
Not only a tool-stone: Other ways of using obsidian in the Near East

Elizabeth Healey

School of Arts, Languages and Cultures, University of Manchester, Oxford Road, Manchester. U.K.
Email: elizabeth.healey@manchester.ac.uk

Abstract:

Obsidian was used widely in the Near East in prehistoric and early historic times to make tools and other objects. We know quite a lot about its use as a tool-stone, but much less about other objects made from it, although such things in other contexts would be regarded as markers of identity. This apparent duality of use raises the question of whether the object made or obsidian as a raw material was more significant; it also raises questions about whether the same crafts-people were involved in both the production of tools and other objects or whether they were separated. As research progresses, we are increasingly realising that there is much information that is scattered and that more holistic and integrated approaches are needed. This demands in-depth study of individual objects using multi-disciplinary approaches. Significant areas for further study include the use of geochemical analysis to determine the provenance of the obsidian from which the objects were made and so to evaluate choice of source. Advanced technological investigation is also needed to elucidate manufacturing methods and techniques. These include studies of manufacturing techniques and surface topography as well as an evaluation of experimental data, not only to elucidate which techniques might have been used but also to assess skill and time input. The objects also need to be examined for indications of use and their context of deposition considered in greater detail. The type of objects produced and the way they were crafted also need to be compared to similar objects made of other materials to see if obsidian had a privileged position. Research into these matters is still at an early stage and this paper can only summarise what we know in order to provide a foundation for further study.

Keywords: obsidian; provenance analysis; personal adornment; production technology; grinding and polishing; drilling; identity

1. Introduction

The use of stone to make decorative items and other non-tool things has been identified from as early as the Epi-palaeolithic in the Near East (c. 11,000 BCE) (Bar-Yosef Mayer 2014a; 2014b, and references therein). Initially, relatively soft rocks (ophiolites, carbonates, and phosphates) were chosen; the use of harder and mostly exotic rocks, such as turquoise, amazonite, carnelian, rock crystal, and obsidian are not documented until the mid-ninth millennium BCE (the Pre-Pottery Neolithic B) (Alarashi 2014: 541-553, tables 13.1 and 2). Unlike most other rocks, obsidian was more commonly used to make tools for a considerable



time before its use to make other things. The dual use of obsidian has been long acknowledged (André-Salvini 1999; Chataigner *et al.* 1998; among others) but when a raw material is used for both tool-making and for ornamentation it can be difficult to know if, or how, the two aspects relate.

As a material, obsidian seems to have been meaningful to prehistoric people (Cauvin 1998; 2000; Goring-Morris & Belfer-Cohen 2001; Ibáñez & Urquijo 2011; Maeda 2007; 2013; Moutsiou 2014: 12-14, 152). In most cases it is exotic and thus indicative not only of long distance contacts but also carries the power that knowledge of faraway places brings (Helms 1993: 9). Decorative items, too, are understood to be markers of identity and affiliation, and sometimes even status (Alarashi 2016; Alarashi *et al.* 2018; Baysal 2018; 2019: 28-36; Baysal & Sağlamtimur 2021; Falci 2015: 11; Hayden 1998; Mattson 2016; Robb 2015; White 2007; White & Beaudry 2008: 7; and many others). Thus, the combination of a distinctive and mostly exotic material and its transformation into object-types which convey social messages should mean that those made of obsidian are powerful indicators of identity and affiliation.

However, at the moment the data that would allow us to explore this in depth is scattered and of uneven quality and often lacks chronological precision, largely because the objects tend to be from older excavations and most received only cursory mention in publications and consequently museum catalogues do not provide useful details. This paper aims to bring together what is known about these obsidian objects, with a view to creating a dataset for future, more in-depth study. The geographic location of the sites from which they were recovered is shown in Figure 1 and Table 1. The details of the objects are summarised in Supplementary file 1.

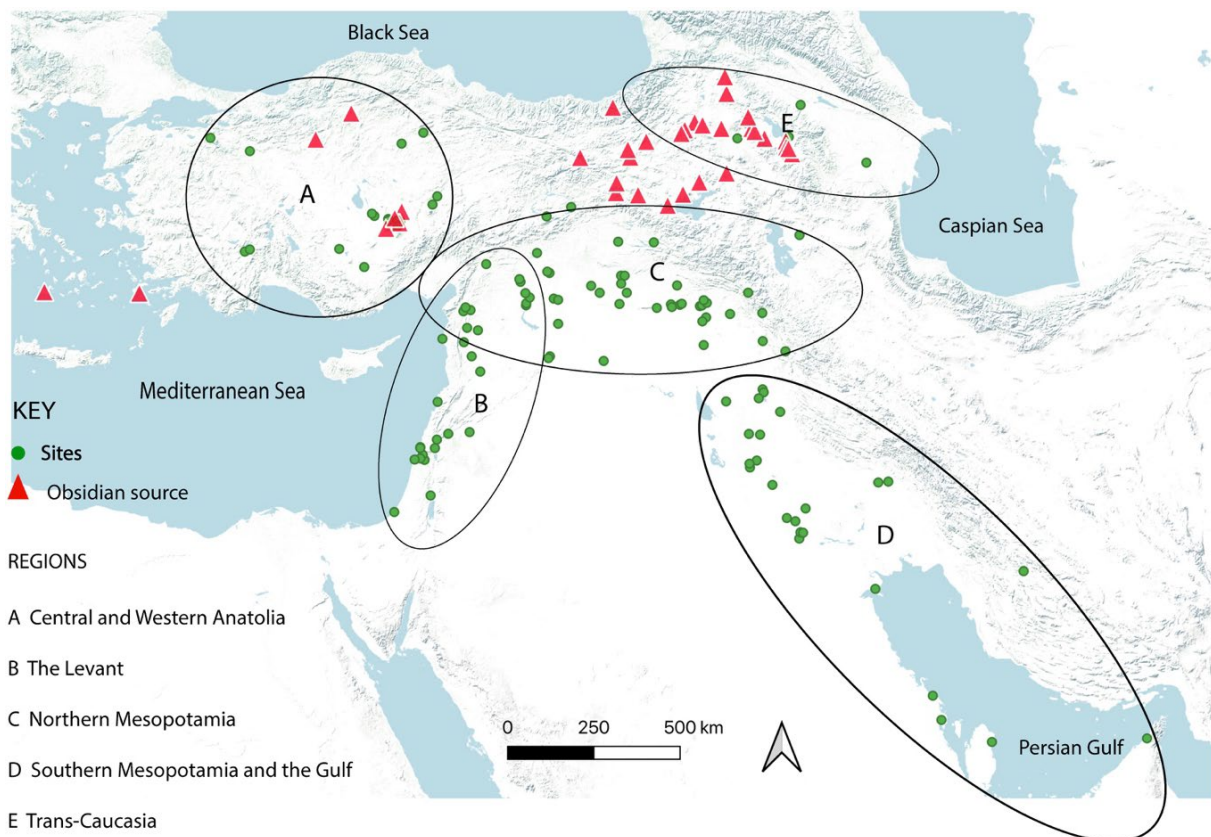


Figure 1. Map showing the location of the sites with non-tool objects and their location in relation to the obsidian sources.

Table 1. List of sites by region. Note: the regions are broadly defined and that the northern Levant and northern Mesopotamia overlap.

The Levant	Central & western Anatolia	Northern Mesopotamia		Southern Mesopotamia & the Gulf	Armenia (Trans-Caucasus)
Byblos	Acemhöyük	Abu Dhahir	Tell Assouad	Abu Khamis	Nader Tepe Arslanduz
Ein Zippori	Aşıklı Höyük	Akarçay Tepe	Tell Billa (Shabaniba)	As Sabiyah H3	Aratashen
Hagoshrim	Barcin Höyük	Aşşur (Qal'at Sherqat)	Tell Brak (Najar)	Choga Mami	Geghasar
Hazor	Boğazköy	Bouqras	Tell Chagar Bazar	Choga Mish	Mentesh
Horbat Manot	Can Hassan	Çafer Höyük	Tell Halaf	Daharan	
Horvat Uza	Çatalhöyük	Çayönü Tepesi	Tell Halula	Dosariyah	
Jericho	Demircihöyük	Domuztepe	Tell Hassuna	Eridu (Abu Sharain)	
Qatna	Güvercinkayası	El-Kowm	Tell Koşak Shamali	Jemdet Nasr K92	
Ras 'Ali, Nahal Zippori	Hacilar	Gird Banahilk	Tell Maghzaliyah	Khafajah (Tutub)	
Ras Shamra	Kaletepe	Grai Resh	Tell Mardikh (Ebla)	Khor	
Sefunim Cave	Karabak Tepe	Jarmo	Tell Mozan	Kish	
Shir	Kayırlı Demiryolu	Kazane Höyük	Tell Qara Quzaq	Nippur (Nuffar)	
Tell Aswad	Koşk Höyük	Kenan Tepe	Tell Sabi Abyad	Ras al 'Amiya	
Tell Atchana	Kültepe-Kanesh	Kirhbet Hatara	Tell Sheikh Hassan	Susa	
Tell el-'Ajjul	Kuruçay Höyük	Mezraa Teleilat	Tell Shimshara	Tal y-Malyan	
Tell el-Judaideh	Ortaköy Şapinuwa	Nader-Tepe Arslanduz (iran)	Tell Tawila	Tell Agrab	
Tell el-Kerkh	Tepecik Çiftlik	Nimrud (Kalhu)	Tell Zeidan	Tell al-'Ubaid	
Tell Kabri		Nineveh (Tell Kuyunjik)	Telul eth-Thalathat	Tell el-'Oueli	
Tell Kurdu		Qalinj Agha	Tepe Gawra	Tell es-Sawwan	
Tell Ramad		Qdeir 1	Tülintepe	Tell Razuk	
		Samsat	Umm Qseir	Tell Songor	
		Tell 'Aqab	Yanik Tepe	Tello	
		Tell al-'Abr	Yarim Tepe I, II & III	Ur	
		Tell Arpachiyah	Yeni Mahalle, Urfa	Uruk	

Studies of similar objects in other materials have demonstrated that an appreciation of the nature of any material (its origin, availability and properties), its technological potential and an understanding of the skills needed to make the objects allows greater insight into who made and used them (see for example, Alarashi 2016). So, too, a more in-depth study of the obsidian objects considered here also requires an integrated approach that considers attributes relating the objects in question from conception, through the choice and acquisition of raw material and its transformation into an object, to its use and final deposition (*e.g.*, Edmonds 1990; Hodder 2012: throughout; Hurcombe 2007: 36-37; Jervis 2019: chapter 1; Leroi Gourhan 1943: throughout; Sheridan 2017).

2. Obsidian as a material

Before considering the objects it is useful to remind ourselves of what we know about obsidian as a material, how it was formed, where it can be found, its physical and mechanical properties and why it might have been chosen (or perhaps rejected) to make tools and non-tool things (Hayden 1998; Torrence 2005) because this provides the background against which the objects are understood.

2.1. The formation of obsidian and its sources in the Near East

Obsidian is a silicic volcanic glass which, in the Near East, is associated with rhyolitic volcanoes. It is formed only in lavas which are rich in silica (over 65%) and which have a high water content and other volatiles that cause explosive eruptions. To form glass the volatiles need to be driven off and the lava left to cool quickly enough to prevent crystallisation. It erupts as flows, dykes, and blocks in pyroclastic deposits (Tuffen *et al.* 2020; Williams-Thorpe 1995); the nature of each eruption likely had a bearing on both the quality and accessibility of the obsidian.

Fortunately for archaeologists, each eruption of obsidian has a unique and homogeneous composition determined by processes in the magma chamber, and it is relatively straightforward to geochemically characterise its elemental composition. So, given a comprehensive and geo-referenced source dataset and suitable methodology, we can cross-match the elemental composition of the obsidian from which an artefact was made to that of a geological outcrop (although, of course, this does not necessarily mean there was a direct connection - that relationship is something we have to work out in each instance).

There are two main types of obsidian in the Near East, calc-alkaline and peralkaline. Not all obsidian is of the same quality or appearance and this may also have affected what obsidian from some sources was used for. Most frequent are calc-alkaline obsidians erupted by many volcanoes across the region (Williams-Thorpe 1995: table 2). They are often visually distinctive. They vary in translucency from crystal clear to cloudy and sometimes are opaque; colours range from almost colourless, through greys and browns to red-browns; sometimes they have inclusions or flow banding which may have been taken advantage of by the makers of the objects, to call attention to the origin of the obsidian and likely added to its attraction for making jewellery (see, for example, section 4.3 “Links or plaques” and the figures therein). Peralkaline obsidian on the other hand is only known from two sources in southeast Anatolia, Nemrut Dağ and Bingöl A. This obsidian is distinctive because of its green colour and may, on some occasions, have been deliberately chosen because of this. Peralkaline obsidian tends to have a slightly higher refractive index and density than calc-alkaline obsidian (Cann *et al.* 1969) although we do not know whether this affects its mechanical properties. While appearance (colour, translucency, reflectivity and so on) and texture, as well as ease of fracture likely influenced prehistoric people’s choice, it is currently difficult to

objectify these characteristics, although developments in nanomineralogy look promising (Ma & Rossman 2013).

