moved, so too could technological or social innovations. Such interpretations were consistent with the extreme rarity of obsidian in Mesopotamian and Levantine assemblages until EP and Neolithic times (Cauvin, 1991). During the Palaeolithic, obsidian largely remained near its Anatolian sources (Kuhn et al., 2015). Consequently, an initial "gold rush" (Özdoğan, 1994:423) of obsidian sourcing in the Near East focused on the Neolithic, as has more recent work (e.g., Bressy et al., 2005; Carter et al., 2006, 2013; Poupeau et al., 2010; Orange et al., 2013; Ortega et al., 2014; Ibáñez et al., 2015; Campbell and Healey, 2016; Frahm et al., 2016a; Khalidi et al., 2016).

Here we report our findings regarding the origin of YR2 Layer 4 obsidian scraper, a small flake that has been steeply resharpened to the point where its utility is essentially exhausted and which has experienced post-depositional breakage. We chemically analyzed this scraper using non-destructive portable X-ray fluorescence (pXRF) and compared its composition to a collection of 230 geo-referenced obsidian specimens. Our data establish that this scraper matches the Kömürcü obsidian outcrops on the slopes of the Göllü Dağ volcanic complex in central Turkey. Therefore, the rockshelter and obsidian source are > 500 km apart linearly (which crosses into the Mediterranean Sea) and > 700 km on foot following the least-cost path across the landscape. This result has three key implications. First, the earliest transport of obsidian into the Levant is usually associated with the EP Natufian cultural complex (~14.5–11.5 ka; Akkermans and Schwartz, 2003:82; Khalaily and Valla, 2013; Ridout-Sharpe, 2015), after the emergence of this phenomenon in Southwest Anatolia (i.e., Öküzini Cave, ~18–14 ka; Carter et al., 2011). The YR2 obsidian scraper, however, attests that this phenomenon has roots deeper in time, dating much farther back into the Pleistocene. Second, a number of techno-typological correlations of the YR2 assemblage to those at nearby sites suggest an age of ~41–32 ka for Layer 4, corresponding to the second half of Marine Isotope Stage 3. This appears to be roughly contemporaneous to Layer C at Shanidar Cave in northern Iraq, where obsidian flakes were sourced by Renfrew and colleagues to eastern Turkey and/or the Caucasus. This means that at least one of the Shanidar flakes was moved about the same distance as the YR2 scraper at about the same time, suggesting similar scales of interaction across the landscape. Lastly, the remainder of the YR2 lithic assemblage, composed of chert and related siliceous rocks, is thought to derive from raw materials < 5–10 km away. The obsidian scraper, which was transported > 700