In the Near East, the sources are in mountainous regions some distance from most habitation sites. There are four main source regions (central Anatolia, southeastern Anatolia, northeastern Anatolia and Trans-Caucasia) each with a number of separate sources. Each source is complex, often with several eruptive episodes and several outcrops. Changes in climatic and environmental conditions have also affected their visibility and accessibility, so that not all flows or outcrops or secondary deposits may have been available at any one time (Binder *et al.* 2011). The long-term exploitation of some outcrops may also have obscured previous extraction sites and knapping floors. In fact, we do not really know in any detail how people accessed the obsidian or whether it was controlled - factors which may affect its value - as few sources have been investigated with this in mind (although see surveys by Balkan-Atlı *et al.* 2011; 2013; Binder *et al.* 2011; Robin *et al.* 2015; 2016).

Distinction between obsidian from different sources seems to have been as important for prehistoric peoples as it is for us, although they would have relied on appearance and perhaps oral traditions that accompanied the raw material rather than our more objective elemental approach. For example, at Tell el-Kerkh and Akarçay Tepe, sites in the northern Levant, obsidian was obtained from both central and south-eastern Anatolian sources but analysis of the obsidian has established that only blades from south-eastern sources were selected to make corner-thinned blades and side-blow blade-flakes, types characteristic of northern Mesopotamian assemblages, even though blades made of central Anatolian sources would have been equally suitable. Projectile points, on the other hand, were made on blades of translucent grey obsidian produced from naviform cores - both the technology and the type of obsidian are associated with Central Anatolian sources (Maeda 2007; 2013). Such studies thus show an association between the origin of the obsidian and the artefacts made based on visual distinctions (which have been supported by geochemical characterisation). This means that as well as determining the elemental composition of the objects, we also need to record the macroscopic characteristics of the obsidian, which were, at least sometimes, the basis of choice for prehistoric people.

2.2. Working obsidian

Obsidian is a relatively hard (5.5 to 6 on the Mohs scale), but brittle rock. It breaks with a conchoidal fracture; the predictability of its fracture allows systematic working, enabling the production of blades with long, thin and sharp edges of regular size and shape, ideal for edge tools or tool blanks. The production of predetermined blades from naviform cores at the Kaletepe workshop on the Göllüdağ source epitomises this (Balkan-Atlı & der Aprehian 1998; Binder 2005; Binder & Balkan-Atlı 2001). Making ornaments, however, involved additional techniques. Some were initially shaped by flaking using the techniques used in tool manufacture, but then required the use of other techniques to finalise them (see Astruc 2001 for a description of the techniques used and for tools involved in stone bead making more generally). The application of these techniques (*i.e.*, abrasion, drilling and polishing) is not usually associated with the production of chipped stone tools. Some temporarily altered the appearance of the obsidian. Abrasion, for example, initially dulls the shiny surface of a freshly fractured piece of obsidian, but a new, smooth, and highly reflective surface can be (re-)created by hammer-dressing, further abrasion and grinding using progressively finer abrasives, before polishing and final buffing. This ability to transform its appearance may well have increased the fascination of obsidian.

2.3. Why obsidian?

Obsidian likely attracted the attention of prehistoric people as much as it does archaeologists today. Moutsiou, for example, has shown that the shiny and apparent blackness of obsidian was an important factor in its circulation in the Palaeolithic (Moutsiou 2019). It was also a significant material for beads in the Neolithic and Chalcolithic of the Near East (Bar-Yosef Mayer 2019). Ethnographic research has shown that many pre-modern societies consider shiny and exotic materials significant and their acquisition deliberate - choice being affected by a number of things (Goodman 1944; Hayden 1998; Helms 1993: 9; Ibáñez *et al.* 2016; Pétrequin & Pétrequin 2020: 17-18; Saunders 2001; Stout 2002; Taçon 1991; among others). Although we cannot assume that similar situations pertained to obsidian acquisition and use in the prehistoric Near East, they do alert us to the fact that the origin and choice of a particular type of stone and its acquisition had meaning (and potential consequences) in pre-modern societies.

Textual evidence from Near Eastern sites makes it clear that lustrous and shiny materials were valued for their aesthetic appearance and were regarded as auspicious (Winter 1999) and 'carried connotations of power, awe and dread' (Said 2020). The earliest sources suggest that some types of stone were regarded as meaningful; for example, texts dating to the second millennium BCE 'catalogue' rocks by their appearance, quality and origin (Postgate 1997). Other, slightly later, texts mention obsidian specifically. They inform us that it had magical and medicinal properties (CAD vol. 16: 257-259; Coqueugniot 1998). Its significance as a raw material, can be seen in the account of nodules of raw obsidian collected by Tiglath-Pileser I which were dedicated to the storm god Adad. Sargon II, too, lists obsidian among the precious stones dedicated to the god Marduk (CAD vol. 16, 258). It seems to have had an intrinsic value too. Obsidian beads are recorded along with other precious materials such as lapis lazuli, carnelian and gold used to create necklaces. This is sometimes unexpected as it was deemed to be a suitable gift for a prostitute (CAD vol. 16, 258), but it also had regal associations: a bead fragment found at Ur is inscribed (in cuneiform characters) "*(Ur-Nam) mu ... king of Ur.*" (Woolley 1974: 50) and necklaces with obsidian beads in them were also given by Tushratta, king of Mittani to Amenhotep III the king of Egypt (Rainey & Schniedewinde 2015: EA25). Objects of Egyptian origin suggest that it was more widely appreciated, for example an *unguentarium* and box with hieroglyphic inscriptions found in the Royal Tombs at Byblos and an *unguentarium* (not inscribed) from a royal grave at Qatna. As well as its personal use, obsidian was also chosen to adorn buildings (Tawil 2006) and its origin seems to have been important. A Middle Elamite inscription from Susa states:

I, Untash-Napirisha, I built a high temple in bricks of gold and silver, obsidian and alabaster and I gave it to the great god and to Inshushinak-of-siyan-kuk. Whosoever tears it down, destroys its brickwork, removes and takes to another country its gold, its silver, its obsidian, its alabaster and its brick-work, may the wrath of the great god, of Inshushinak and of Kiririsha-of-siyan-kuk be on him and may his descendants not prosper under the sun! (Potts 2016: 201 table 7.7, IRS 77)

As a material it seems to have almost universal appeal. Outside the Near East its use in statuary and house decoration, as well as for making vessels and jewellery, continues into the Roman period (Coqueugniot 1998; de Romanis 1996: 225-239; Decourt 1998) and modern auction house catalogues show that it continues to be of interest and value today. It seems to have been fascinating for other societies, particularly in Central America, in different ways and was valued for its brilliance (Campbell *et al.* 2019; 2021; Levine & Carballo 2014;

Saunders 2001). Other times, though, it had negative and dangerous connotations (Robinson 2004).

3. Approaches to the study of the objects

Items of personal adornment, mirrors and vessels, such as those discussed in this paper, tend to be singled out from the everyday artefacts, as symbolic objects and markers of identity, sometimes because of the context in which they were found, but also because they are often made of exotic materials and are rare and different from most other things found at a particular site. However, by studying them as special objects (and thus removing them from their original context), we may be altering their meaning or giving them too much importance, and perhaps even suppressing their more everyday meaning. We should remember that things which appear to be mundane to some people can be significant for others and *vice versa* (Lemonnier 2013: 15-18).

Different theoretical stances also of course affect how things are studied and thus our understanding of them. It has been accepted for some time that things and how they were made are a combination of technique, material, culture and society so they cannot be fully interpreted outside of their particular context (see, for example, Dobres 2000: 4-5; 2010; Edmonds 1995: 14; Kopytoff 1986; Lemonnier 1993: 26-27; Lemonnier 2012: 16; Pfaffenberger 1992). Although it is usual to investigate such objects through the sequences and techniques of raw material acquisition and manufacture using a *chaîne opératoire* approach, some see this as imposing a hierarchical structure and have taken other approaches including life historical ones (Gosden & Marshall 1999; van Gijn 2010: 11; 2017; Kopytoff 1986), or employed interpretative discourses (Thomas 2000:18), entanglement theory (Hodder 2012: throughout), assemblage theory (Jervis 2019: throughout) and object itineraries (Bauer 2019). Surprisingly though, these ideas are rarely foregrounded in individual object studies (*e.g.*, Baysal 2019: 36-40; Said 2020; Sheridan 2017). It is, then, likely that all attributes of an object are not only inter-related but also articulate with other aspects of the society in which they were made (see Hurcombe 2007: 49-53). This starts with their conception (why someone decided to make a particular object), the choice and acquisition of the raw material (including the mythologies surrounding sources and rituals associated with acquisition), as well as the more easily observed and understood and recorded production methods and tools needed to make it. It also includes the form of the object made and the use to which it was put (not forgetting the additional materials needed to make it usable, such as bone, wood, leather, plant matter, *etc.* for hafting or stringing or mounting. Its deposition (whether deliberate or casual loss) and ultimately its recovery and subsequent more recent history may also affect our interpretation (Gosden & Marshall 1999). This can be a chicken-and-egg situation: each decision, action, and gesture being entangled and associated both within its immediate environment (Jervis 2019: chapter 5) and its wider world (see also Bauer 2019; Hodder 2012: 208). The difficulty is in teasing out this sort of information from objects which are no longer associated with their original context. Such studies are only just beginning.

3.1. Some practical issues

Because most of the objects under discussion have tended to be treated as *objets d'art* they have become divorced from the *milieu* in which they were made and used and many are simply catalogued without further study. Here I try to suggest ways in which we might re-contextualise them, although it is not always straightforward and much more needs to be thought about and done. Many are from older excavations where retrieval techniques may have affected recovery levels. Objects may have been dispersed to museums around the

world, some of which are inaccessible for political reasons. Often only minimal information has been published, and detailed descriptions and contextual information are not always obtainable or verifiable. It is also not unusual for museums to randomly reconstruct or associate objects, especially beads, with similar finds regardless of context or site (Aruz & Wallenfels 2003: 4, 7 footnote 2; Wartke 1999; personal observation). In some publications and museum catalogues, the type of stone is not mentioned or may simply be referred to by colour, mis-identified (Campbell & Healey 2017; Postgate 1997), or even not identified at all. Furthermore, there are sometimes ambiguities of terminology in descriptions. It is unlikely, therefore, that we have a full record of ‘things’ made of obsidian. Nevertheless, with the *caveat* that incomplete information may affect our interpretations we can often still (and should) generate basic descriptions (Mattson 2016).

It is not possible to address the details of these issues in a single paper, and here we can only aim to make a start by summarising the *status quo* in order to provide a basis for further study.

4. The objects and other examples of the non-tool use of obsidian

The obsidian items included here are non-utilitarian *sensu* Hayden (1998). Most are distinctive because of their form and finish, and sometimes context. They include items of personal adornment, mirrors, and vessels as well as unmodified flakes and blades inserted into statuary and figurines which are only identifiable as non-utilitarian because of their context, as for example, objects deposited in graves. The inclusion of chips of obsidian for tempering clay is also briefly considered. Other artefacts which have been embellished beyond the strictly utilitarian, such as inscribed arrowheads, are not discussed further here.

For the purposes of this study, I have grouped the ‘things’ into broad and conventional categories (beads, pendants and other small items of adornment, inserts and inlays, mirrors, and vessels) although, of course, this may not have been the categorisation of their makers and users (Baysal 2019: 20-22) and some categories overlap. Within each category there is a brief description of the range of forms included, their main geographic and chronological occurrences as well as any evidence relating to manufacture and use and, where known, the provenance of the obsidian (also detailed in Supplementary file 1). In the succeeding discussion, amongst other things, the occurrence of objects through time is summarised. The reader is referred to Supplementary file 1 for references to the objects; for the sake of brevity, these references are not repeated in the text.

4.1. Beads

The main defining characteristic of a bead is that it is usually relatively small and has a central perforation which enables it to be strung with other beads, or attached to a different material perhaps in order to identify or decorate it in some way. Beads come in a diverse range of shapes and sizes which are widespread in time and space (for a general typology see Beck 1928; for lithic beads in the Near East see, among others, Alarashi 2014: figs. 4 and 8-11; Bar-Yosef Mayer 2014a; 2014b; Özdoğan 2006; Yelözer & Sönmez 2018: fig. 4). They are made of many materials, local and exotic, lithic and otherwise and are frequently found. They are among the earliest (ninth millennium BCE) and most frequent object-type made of obsidian although obsidian constitutes only a very small proportion of the lithic materials used to make beads. Colour and shininess were likely an important factor in its choice (Bar-Yosef Mayer 2019). Forms include:

Cylindrical beads (including long and short forms which may be spherical, barrel-shaped and carinated, as well as some ring beads) (Figure 2: 1-4 and 6-8). They have a wide geographic and chronological spread. Examples are known from Tell Aswad, Tell Ramad,

Motza, Hagoshrim in the Levant, Mezraa Teleilat, Yarim Tepe II, Domuztepe, Tepe Gawra, Tell Inghara, Ur and elsewhere in Mesopotamia.



Figure 2. A selection of beads from Domuztepe to illustrate the range of forms that may be present in a single assemblage. All are from late Halaf (c. 5800 BCE) contexts. Nos 3 and 5 from the Death Pit and nos 11 and 12 from the possible bead production area. Photographs courtesy of Stuart Campbell.

Flat, long (over 20 mm) beads (as Figure 2: 5) and winged or butterfly beads are quite rare in any material and are quite restricted in occurrence; present evidence suggests that they are mostly found in the late Pre-pottery and Pottery Neolithic in the Northern Levant. The hardness of the stone used, the relative thinness of the bead and the length of the perforation suggests that they are produced by skilled craftspeople (Alarashi 2016). Obsidian examples of butterfly and thin and flat forms are known from Tell Halula, Shir, Tell Aswad, Çayönü Tepesi, Tell Assouad and a lenticular or flattened and long example from Domuztepe (Figure 2: 5)

Disc beads are the most frequent type in most materials, although they are not made of obsidian until the late Neolithic. They are generally small (< 10 mm in maximum dimension) and thin (Beck's definition is that the length or height is less than one-third of the diameter (1928)). Some are shaped by the removal of micro-bladelets around the periphery of the blank (Khalidi 2014) which in some cases seems to be akin to retouching. The edges are sometimes ground and the surfaces may be fully polished, partly polished before perforation or simply left unpolished. They are less well finished than the ring beads. In an earlier paper we suggested that disc beads may be inept imitations of more elaborate types (Healey & Campbell 2014), but it is perhaps more likely that they were made for specific purposes such as burial (as suggested by Bains *et al.* 2013: 346). Multiple examples may be associated with burials (often child burials) and were strung with other materials (for example over 500 were found interspersed with shell beads in a child's burial in Area TW at Tell Brak (Khalidi 2014: fig. 5, 20) and 1125 obsidian ring beads among 24,300 beads of other materials of contrasting colours, mostly white, associated with the burial of an adolescent in tomb 102 at Tepe Gawra (Rothman 2002: 283) (two finely made obsidian bowls were also found in this tomb). (On the blackness of obsidian see Bar-Yosef Mayer 2019; Moutsiou 2019)).

Multi-sided or rectilinear beads are rare (so far they have only been identified on three sites, namely Can Hassan I, Domuztepe (Figure 2: 9), and Tell Agrab in Mesopotamia. They are made from thick blades or small cores or core fragments and longitudinally perforated.

Beads are often found singly, perhaps the result of accidental loss, but most probably belonged with others as part of a composite necklace, head-dress, girdle, bracelet, armband or anklet. The loss of beads may have been mitigated by the stringing system, as suggested by Belcher (2011). They also may have been attached to clothing, animal trappings, or containers (Baysal 2016; Bos 2017). Information on how they were worn can sometimes be determined from burials, when their location on the body can provide clues, and from statuary, texts and other depictions.

Despite their ubiquity, *in situ* archaeological evidence for the production of obsidian beads is scarce and mostly involves disc beads; it has rarely been possible to document a complete *chaîne opératoire*. Probable production places have been identified at Domuztepe (c. 5500-5300 BCE) where there is a small, discrete area which has some somewhat ephemeral evidence for the shaping of obsidian beads and pendants (Healey & Campbell 2014); there is better evidence in the Late Chalcolithic (c. 3900 BCE) from specific workshops at Tell Brak and Grai Resh where various stages in the manufacture of beads of obsidian, calcite, bone, and shell were noted (Kepinski *et al.* 2011: fig.15; Khalidi 2014: fig. 5.20). All three instances are associated with knapping debris from tool manufacture (which perhaps provided the blanks); unfinished disc beads are also sometimes recovered amongst the general lithic debris, such as at Hagoshrim and Ein Zippori in the Levant (Schechter *et al.* 2013; Schechter *et al.* 2016) and possibly the minimally shaped perforated square 'bead' from the LBA II Levels at Tell Atchana (Healey 2020b: fig. 6.9). The small amount of evidence available seems to indicate that at least the early stages of their manufacture happened alongside the general working of obsidian. For the most part reconstructions are informed by experimental replication and ethnographic studies (for example, Alarashi 2014: fig.15:3 and

4; Roux *et al.* 2000). Beads manufactured in other materials also provide clues and possible parallels; they involve a single material (be it Dabbah marble (Wright & Garrard 2003; Wright *et al.* 2008), greenstone (Abbès *et al.* 2008) or carnelian (Calley 1989)) and the entire sequence of production, including associated debris, and tools (*e.g.*, drills, stones for abrasion and smoothing, and work-benches) was found in one place.

For other types of bead, we must largely rely on broken pieces and traces of manufacture left on the beads themselves. Possible preforms have been recovered from Tell Aswad (Orange *et al.* 2012: fig. 7) and Domuztepe (Figure 2: 10-12) as well as an enigmatic piece from EPPNB Tell Ain el-Kerkh (Tsuneki *et al.* 2006: fig. 3.15). The scars of the different stages of the production cycle are evident on the beads from Tell Inghara (Kish) which are minimally ground or abraded following their initial shaping by flaking (Campbell & Healey 2017: fig. 2). Most beads, however, are fully polished thus obliterating obvious manufacturing traces. Further microscopic studies of the surface topography and directions of the striations are needed to determine whether they were polished individually or tumbled or even perhaps strung together and rolled on a grooved stone with a lightly abrasive surface (see Alarashi 2014: fig. 15.2; Bains *et al.* 2013: fig.19.5; d'Errico *et al.* 2000).

Techniques of perforation also vary. Most beads seem to have been drilled from both surfaces, but some of the disc beads may have been drilled from one face and the hole punched through using a *tamponnier*, a technique used for perforating carnelian beads at Kumartepe (Calley & Grace 1988) and Larsa (Chevalier *et al.* 1982) and observed on some obsidian disc beads from Tell Kurdu (Yener *et al.* 2000a and personal observation). It is generally assumed that solid drill-tips, probably of flint, were used, and rotated either by hand or more likely using a mechanically driven device such as a bow or pump drill. In some cases, it is likely that abrasives such as fine sand were also involved (Alarashi 2014: 214 and following pages, Annexe III L; Atılbilek *et al.* 2001; Gurova & Bonsall 2017) and the deep cusps on some beads may have been receptacles for an abrasive material; alternatively, the wide and deep cusps may have been the result of using too large a bit or too slow a drilling speed (Baysal & Sağlamtimur 2021). Silicon casts and SEM and digital imaging of the perforations of carnelian beads (Alarashi 2014: 229 and following pages, figs. 5.7 and 8, Annexe III.2; Glover 2019: 35-41; Groman-Yaroslavski & Bar-Yosef Mayer 2015; Ludvic 2012; Ludvic *et al.* 2015; Sela & Roux 2000) building on Gwinnet and Gorelik's (1981; 1991) earlier research) have been used to determine the method of drilling based on the regularity of the striations inside the perforations and tested by experimental replication. Coşkunsu (2008) was also able to match the striation patterns on the long cylindrical drill-bits to those in the perforations of the long beads (not obsidian) found at Mezraa Teleilat. For the most part though, drill-bits have not been specifically associated with obsidian bead working, although the numbers found at other bead production sites suggest that one might expect them to be prolific where bead production is taking place (Calley & Grace 1988; Chevalier *et al.* 1982; Unger-Hamilton *et al.* 1987). Identification of the drilling methods and tools may ultimately allow us to identify changes in techniques through time and perhaps different workshops and even artisans (Gonzalez-Urquijo *et al.* 2013; Ludvic *et al.* 2015) and may enable us to infer whether they could have been made by regular stoneworkers or whether they required dedicated craftspeople.

The type of obsidian used to make beads suggests that in some cases, at least, there was deliberate selection based on appearance and that translucency was important. At Domuztepe, for example, in the production area mentioned above, there was a definite preference for translucent grey or brown-grey coloured obsidian for bead manufacture even though tool production debitage was of green obsidian which predominates in the area. The obsidian used for bead making has been provenanced to the Bingöl B and Syunik sources, whereas the tools are made from obsidian sourced to Bingöl A or Nemrut Dağ (Healey & Campbell 2014).

Similarly, the beads from an early Dynastic tomb in Kish were also translucent and brown and grey in colour although they have been provenanced to four sources namely Meydan Dağ, Tendürek-Diyadin, and two sources at Syunik (Campbell & Healey 2017).

4.2. Pendants

Pendants, a type frequently found in similar contexts as beads and sometimes classified with them, are typically perforated transversally near one edge so as to hang from a string or thread. Shapes vary from round to elongated and rectangular; some are quite thick (including one from Ras Shamra III (de Contenson 1992: Pl. CVII: 4) and Chagar Bazar (Figure 3: 7)) but others are thin and flat(ish) (Figure 3: 1, 2, 8 and 9). As with the beads, their occurrence is widespread.

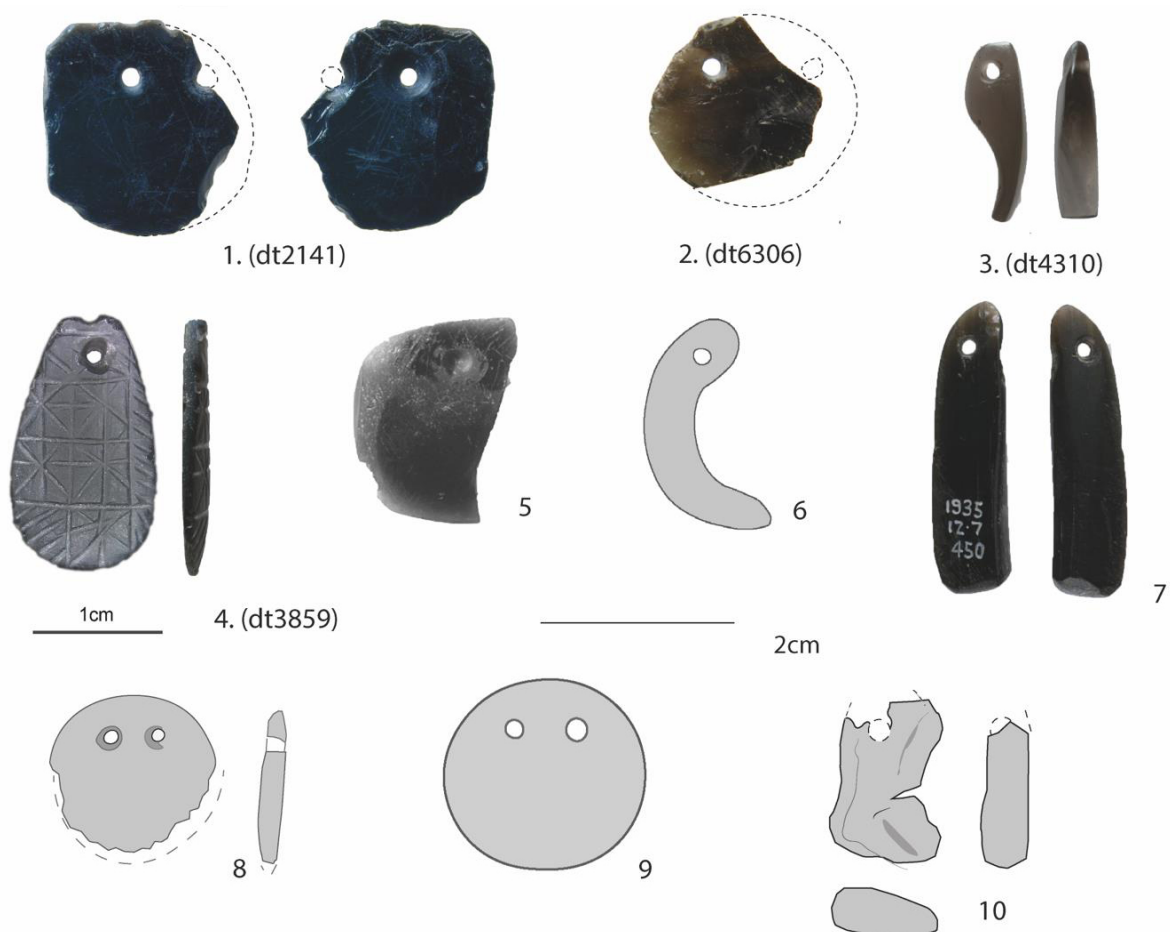


Figure 3. Examples of pendants from Domuztepe (1-5); Tülintepe (6), (redrawn from Oliveira *et al.* 1983: fig 4, 6); Chagar Bazar (7); Qdeir 1 (8) (PPNB) (redrawn from Cauvin 2000: fig. 7.1.); Ras Shamra VC (9) (redrawn from de Contenson 1972: fig. 125, 11) and Tell Aswad (10) (PPNB) (redrawn from Maréchal 1995: fig. 119, k). Note: No. 4 is a small engraved pendant, broken across the original perforation and the new perforation crudely executed and placed off-centre. No. 5 has an incomplete perforation which suggests on-site manufacture. Photographs courtesy of Stuart Campbell.

The most frequent shape is sub-circular; these pendants are made on flakes that have been perforated once or twice near the edge. Some examples have one or both surfaces ground and polished as at Qdeir 1, Ras Shamra Vc (Figure 3: 8 and 9), Tell Magzaliyah, and Tepe Gawra; others are ground only on the edges as Domuztepe (Figure 3: 1 and 2) and Kenan Tepe (Healey 2016). Breakage across a perforation is not uncommon (Figure 4: 1, 2, 4 & 10).

Elongated examples, usually made on blades are known from several sites, including Tell Kurdu, Tell Judaidah, and Tell Tawila and are little more than pierced blades. At Tell Brak in the TW area (*c.* 3900 cal. BCE), retouched blades had been partially ground, and polished and then perforated, thus repurposing them as pendants (Khalidi 2014). On other occasions blades with abraded edges and bilateral notches for example at Kfar HaHoresh and Başur Höyük may also have served as pendants (Birkenfeld 2018: 163; Goring-Morris & Belfer-Cohen 2020: fig. 4:7; Baysal & Sağlamtimur 2021: fig.7, second on left). At Jericho a notched piece was described as pendant because it was found at the clavicle of a skeleton (Crowfoot-Payne 1983: 700, fig. 330.3; Talbot 1983: 789, fig 360.5).

Hook-like pendants of obsidian are known only from Tülintepe (Figure 3: 6) (where there seems to have been a dedicated workshop (Arsebük 1974: 130-131)); similar examples in stone are known, for example from Tell Aswad (Alarashi 2016: vol 2, 94, fig. 12.6j) and in bone at Asıklı Höyük (*e.g.*, Yelözer & Sönmez 2018).

A few pendants have a sinuous outline and have been described as anthropomorphic. They include an aceramic Neolithic example from Tell Aswad (Maréchal 1995) (Figure 3: 10) and later examples from Tepe Gawra (Tobler 1950: Pl. CLXXII, 52 and 53). Others, as the example from Domuztepe, are foot or duck-shaped (Figure 3: 3).

Engraved pendants made of obsidian are rare. They include examples from Domuztepe, Tell Chagar Bazar and Tell Judaidah. The designs are geometric and recall those on Halafian stamp seals dated to the sixth millennium. The precise method of manufacture has not been established but the design was likely cut or abraded onto the polished surface of a blank, which in the case of the example from Domuztepe was a flake (Figure 3: 4). This particular pendant had broken across the perforation but then was re-perforated and perhaps even reshaped; compared to the original working the new perforation is off-centre and crudely executed perhaps suggesting that what the object represented was as important as its finish.

The manufacture of some pendants seems, on occasion at least, to have taken place alongside disc beads as at Domuztepe (Healey & Campbell 2014) and at Tell Brak (Khalidi 2014). Potential preforms have also been noted at Tell Aswad (Maréchal 1995). Sequences of working, reconstructed from examples which are unperforated or have incomplete perforations (Figure 3: 5) suggest that the perforation was carried out after the shaping, although there are some unmodified or minimally modified flakes and blades which have been perforated, but otherwise not shaped, for example from Ein Zippori (Schechter *et al.* 2016: fig. 5. 3) and Tell Aray 1 (Personal communication with Osamu Maeda on 10th December 2018); it is not clear whether they are trial or early stage pieces.

In addition to the more obvious decorative pendants there are a number of cores which appear to have been re-purposed as pendants. Some have a groove incised around the circumference of the core just below the striking platform as if intended for suspension and one from Kuruçay Höyük has its distal end abraded. The example from El Kowm 2, dated to the last half of the eighth millennium BCE (Cauvin 2002: fig.7:1), is one of the first ways in which seemingly every-day obsidian items were given a new or extended life (Healey & Campbell 2021); other examples seem to be seventh millennium in date. A bullet core from Susa (undated), has been perforated rather than grooved and is quite extensively ground (Tixier 1982) and another later example from Tell Razuk (third millennium BCE) has been notched (Thuesen 1981).

4.3. Links or plaques

Links (sometimes described as two-holed pendants) are, thin, plate-like pieces perforated transversally, but unlike pendants, the perforations are at opposite ends or sides of the piece suggesting that the objects might have been linked together with other objects or perhaps

mounted flat (rather than being suspended) on a piece of material such as cloth or leather or on wood. There are a variety of shapes and sizes including lozenge and oval, crescentic, triangular, flanged, and rectilinear forms, much as in other materials. It has been suggested that they may have been fasteners, perhaps to keep an archer's wrist guard in place (Léon & Casseyras 2014) or as a sort of clasp to close strings of beads as suggested for a similar example in a black stone from a burial in Ba'ja (Gebel *et al.* 2019: fig. 7, on right, second row).

Shapes include lozenge or oval forms as well as crescentic types from Domuztepe, Tell Kurdu, Ras Shamra, and Tell Halaf (Figure 4). A unique flanged example was recovered at Domuztepe (Figure 4: 1). Triangular forms on the other hand seem to be restricted to Mesopotamia (Gird Banahilk, Yarim Tepe, and Tepe Gawra).



Figure 4. A selection of links from Domuztepe. No. 1 is a unique flanged form; nos 2 and 3 small lozenge shaped and oval forms and nos 4-6 crescentic forms. They are all late Halaf (c. 5800-5300 BCE) in date. Photographs courtesy of Stuart Campbell.

Some thirty-six rectangular plaques were found together at one end of a room in the Burnt House at Tell Arpachiyah (c. 5000-5400 BCE) (Figure 5: 1-5); they fall into four standardised size groups of either c. 60 mm (the majority) or 90 mm in length, but of different widths (Healey & Campbell 2014: fig. 10). They seem to be a group or groups, perhaps originally linked as a girdle or attached to material to form a helmet or similar object (Mallowan & Rose 1935: Pl XI b). Mallowan and others (Léon & Casseyras 2014) have also suggested that they might have been archers' wrist guards; however, we considered that they more likely belonged together, perhaps part of a decorative object or objects (Campbell & Healey 2013), perhaps matched (or opposed) according to shape and size as, for example, a much later composite ornament from Başur Höyük (Baysal & Sağlamtimur 2021: fig. 12). Some have broken across a perforation and have had new holes drilled; the new hole was carefully placed so as to maintain the length and balance of the object (Figure 5: 5)

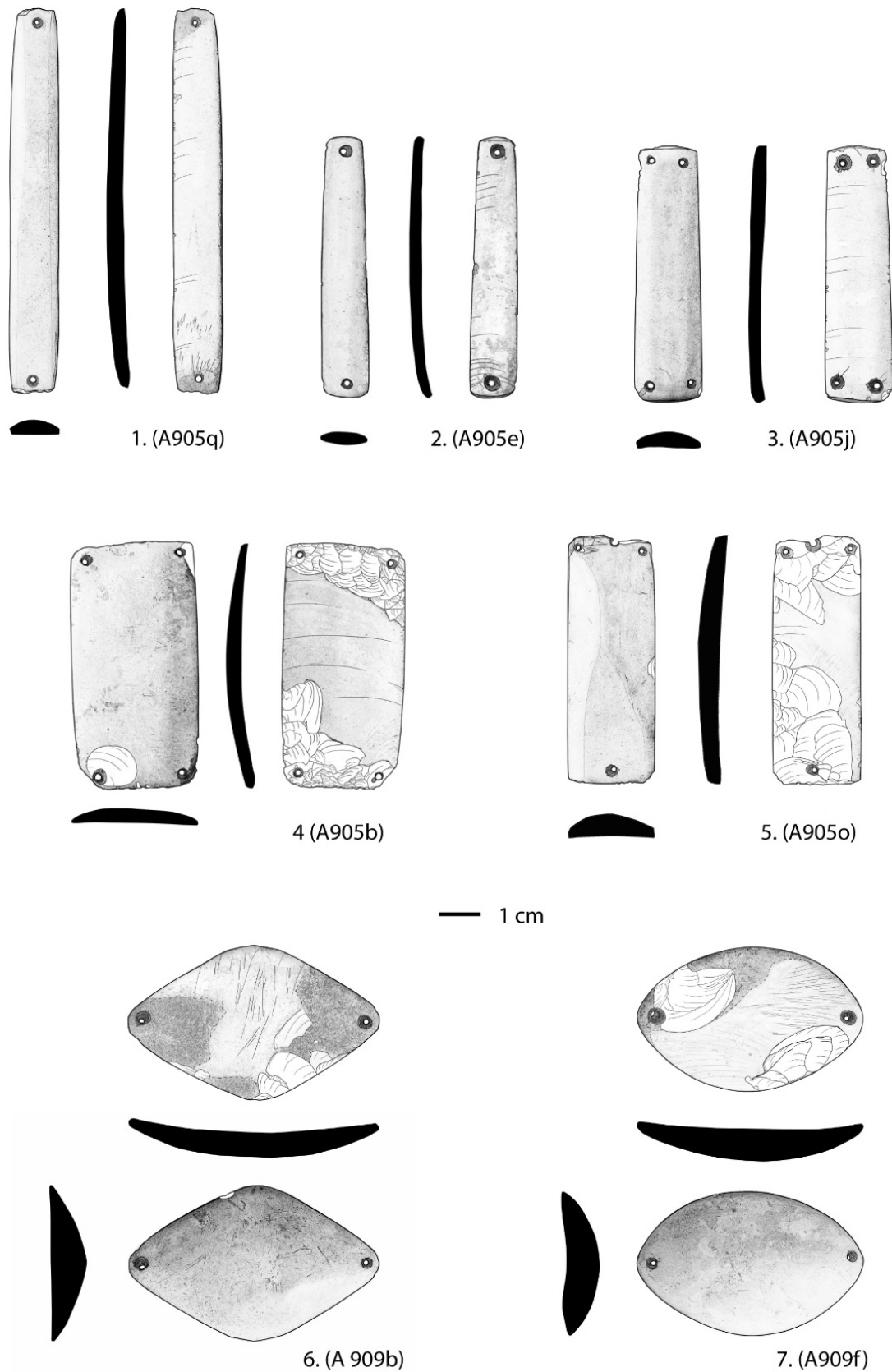


Figure 5. Nos. 1-5. A selection of rectangular links from Burnt House at Tell Arpachiyah. Note that No. 5 was broken across the original central perforation and subsequently re-perforated at either side to maintain the length when mounted. Nos. 6 and 7 examples of lozenge and oval shaped links from Tell Arpachiyah (Drawings by Steve Bellshaw).

Other rectangular links are known from Banahilk, Chagar Bazar, and Tepe Gawra and a possible example from Kazane Tepe (Bernbeck *et al.* 1999: fig. 17c), all of similar date. The present evidence suggests that the type had a restricted distribution in time and space.

What appears to have been a set of oval and lozenge-shaped links were also found in the Burnt House at Tell Arpachiyah (Figure 5: 6 and 7), associated with cowrie shells, a pebble pendant, and a clay lozenge-shaped link, which the excavators described as a necklace (Mallowan & Rose 1935: Pl. Xia) (Figure 4: 11). Similar oval and lozenge forms have been found in a tholos at Tell Aqab, although but no details are given of the numbers present or their relationship to each other (Davidson & Watkins 1981). Other examples are known from Tepe Gawra, Gird Banahilk, Yarim Tepe III, Choga Mami and possibly Chagar Bazar, all located in northern Mesopotamia and of mid sixth millennium BCE date.

We have been able to provenance the obsidian of all six of the oval and lozenge shaped links from Tell Arpachiyah and they are of very similar elemental composition and can be attributed to a Nemrut Dağ sub-source (Campbell & Healey 2013). Most of the 17 rectangular links provenanced are also made of obsidian from Nemrut Dağ, but a few are made on blades of obsidian originating from the Bingöl B and Meydan Dağ sources (Healey & Campbell 2014).

Experimental replication of both types of link intimated that manufacture was staged and time-consuming (Léon & Casseyras 2014). They also noted that about 20% of the original blank was lost during the shaping and finishing process, suggesting that blanks substantially larger than the finished object would have been need. It is tempting to associate the large number of blades and cores recovered from the Burnt House with the manufacture of the links, but most of the debitage is quite a lot smaller than the finished examples. Also, many of the links are not in pristine condition but are worn or damaged from use, suggesting that they were not new when they were deposited. It seems unlikely, therefore, that the blades immediately relate to the manufacture of the links (Campbell & Healey 2013; Healey & Campbell 2014: fig.11) although local manufacture cannot be entirely ruled out. The rectangular links have a standardised length, the ‘norm’ being set by the majority made of Nemrut Dağ obsidian; we noted that at least one of the links made of Bingöl B obsidian was fractionally shorter and had less of the original blank removed suggesting that the blade blanks of Bingöl B obsidian were also shorter than those from Nemrut Dağ.

Other examples from Tell Chagar Bazar have a more wedge-shaped cross-section compared to those from Tell Arpachiyah but are otherwise similar; they have also been provenanced to a Bingöl B source (Healey & Campbell 2014).

4.4. Bangles and rings

The term bangle (or annulet or ring) refers to objects made from a single piece of raw material. Some may have been rings or pendants (the diameter is not always given); obsidian examples are rare. Bracelets on the other hand, are comprised of several pieces – usually beads – and defined by their position on a body (for example a string of beads of obsidian, limestone, and red stone around the wrist bones of a skeleton in a burial at Samsat (Özguç 1988).

Plain, annular forms have been reported from late Neolithic sites (*c.* 5500 BCE), for example from Gird Banahilk and Hagoshrim; there is also ‘part of a ring’ from the much later site of Nader Tepe Aslanduz, Iran. Fragments are also reported from pottery Neolithic levels at Çayönü but no details are yet available (Astruc *et al.* 2011).

Much more striking is the fragment of a well-made bangle with a distinctive raised middle rib found at Aşıklı Höyük (an early Neolithic site (*c.* 8300-7400 BCE) located in the obsidian source region of Central Anatolia which depended on obsidian to make tools). It was

found in Building T (a public area) and is the only non-tool object of obsidian found at Aşıklı Höyük. The form is unique in obsidian although similar and contemporary examples are in other materials, for example in marble, a much softer material, at Cafer Höyük (Maréchal 1985) and in alabaster at Bestansur (Richardson 2020: 557). The form continues later too (Baysal *et al.* 2015; Ünlüsoy 2002). The bangle found at Aşıklı Höyük is remarkable on several counts. It is one of the earliest examples of the non-tool use of obsidian known, yet its regularity, especially the flanged ridge, as well as the quality of its finish are especially noteworthy. These features suggest high competence in both design and production as well as an understanding of the properties of obsidian (Astruc *et al.* 2011) even though obsidian objects of this quality have not been recorded in this time period. Added to this is that the obsidian has been described as ‘high quality and green in colour’ and thus is very different from the local, translucent grey Cappadocian obsidian which was used for tool manufacture at the höyük (Balcı 2010). The green colouration is typical of peralkaline obsidians from south-eastern Anatolia (Astruc *et al.* 2011), although it has not been possible to confirm this geochemically. As no debitage or other object of this obsidian has been found on the site, it may have been acquired in finished form and if its source can be corroborated, it would indicate early contact with south-eastern Anatolia (see Carter *et al.* 2008 for later examples).

4.5. Labrets or Nails

Nails (also termed studs or plugs) are usually considered to be lip ornaments (Hole *et al.* 1969: fig. 109) for which there may also be some dental evidence (Frayer *et al.* 2020); shorter examples are often termed earplugs; others have suggested that they were applicators for oil or cosmetics (Coqueugniot 1996: 293). They are made of a variety of lithic materials. The obsidian examples are mostly from Mesopotamia (for example Hassuna, Shimshara Tell el-‘Oueli, Ur, Eridu, Nineveh and Tell al-‘Ubaid in the Chalcolithic levels and only rarely further afield). Most are broken, but a complete one from Tell el-‘Oueli measures *c.* 3.5 cm in length. The diameter of the shaft varies between 1.5 and 5 mm. The heads are well-demarcated; most are circular (10-12 mm in diameter) and more-or-less flat, but a few conical forms are known for example from Ur and Tell el-‘Oueili. Little is known about their manufacture, but Coqueugniot (1996: 292) suggested that the striations on the shaft indicated that they were smoothed by longitudinal grinding and scraping rather than by rolling.

The obsidian from which one of the “nails” from Tell el-‘Oueli is made has been provenanced to Group 6 (Coqueugniot 1996: 294, footnote 48; Gratuze *et al.* 1993) which likely to be a Trans-Caucasian source (probably Gegham or Syunik) (Chataigner 1998: 321).

4.6. Spools

Spools or flanges of obsidian are rare, though the form does occur in clay. Obsidian examples come from Uruk and Ur and three probable examples from Ubaid contexts in Kuwait (H3 As-Sabiyah). All are symmetrically designed and finely finished.

The obsidian from which the spool from Ur was made has been attributed to the Trans-Caucasian source of Spitaqasar (Internal Report Manchester Obsidian Laboratory).

4.7. V-perforated Buttons

These “buttons”, better known in other, softer materials, are disc-like objects ranging from approximately 10 mm in diameter upwards; they have a domed or conical upper surface into which perforations were drilled from opposite sides to meet at an angle within the domed area so that the perforation forms a ‘V’ shape. Although not exactly the same, this method of perforation is not dissimilar to that seen on the unfinished mirrors with handles from

Güvercinkayası (Balcı & Altınbilek-Algül 2019: figs. 1-4). Most of those made of obsidian seem to be found in northern Mesopotamia, for example from Tell Kurdu, Tell Zeidan, and in southern Mesopotamia (Tell el'-Oueli). They date to the fifth millennium BCE.

Local manufacture is suggested by four from Tell Kurdu, which are in different stages of manufacture. No use-wear analysis of the obsidian examples has been undertaken to indicate their purpose, but wear on similar objects made of jet, found in Bronze Age burial contexts in the UK and Holland, indicates that they were both practical and decorative, acting as fasteners or used as decorations on clothing (van Gijn 2017: 110, fig. 8; Woodward & Hunter 2015: 161). In the Near East, similar forms in other materials have decorated surfaces and seem to have been classified as stamp seals (Akkermans & Duistermaat 2004: fig. 2, 2). The use to which the obsidian examples were put remains to be determined.

4.8. Obsidian as an element of composite objects

This category includes obsidian which has been incorporated in various ways into other objects and materials.

“Inlays” include examples of obsidian flakes inserted into the eye sockets of human or animal heads such as those from Şanlıurfa (Çelik 2014; Hauptmann 2003), Çatalhöyük (Lingle *et al.* 2015) and Bouqras (Akkermans *et al.* 1983) all dating to the seventh millennium BCE or earlier, or into vessels such as those from Köşk Höyük and Güvercinkayası (Balcı & Altınbilek-Algül 2017; 2019), and possibly also from Hacilar (Mellaart 1970: 180-181), although the Hacilar examples require authentication (Aitken *et al.* 1971). The practice is also found in the Chalcolithic levels at Yanik Tepe (Burney 1982) (Figure 6). This way of using obsidian seems to take advantage of the translucent and shiny or reflective properties of obsidian. It made the figure animate, by enabling it ‘to see’ and perhaps also referenced the distant origin of the obsidian and its properties. These ‘eye-stones’ are fragments of unmodified flakes and blades and can only be recognised as different because of the context in which they were found and the practice may be more frequent than documented here.

The obsidian used for the ‘eyes’ in the Yanik Tepe vessels has been provenanced to Meydan Dağ (Internal report, Manchester Obsidian Laboratory). Those in the head from Çatalhöyük, have been visually attributed to the Central Anatolian source of Göllüdağ-east (Lingle *et al.* 2015).



Figure 6. No. 1 Sherd of ceramic vessel from Yanik Tepe with obsidian inserts (re-drawn from Burney 1962: Pl. XLIII, 12); No. 2 Ceramic sherd with obsidian insert. Photograph by the author.

The much later use of obsidian for eye-stones, such as the example cemented to a piece of white agate to form part of a compound eye bead found in the temple of Nabû at Nineveh in the second half of the first millennium B.C.E. (Campbell Thompson & Hutchinson 1929: 143, fig. 2b) may simply have been because it was black and shiny rather than because it had

significance as obsidian. The practice of using obsidian and other 'dark' stones to indicate eyes was also known in Old Kingdom Egypt on coffin lids and statues (de Meyer 2011). These later examples were shaped and thus more readily recognisable.

Other inlays include decorative elements for walls of palaces and temples (Potts 2016: 201; Woolley 1955: 61 and 64). There are also some elaborately shaped pieces from Ortaköy Şapinuwa (Süel 1998; 2002) which may have been set into furniture or similar.

As well as the incorporation of obsidian flakes as an inlay into other objects, small chips of crushed obsidian were sometimes mixed into ochre, for example at Neolithic Bestansur in the Zagros foothills (Richardson 2019: fig. 5) and in wall plaster at Çatalhöyük where the red colour is considered to have been significant (Anderson *et al.* 2014: fig. 7). In the southern Caucasus (for example at Aratashen, Mentesh Tepe and elsewhere) obsidian was used both as toolstone and as temper for pottery, particularly kitchen wares; the reasons for this are still under investigation (Palumbi *et al.* 2014; 2018). Meantime, preliminary geochemical analysis of the obsidian indicates that the potters crushed up knapping waste for temper; while this might have been expedient, Palumbi *et al.* (2018) suggest that it might also reflect the symbolic nature of the social and productive relations between potters and knappers.

4.9. Mirrors

Objects with a flat, smooth and very highly polished, reflective surface, usually circular or sub-circular in shape, are often described as mirrors even though they do not reflect an image in the same way as a silvered glass mirror does (but see Doyle 2017: 199, fig. 6). There seem to be two types, one on chunky blanks, the other with two more-or-less parallel surfaces, a sub-variety of which has a strap handle.

The first type is characterised by an approximately circular polished surface on a thick blank, measuring between *c.* 6 and 9.5 cm in diameter. To date fifteen have been recovered at Çatalhöyük (12 listed by Vedder 2005, 2 by Carter & Milić 2013: App. 21, 5, and one by Doyle 2017) and at least some dated to the seventh millennium BCE. Individual examples have been recorded from Tepecik-Çiflik in Central Anatolia and from Akarçay Tepe on the Euphrates River (Figure 7: 3). These mirrors are from later Neolithic sites dating around the early to middle sixth millennium.

The blanks on which the surface was prepared are not standardised: five from Çatalhöyük are hemispherical and abraded or hammer-dressed on the outer surface, two are encased in plaster (Doyle 2017: fig. 6, 199; Vedder 2005). Others are made on large flakes or core tablets struck from large, bidirectional blade cores which may have been imported for the purpose (Carter & Milić 2013: App. 21.2, 5, figs 21, 48-49). The grinding of the surface of some core tablets at Tell Arpachiyah may be a related practice although because of their small size, we have described them as disc blanks (Healey & Campbell 2014: fig. 9; see below). The surfaces of the mirrors are smooth and highly reflective. Some are very slightly convex, which Vedder suggested could be the result of the method of polishing. The edge between the body of the mirror and its surface is often beveled (forming an angle of about 45 degrees) which helps to prevent the edge splintering when grinding the mirror surface on a slab; care also needs to be taken to avoid introducing loose grits that might scratch the surface (Vedder 2005; personal observation) Experimental replication using grinding slabs of decreasing coarseness to flatten and smooth the surface, indicates that it takes about seven hours-worth of grinding to achieve a mirror polish (Vedder 2005).

There is as yet no standard or agreed way of recording the degree of reflectivity on obsidian. Vedder used asperity indexes. Alternative imaging methods are being trialled on mirror like surfaces and other objects, including vessels which also have highly reflective surfaces (see section 4.13) to determine if they were polished to the same degree.

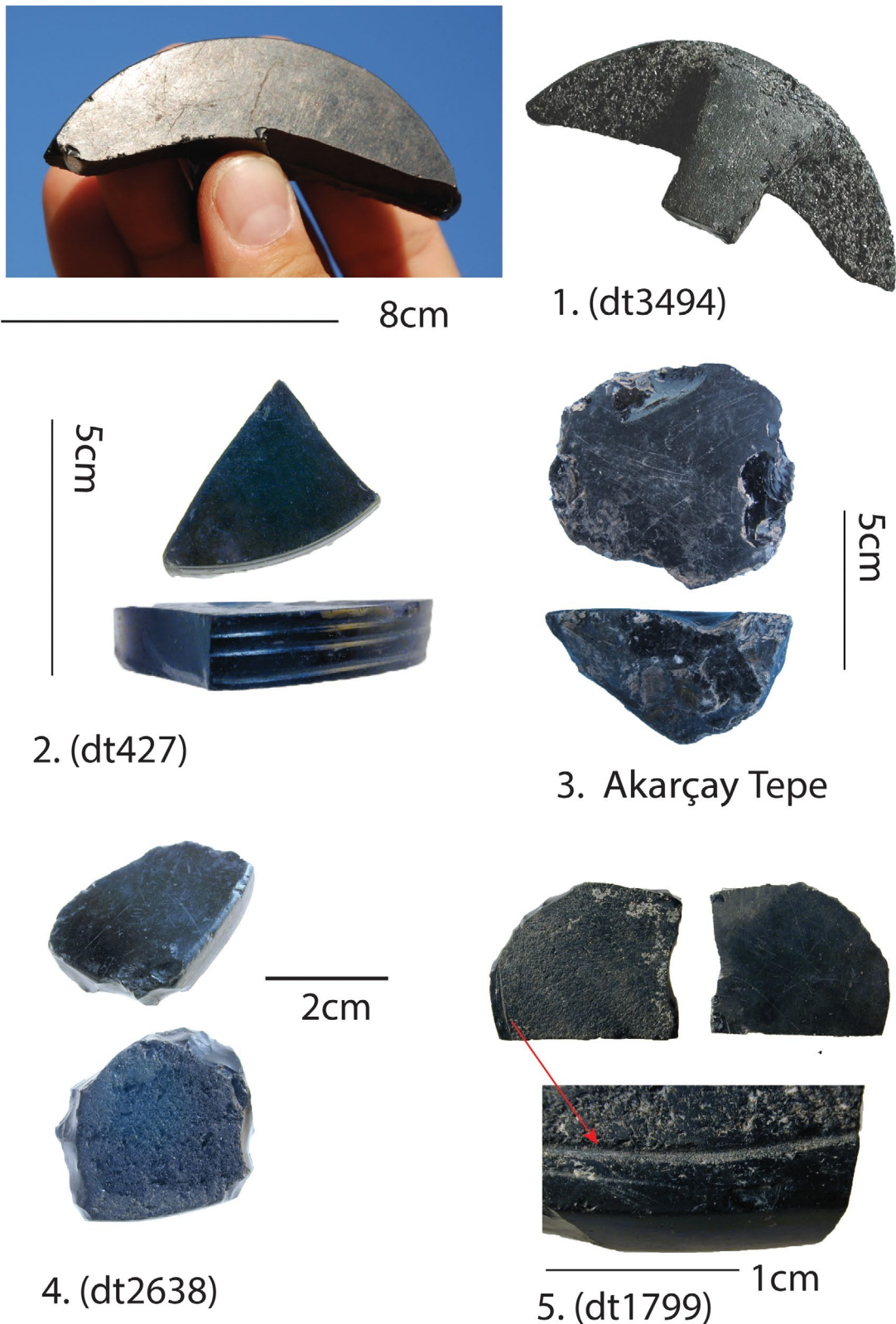


Figure 7. Mirrors and Discs. No. 1a and b fragments of a mirror with a strap handle from Domuztepe. Note the different levels of finish on the back. (photograph No. 1a courtesy of Laurence Astruc and Roberto Vargiolu); No. 2 a disc polished on both surfaces and with three grooves inscribed around the circumference; No. 3 possible mirror on a chunk of obsidian Akarçay Tepe, PPN to PN transitional levels (photograph courtesy of Ferran Borrell), nos. 4 and sub-circular 5 mirror fragments from Domuztepe, with one polished surface and the other pecked or abraded, and the sides smoothed. Note the groove on the upper surface of No. 5. (Domuztepe photographs courtesy of Stuart Campbell).

The other type of mirror is also discoidal or sub-discoidal in shape but is slightly larger and distinguished by having two more-or-less parallel surfaces. Mostly one of these surfaces is smoothed and polished and the other (presumed to be the back) pecked or abraded (Figure 7: 4 and 5). On occasion this was embellished by a groove (Figure 7: 5). The mirror or disc shown in Figure 7: 2 has both surfaces ground and polished and has been further elaborated with three parallel grooves inscribed around its circumference and is possibly a different category of object.

A rare version of the discoidal mirrors has a strap handle, a highly polished mirror surface and a non-reflective back. The large mirror (18 cm in diameter) from Tell Kabri the southern Levant, a surface find but attributed to the pottery Neolithic of seventh millennium BCE epitomises the form, although it is unique in its size and quality of finish. Its features are emphasised by two parallel grooves around its circumference and across the handle (Prausnitz 1969). Smaller examples with strap handles (*c.* 10 cm in diameter) are known from Domuztepe in south-eastern Anatolia (Figure 7: 1). The handled mirrors from Güvercinkayası in Central Anatolia are of a slightly different type (Balcı & Altınbilek-Algül 2019: figs. 1-5).

Unlike smaller items of jewellery, the making of mirrors would have required more substantial pieces of obsidian. Our best evidence to date comes from Güvercinkayası where there is evidence manufacture as well as the storage of raw obsidian.

The examples from Güvercinkayası suggest that the entire mirror was shaped by pecking, and the handle formed before the mirror edges and surface were ground and the surface polished (Balcı & Altınbilek-Algül 2019: fig. 1). The handle seems to have been formed by pecking or drilling diagonally into the thickness of the blank (Balcı & Altınbilek-Algül 2019: fig. 4).

The handles of the mirrors from Domuztepe and Tell Kabri on the other hand, seem to have been conceived and made differently. On these examples the handles stand proud of the back of the mirror (rather than being part of the thickness) and were likely created from a blank or block with two parallel surfaces, on one of which the handle was marked out and the excess obsidian gradually removed probably by chiseling and pecking until the desired thickness was reached. The hollowing out of the handle may have been achieved by drilling or perhaps punching it through; the back of the mirror was regularised by fine pecking and the top of the handle and the sides of the mirror were likely smoothed by gentle abrasion. The mirror surface, although prepared early in the proceedings, was probably finalised last and would have required periodic re-polishing to maintain its reflectivity.

Experimental pecking or hammer-dressing has demonstrated the risky nature of the procedure but also showed that it is effective for shaping and rounding angles on blanks (Torrence *et al.* 2009) and one which seems to have been employed in prehistoric times for shaping out larger objects including vessels (section 4.11 below).

Most mirrors are made of transparent grey or brown-grey obsidian. Those from Çatalhöyük have been attributed to obsidian from the source at Nenezi Dağ, initially a minority source, but one which became dominant through time (Carter & Milić 2013: App. 21, 5). Almost all the mirrors from Domuztepe are made of Bingöl B (calc-alkaline) obsidian which is also translucent in nature, only one is of green, peralkaline obsidian and provenanced to the Bingöl A source complex. There is also a chunk of Group 3d obsidian (an opaque and often quite grainy feeling obsidian not otherwise known to have been used for non-tool items), which has a flat surface that seems to have been deliberately smoothed and polished, but is currently undergoing further investigation.

Although termed 'mirrors' the function of these objects is by no means clear. Their occurrence in graves (purportedly of females) at Çatalhöyük led Mellaart to think that they may have had a cosmetic use (Mellaart 1967: 209). Other suggestions have included their use for directing light, signalling, telescope mirrors (among others, Vedder 2005; Vit &

Rappenglück 2016) or for occult purposes, as observed among the Aztecs (Saunders 2001). Indeed, in the sixteenth century Europe, Aztec obsidian mirrors were also likely used in catoptromancy as the mirror attributed to the Elizabethan magus, John Dee (Campbell *et al.* 2021). They are also seen as objects used in various ways to induce the alteration of consciousness (Caputo *et al.* 2020) and a strong sense of self (Wentzel van Huzyensee 2014). Obsidian seems to have been regarded as a suitable medium as early as the seventh millennium BCE.

4.10. Discs

This category is distinguished from mirrors largely by size. It includes small and relatively thin, circular shaped objects most of which have been polished on one or both faces and it may be that some of the examples described with the mirrors belong to this category. Some of the smaller examples have been perforated more or less centrally, and may in fact be a type of pendant, but others have not been perforated. Most date to the seventh and sixth millennium BCE (*i.e.*, pottery Neolithic and Ubaid) but there later examples from Tell Brak (late fourth millennium BCE) and Tell Kurdu. Some small core tablets recovered from the Burnt House at Tell Arpachiyah seem to have been in the process of being ground and may be unfinished examples (Healey & Campbell 2014: fig. 9) although they are rather thick compared to the ‘finished’ examples.

4.11. Vessels

Obsidian vessels first occur in the sixth millennium BCE and are particularly associated with Halaf sites but continue into the Ubaid period; other more ostentatious forms occur later. The earlier vessels are smaller and less elaborate than the later examples. Forms include small cups and jars. Most measure between about 80 and 110 mm in diameter at the rim and are estimated to stand about 150 mm high; the walls of most are thin (about 4 to 6 mm thick) although examples with walls up to about 10 mm thick are known. These vessels mostly have straight or slightly convex sides (Figure 8: 1-6), although there are shouldered examples amongst the repertoire from Domuzepe (Figure 8: 7). Their exteriors are mostly highly polished. Three from Hagoshrim have incised decoration on their surfaces (Schechter *et al.* 2013: fig. 11e) and one from Domuztepe has grooves incised around its circumference at the neck (Figure 8: 10). Interior surfaces are generally matt; whether they were deliberately left unpolished or whether it is due to some sort of surface alteration caused by the contents, as suggested by the stain on a perfume jar from Byblos (de Montet 1928: 156, although for a different view see Kopetzky 2018) needs to be investigated.

Amongst the more robust forms there are some unfinished examples (Figure 8: 11 and 12 and possibly 8) which provide some insight into the techniques of manufacture. One is a complete vessel from Tell Arpachiyah (Figure 8: 11), the exterior surface of which seems to have been shaped by pecking or hammer dressing. The jar-like fragment from Domuztepe (Figure 8: 8) appears similar. This shaping method was also used in the Bronze Age, as an incomplete cup from Kultepe-Kanesh shows (Balçı & Altınbilek-Algül 2017: fig. 6) and in mirror manufacture (Balçı & Altınbilek-Algül 2019: fig.1). The fragment of a bowl from Tell Zeidan, broken during manufacture, has a much smoother exterior and suggests other techniques were also used (Figure 8: 12). Interiors seems to have been hollowed out by drilling and the hole may have been enlarged by grinding with a pebble (Stocks 1993).



Figure 8. Obsidian cups and bowls of late Neolithic and Ubaid date. Nos. 1-2, 6-10 from Domuztepe (photographs and drawings courtesy of Stuart Campbell); nos. 3 and 4 from Kenan Tepe (drawings by the late Bradley Parker); No. 5 from Tülintepe (redrawn from Arsebük 1983); No. 13 from Tell Arpachiyah, 16 cm in height (redrawn from Mallowan & Rose 1935: fig. 44, 15); No. 12 bowl from Tell Zeidan, broken in the course of manufacture (photograph by the author).

By the fourth millennium BCE vessels of obsidian seem to become objects of conspicuous consumption. For example, at Tell Brak in northern Mesopotamia, there is a unique vessel, described as a chalice, found in a Late Chalcolithic rubbish bin (TW level 19, *c.* 3900 BCE). It is basically a large, conical blade core (127 mm in length and 60.4 mm diameter), the striking platform of which had been ground and hollowed out; fragments of bitumen, described as purposefully grooved, still adhere to the upper part of the vessel near the rim, perhaps part of a band to which decorations were affixed (Khalidi 2014: fig. 5.22) or, more prosaically, the bitumen could have been applied to disguise some step fractures resulting from its use as a core or perhaps from subsequent damage (if this was the case, the surface could have been refreshed, by the removal of a core tablet, but it would have considerably reduced its height, hence the alternative explanation given here). The apex of the core had been ground to fit into a marble stand and the whole thing stabilised with bitumen; it was discarded still affixed to its stand. The reason for the transformation of what appears to be a still productive core into a vessel and then its subsequent discard is not immediately obvious, but it is tempting to speculate that since it was still fixed into its marble stand when it was discarded it might have been intended as a show piece rather than as a readily useable vessel.

Also purported to be of fourth millennium BCE date are two highly polished, thin-walled, spouted bowls with diameters of 116 and 126 mm, both from tomb 102 at Tepe Gawra (Tobler 1950: Pl. LIII b and c; Pl. CIII 7 and 8); the diameter of these vessels, the creation of spouts (one 70 mm long) and the thinness of their walls (one is only 4 to 6 mm thick) suggests that they were made by a confident, skilled ‘professional’ vase maker. One (Tobler 1950: Pl. LIII, fig. 8) had broken and been mended in antiquity.

Obsidian vessels are quite frequently documented from fourth millennium BCE sites in southern Mesopotamia, for example Eridu and Tell al’Ubaid, although there is little detail relating to their size or form or the numbers present.

Large numbers of vessels of obsidian and other stone were recovered from Uruk-Warka, mostly in Uruk IV levels (*c.* 3200-3100 BCE) from temple-related contexts. Among the numerous fragments, thirty-nine vessels could be reconstructed and included forms such as knobbed beakers and vases as well as some unattributable fragments. The choice of obsidian, rather than any other type of stone, in this case seems to have been deliberate as it is virtually the only hard stone used and the only imported raw material (Lindermeyer & Martin 1993: 24).

Vessels made of obsidian continued to be made and used into the Bronze Age across the Near East. For example, fragments of vessels have been found in northern Mesopotamia at Ebla in an early Bronze Age palace (*c.* 2400 BCE) (Ascalone & Peyronel 2006; Richard & D’Andrea 2004) and at Tell Mozan, in the Khabur region (Frahm 2010: 246; Frahm & Feinberg 2013). In southern Mesopotamia, a particularly fine and delicate bowl was found in Queen Pu’abi’s grave at Ur (Ur III period *c.* 2600-2400 BCE) in the Great Cemetery (Woolley & Burrows 1934: 379 and Pl. 165. U 10488). It is oval in shape and has very thin walls (3 mm) but is relatively large, measuring 165 mm in length, 99 mm wide and 60 mm high. The exterior, which is highly polished, has finely executed, pseudo-lugs, perhaps in imitation of those on locally manufactured metal vessels, which as Moorey has suggested, may indicate that the obsidian bowl was also locally made (Moorey 1994: 45). Other obsidian vessel fragments from Ur carry cuneiform inscriptions (Gadd & Legrain 1928: No. 15), including one dedicated to Bau (Woolley 1974: 90; U523).

Towards the end of the second millennium BCE during the Assyrian Trading Colonies period (*c.* 1950-1750 BCE) in Anatolia, several vases, some of elaborate shapes and others unfinished, were found at Kültepe-Kanesh (Özguç 1986: 280; 1999: 113, 125-6, Balçı & Altınbilek-Algül 2017) and in the Sarakaya palace at Acem Höyük including rhytons, fluted

vases with handles decorated with antelope heads and an open bowl (which was compared to those from Alalakh) along with similar vessels of rock crystal and other vessels of marble, radiolite, limestone and basalt (Özten 1988). The value accorded to these vessels is exemplified by the meticulous repair with gold thread of a broken vase (Özten 1988: fig.19a and b) recalling the Japanese art of *kintsugi* (Keulemans 2016). The larger, sturdier bowls recovered from level VII palace at Alalakh (Figure 9) may be slightly later in date (Woolley 1955: 99, 109-110; Healey 2020a, although recent re-assessment and excavations suggest that they may pre-date the Level VII palace).

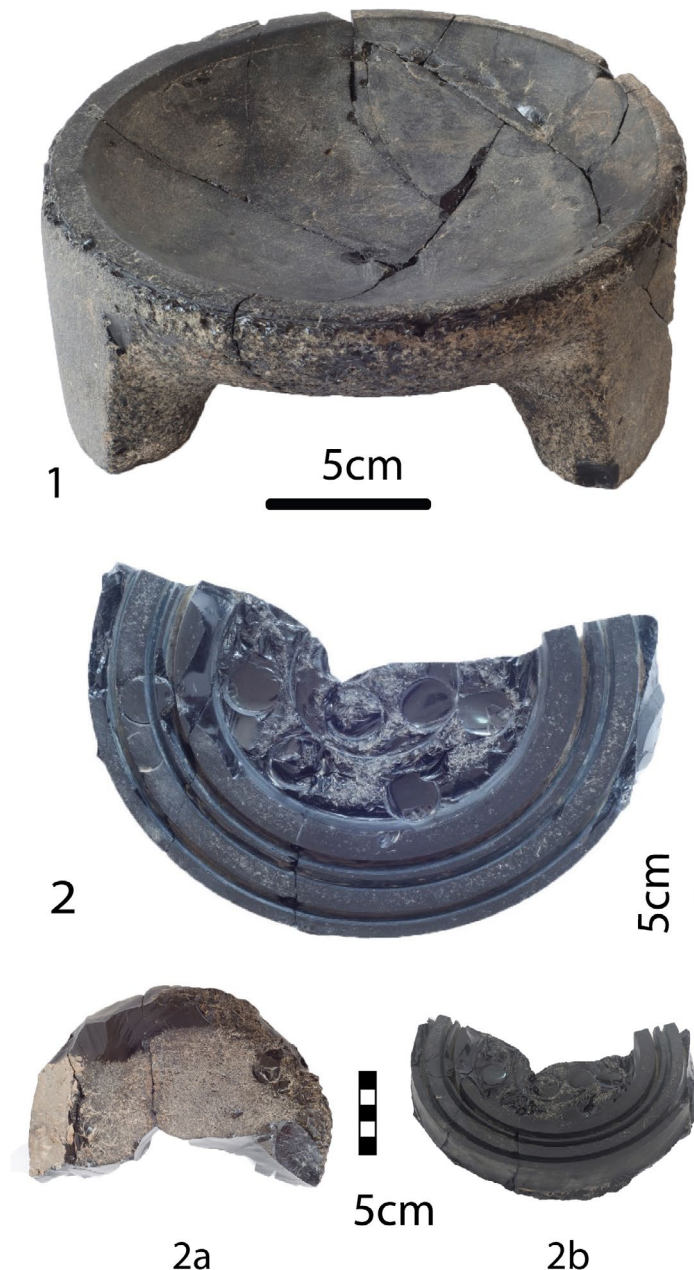


Figure 9. Two of the unfinished vessels from the vase maker's workshop at Alalakh. No. 1 a tripod mortar (AT 48/100); both the interior and exterior surfaces have been hammer dressed and ground smooth ready to be finished by polishing and buffing. No. 2 a bowl in the process of being hollowed out (AT/48/99). No. 2a shows the bottom and outside surface; note the rough shaping and presence of cortex. No. 2b an interior view showing series of concentric cuts made by large tubular drills of different diameter; the inner part of the bowl has been hollowed out, the drill stumps show scars indicating that they were broken off by flaking perhaps using a chisel, or similar. Photographs courtesy of Murat Akar (Tell Atchana Archive).

As well as the vessels described above, which were likely of Anatolian manufacture, some Egyptian style vessels have been found at sites in the Levant and Anatolia. The three most striking examples have gold bands on them, one an *unguentarium* in the royal necropolis (Tomb VII) at Mishrefeh (Qatna) (Ahrens 2015), another *unguentarium* from Byblos and a small chest or box from an adjacent tomb in the Royal necropolis (tombs I and II) (de Montet 1928; Viroilleaud 1922); both the Byblos finds have hieroglyphic inscriptions dating to the 12th dynasty of the Middle Kingdom, c. 1853-1806 BCE. These objects were initially assumed to have been gifts between royal households but recent re-assessment suggests that they may have been looted from the Memphis region of Egypt and later incorporated into the tombs (Kopetzky 2018).

Similarly, there is a fragment of a large vessel, estimated to have been c. 120 mm diameter, from Boğazköy inscribed with a cartouche of the Hyksos ruler, Chian, c. 1610-1580 BCE (Boehemer 1972: No. 2178). A flake of obsidian associated with this vessel was analysed by Renfrew *et al.* (1966: No. 295) and attributed to his group 4d (probably SW Asia); Zarins also analysed a fragment apparently from the vase itself (although it is not clear whether this is the same piece that Renfrew *et al.* analysed), which he attributed to his sub-group B, associated with artefacts from the Red Sea coast of Arabia, upland Yemen and Saudi Arabia (Zarins 1987; 1989: 367), seemingly confirming its Egyptian origin.

Other vessels of Egyptian style have been found at Tell el-‘Ajjul in the southern Levant, including a pyxis with a lotus leaf design on it and a small kohl pot; these are cruder than the other examples and, it has been suggested, could be local imitations, however, until the origin of the obsidian can be determined this remains speculative (Sparks 2007: 205).

The evidence for the production of vessels is somewhat ephemeral and mostly comes from palace or temple complexes and associated with supplies of raw material. We may note textual evidence that stone vase makers were attached to palaces (Loding 1981) as well as a text from Mari describing the stock piling of raw materials in palaces for local use (Michel 1992: 127 B2). Although obsidian is not specifically documented as a trade-good, a consignment of obsidian to a vase maker is hinted at in UET III texts (Neumann 1993: 77, footnote. 379). The archaeological evidence is also quite strong. Blocks or nodules of raw obsidian were stock-piled in temples and palaces during the Assyrian Trade Colonies period (c. 1950-1750 BCE) in central Anatolia. At Kültepe-Kanesh, for example, large numbers of raw obsidian blocks (probably from the Kayırlı sub-source of the Göllüdağ-east volcano (Carter & Kilikoglu 2007)) were stockpiled in a room adjacent to the Anitta temple estimated to weigh over 2 tons (Balçı & Altınbilek-Algül 2010; Özguç, 1996: 50, fig. 97, 4-5) suggesting ‘centralised’ control over the acquisition and storage of raw materials, either for vase manufacture or onward trading; unfinished vessels were also present (Balçı & Altınbilek-Algül 2017). Ascalone & Peyronel (2006) have even suggested that in the southern palaces at Ebla the co-occurrence of obsidian and other precious materials along with weights indicates that procedures were in place which allowed the amount of a raw material to be checked, thus controlling its use and distribution. A stock of raw nodules or blocks (in this case probably from a south-east Anatolian source) was also discovered by Woolley in a vase making workshop at Alalakh (in the Hatay) associated with the level VII Palace (mid second millennium BCE or perhaps earlier (above) (Healey 2020a; Woolley 1955: 99, 109-110). The huge blocks of obsidian, one weighing 22 kg, found at Tell Arqa, which were originally ascribed to Neolithic activity (Thalman 2006a) are perhaps more likely to belong to the Bronze Age palace, although no vessels are recorded from there, only blades and flakes. Both artefacts and blocks can be attributed to central Anatolian sources (Coqueugniot in Thalman 2006b: 20).

Despite the stock-piles of obsidian and the presence of unfinished vessels, the only production place identified so far is at Alalakh (Room 22 in the Level VII palace). It had been

destroyed by fire leaving the remains undisturbed. Woolley found at least four vessels in different stages of manufacture and he claims that the skeleton of a male found in the burnt-out workshop was that of the obsidian vase maker fleeing the fire. Little other evidence for the manufacturing processes or the tools employed survives however (Sparks 2001), although Woolley surmised from the unfinished obsidian vessels (Figure 9) that they were hollowed out before being shaped whereas the granite vessels were shaped first (Woolley 1955: 99, 109-110, 292-293; Woolley 1955: 293). We may note however, that the obsidian vessels were made using different methods, the mortar (Figure 9: 1) for example seems to have been pecked and abraded whereas the bowl (Figure 9: 2) was hollowed out using tubular drills (see below).

The initial shaping was likely carried out by pecking or hammer-dressing, as the discarded cup from Kültepe-Kanesh suggests (Balcı & Altınbilek-Algül 2017: fig. 6). Hollowing out was likely achieved in a number of ways, perhaps related to the stage of manufacture, and may have involved more than one technique. Some may have been drilled out using solid drill heads (as one from Alalakh, AT/38/101), others ground-out using figure-of-eight and crescentic stone borers which could have been used both to create a hollow and to enlarge it later on (Eichmann 1987; Ilan 2016; Stocks 1993: fig. 5). Özten suggested that tubular drills must have been used at Acem Höyük (Özten 1988: 404-406). Other evidence for the use of tubular drills includes two ‘rods’ of obsidian from at Kültepe which maybe drill cores or *carots* (Özguç 1986: 48, Pl, 97.6; but see Balcı & Altınbilek-Algül 2017: 23, fig. 8). More compelling is the obsidian bowl from Alalakh (AT/48/99) illustrated in Figure 9: 2 which clearly shows the use of a series of large tubular drills (Healey 2020a: figs. 4 and 7). The technique was widely practiced in Mesopotamia, Egypt and Minoan Crete (Morero 2015; 2016; Stocks 1993) although relationships between them need more consideration before any connections and technological transfers can be inferred.

4.12. Seals, scarabs, statues, amulets and Lamashtu plaques

Obsidian continued to be used into the Bronze Age and beyond for beads, seals, Lamashtu plaques, scarabs, amulets and so on, although many of these objects are without site or context and are largely dated on stylistic grounds.

Seals include stamp, scaraboid and cylinder forms. Stamp seals of obsidian have been recorded from Tepe Gawra XIII-XII (late fifth millennium BCE), Nippur (third millennium BCE) and Tell Brak (of unknown date) and elsewhere. Cylinder seals made of obsidian, along with those of other harder stone, seem to appear towards the end of the third millennium BCE and continue into the second millennium although they are rare (Collon 1986: nos. 178, 183, 291, 396, 655; 1987: 102; Moorey 1994: 75). It has been suggested that the drill cores from vase manufacture would have provided good blanks for cylinder seals (Moorey 1994: 58; Porada 2014) although this has not been demonstrated archeologically.

Most have been studied from an iconographic point of view and few explicitly for origin of their raw material. Of those that have been provenanced one (now in the Ashmolean Museum) used obsidian from Nemrut Dağ (Internal report Manchester Obsidian Laboratory). Of two others, one is of Bingöl B obsidian and the other is not attributable to an Anatolian source but is compositionally similar to the obsidian used to make a bowl found at Abydos in Egypt (Frahm *et al.* 2019).

Objects of Egyptian origin likely also include scarabs and statues. Scarabs include examples from Ras ‘Ali in Nahl Zippori in the southern Levant (Brandl 2014: No. 4) and one from a Babylonian grave at Nippur in Mesopotamia dated to the first millennium BCE. Fragments of smashed statues of Egyptian origin were recovered from Hazor (Connor *et al.*

2017; Haney 2020: Appendix A). As with the vessels the origin of the obsidian needs to be determined.

Amulets form something of a catch-all category, including a small, hand-shaped object from Tell al-‘Ubaid and a bird’s head from Ur but also Lamashtu plaques.

Lamashtu amulets or plaques are made of a variety of materials including some of obsidian and are thought to offer protection against the malevolent (female) daemon, Lamashtu. They date from the first millennium BCE but are now almost all uncontexted and like seals have been studied from an iconographic perspective. Little attention has been being given to the nature of the material from which they were made. However, a recent study of a Lamashtu plaque now in the Metropolitan Museum of Art focused on the visual properties (radiancy and luminosity) of the obsidian (Said 2020) and demonstrated that the material and the object made were intimately bound up with each other. The obsidian (and that of another plaque) has been attributed to the Göllüdağ source (Frahm *et al.* 2019). This obsidian is often described as transparent grey in colour and known for its visual properties. It may be no coincidence that similar obsidian was used to make the mirrors described above.

5. Summary and potential for further study

One of the aims of this paper was to investigate whether the use of obsidian to make objects rather than tools was significant in its own right and whether it had meaning in terms of identity and connections, or whether obsidian was regarded as another material. To try to elucidate this, I briefly reviewed what we know about the range of forms made, including any evidence for their manufacture and use and their chronology. While it did not prove possible to definitively answer the questions posited, the study has highlighted many aspects that need further research.

It has shown that the practice of making non-tool objects of obsidian was geographically and chronologically widespread (Figure 10), although not universally practised.

It also highlighted the need not only to investigate the different aspects and processes associated with the manufacture and use of individual obsidian objects but also to compare the morphologies of and the technologies used in creating similar objects in other raw materials to see if or how they relate.

Items of personal adornment are similar in form to those made of other materials, although there is not sufficient evidence to determine conclusively whether they were produced by the same lapidary workers who were already experienced in making beads and things in other lithic materials, or whether obsidian workers adopted the lapidary workers techniques, or indeed, if they were one and the same artisans.

The use of obsidian to make vessels does not appear until relatively late (sixth millennium BCE) in the long tradition of stone vessel manufacture (initially using soft stone like chlorite) which dates back to at least the early ninth millennium, for example at Körtik Tepe (Özkaya & Coşkun 2011). While this may, in part at least, be because of the skill sets needed to make vessels from harder materials are generally not recorded until later, we should note that in the seventh millennium BCE 20 % of the stone vessels from Bouqras were made of hard, exogenous rocks (Roodenberg 1986: 140), so other explanations also need to be explored. The evidence for the manufacture of obsidian vessels is at first ephemeral, although in the mid seventh millennium we can point to partially finished vessels at Tell Arpachiyah, and a little later at Tell Zeidan, which suggest local manufacture. The evidence from Domuztepe where fragments of 25 vessels were recovered, is more ambiguous. Despite the presence of what appears to be a partially finished vessel (Figure 8: 8) no suitably sized blocks of raw obsidian were recovered which could serve as blanks, despite the fact that there was a strong tradition of obsidian working.

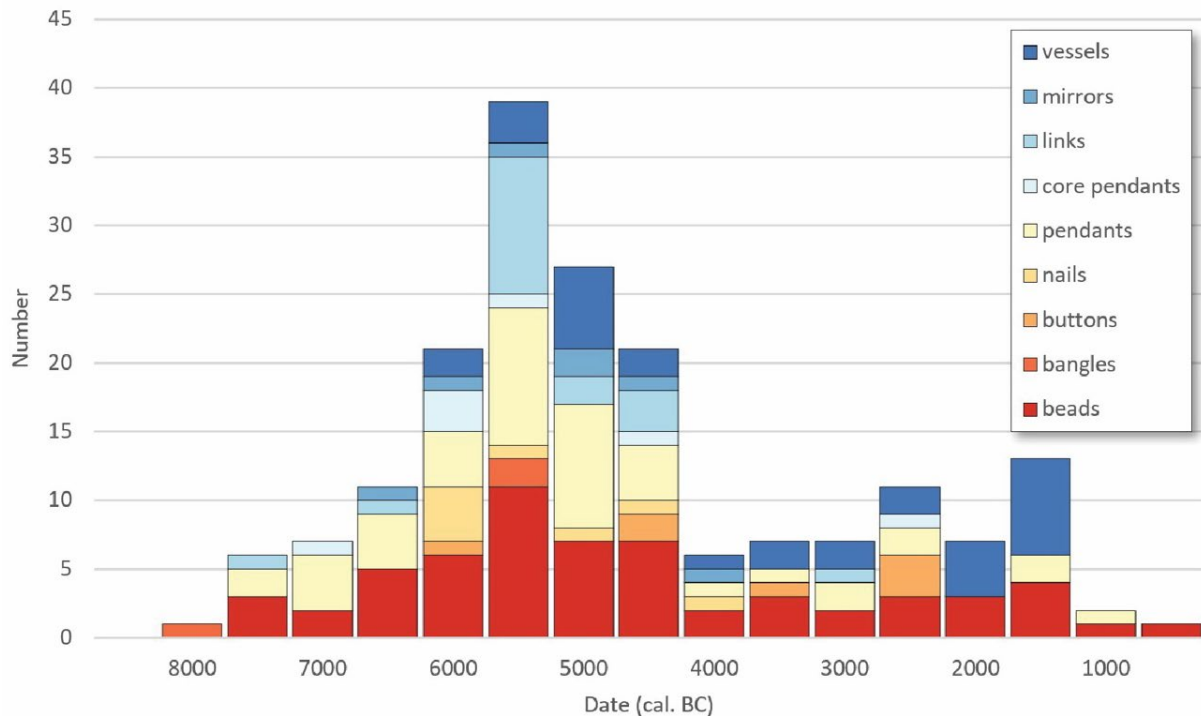


Figure 10. Schematic diagram summarising the occurrence of different types over time. The data on which this is based may be found in Supplementary files 1 and 2.

Other uses seem to be referencing the properties of obsidian that make it stand out from other stone, notably the flakes inserted into the eye sockets of statues and mirrors, both uses specific to obsidian (Healey & Campbell 2021). It has also been suggested that its transparent and reflective was particularly pertinent to its selection for a Lamashtu plaque (Said 2020).

We have also seen that at other times seemingly mundane things such as cores and blades at the end of their ‘useful’ life, were converted into what appear to be decorative objects (Cauvin 2000: 162; Khalidi 2014) or sometimes only minimally modified to make pendants (Birkenfeld 2018: 163).

In documenting the use of obsidian through time and by object type it becomes clear that the special ways of using obsidian described in this paper, may go hand in hand with other changes in people’s lifeways. It is perhaps because it had long been embedded in society as a familiar and meaningful material that it could be adapted to meet changing understandings of the world. In the Near East obsidian had been exploited locally as a tool-stone for tens of thousands of years, but seemingly not widely distributed as a tool-stone until the late ninth millennium BCE and, at about the same time, it was used to make other things too. These changes in the way it was used seem to coincide with other changes in society and it is widely thought that that obsidian may have an active role in this (Asouti 2006; Cauvin, 2000: 67-71, 1998; Watkins 2008; 2010). If this is the case then it merits further study on this basis alone.

The numbers and types of object made gradually increased through time (at least until the fifth millennium) (Figure 10) although detailed chronological resolution is for the most part poor. By the third millennium and probably earlier, there are hints that obsidian is seen as a commodity. It is eventually controlled by the elites and becomes part of a culture of conspicuous consumption, at the same time as its use as tool-stone is greatly reduced.

Not every obsidian-using community had non-tool objects of obsidian. The somewhat partial nature of the evidence reviewed here suggests that of the communities that do show non-tool use of obsidian some appear to have had only a single example or type, others two or three different types, while others had both a wider range of forms and numerically more

pieces (*e.g.*, Domuztepe, Tell Judaidah, Hagoshrim, Tepe Gawra, Ur) or multiple examples of the same type (*e.g.*, Çatalhöyük (mirrors), Tell Arpachiyah (links), Uruk (vessels)). Whether this relates to the amount of obsidian present or the range of sources from which it originated requires more investigation, though we may note that most of these sites seem to have consumed relatively large quantities of obsidian for tool manufacture.

An important contribution to obsidian studies has been the ability to determine its origin. Because the obsidian from each source has a unique elemental composition and it can be characterised geochemically, the obsidian from which artefacts and objects were made can be attributed to a particular source. Despite the seminal work of Renfrew and others in the 1960s, however, characterisation has been quite restricted. This is for a number of reasons, not least because, until recently, most analytical facilities were at least partially destructive, laboratory based and expensive, which meant that the artefacts had to be taken out of the country of finding in order to provenance them. In most countries permission is required to export artefacts for study and conditions can be quite strict so the type and number of artefacts for which a licence is given is often restricted. Insignificant pieces have tended to be selected from less secure contexts which are not representative of the range of artefacts within an assemblage, so our understanding has been somewhat limited.

More recently, though, the increasing availability of portable instruments and confidence in the reliability of pXRF has enabled the provenancing of objects to be carried out in museums and field laboratories (Forster & Grave 2012). The focus seems to have been on museum objects, so there is now an imbalance in that not enough ‘everyday’ artefacts have been provenanced to allow meaningful comparison with the obsidian that was selected for making objects.

To date, 231 objects from some 21 sites have been provenanced (Figure 11 and Table 2). The details are included in Supplementary file 1. The majority are beads (158) from ten sites, also included are nine pendants from five sites, three sherds with inlays, 29 links, one nail and one spool, 14 mirrors and discs from one site and 16 vessels from six sites. Sometimes objects, particularly those made of green obsidian, such as the bangle from Aşıklı Höyük, have been tentatively attributed, on the basis of appearance, to the peralkaline sources of Bingöl and Nemrut Dağ; similarly objects of Egyptian type are considered to have been made of obsidian from SW Asian sources, but because some may be local imitations the origins need to be geochemically determined.

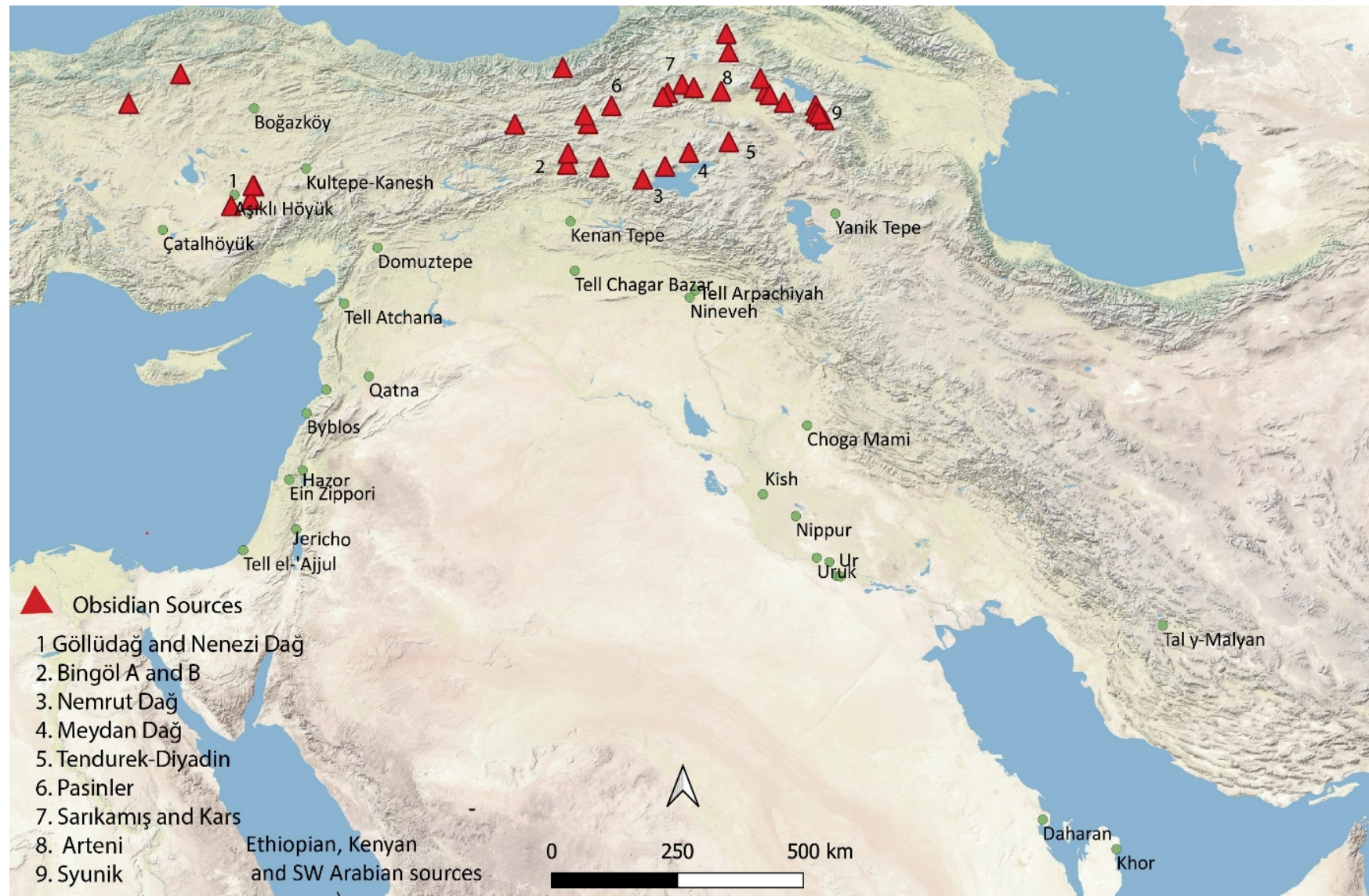


Figure 11. Map showing the location of sites from which the origin of obsidian objects has been determined.

Table 2. Sites from which objects have been provenanced (*: geochemical attribution; [*]: visual attribution). References to provenance analyses may be found in Supplementary file 1.

Region	Site	Central Anatolia	Peralkaline	S.E. Anatolia other	N.E. Anatolia	Trans- Caucasia	Other
Central Anatolia	Çatalhöyük	*					
	Boğazköy		[*]			*	
	Kültepe-Kanesh	*					
	Aşıklı höyük		[*]				
Levant	Alalakh		*				
	Ein Zippori	[*] reassessed				* probably	
	Jericho	*					
	Tell el'Ajjul						[*]
	Byblos						[*]
	Qatna						[*]
	Hazor						[*]
	N. Mesopotamia	Domuztepe	*	*	*	*	*
Chagar Bazar			*	*			
Tell Arpachiyah			*	*			
Tepe Gawra			[*]				Gp 1 e-f
Kenan Tepe			*				
Yanik Tepe				*			
S. Mesopotamia & Gulf	Kish			*		*	
	Uruk		*			*	
	Tell 'Oueli					*	
	Ur		*	*	*	*	
	Nimrud				*		
	Tal y-Malyan		*	*			
	Daharan		*	*			
	Khor						*

Although a surprisingly high number of objects have been provenanced, over half come from just three sites (105 beads from Kish, 21 links from Tell Arpachiyah and a further 84 objects, forming a more general selection of types, from Domuztepe). While the provenance of groups of objects is useful in relation to the object type, the analysis of a more comprehensive range of artefacts and objects is instructive in a different way. At Domuztepe for example, over 1240 artefacts, including 84 objects (and 13 miscellaneous fragments from ground objects) have been provenanced, but even so, it is only a very small proportion of the entire assemblage. Preliminary results indicate a marked difference between obsidian selected for tool-stone and that for objects. About 80% of the artefacts provenanced were made of obsidian originating from eastern sources. However, 51% of the non-tool objects (7.6% of the artefacts provenanced) were made of obsidian from the Göllüdağ-east source in Central Anatolia which is typically translucent and grey in colour. We still need to investigate whether this reflects the assemblage as a whole, but on present evidence it seems that the more translucent obsidians (including those that are not from central Anatolian sources) were

preferred for objects (Healey & Campbell 2014). Indeed appearance seems to have been a factor in the choice of obsidian. At Ein Zippori it was noted that rare pieces of red spotted obsidian were selected to make beads (Schechter *et al.* 2016). A particularly striking example (although outside the region under discussion) of the use of visually different obsidian is from Middle Minoan Crete, when the use of spherulitic (spotted) obsidian from the Giali source in the Aegean (which had been shunned in the Neolithic for tool production because of its quality) was chosen for making vases; its appearance was even imitated in pottery (Carter *et al.* 2016).

Of particular interest highlighted by recent analyses is the repeated presence of objects made from north-eastern Anatolian and Trans-Caucasian obsidians. Although only involving individual artefacts it seems to be a repeated pattern in southern Mesopotamia, but occasional objects are found as far away as the Levant (for general use of these obsidian outside their source regions see Frahm *et al.* 2016).

However, but it must be remembered that these results are very preliminary, even if they seem hint at potentially interesting connections. They certainly emphasise the need for comprehensive provenance analysis of both objects and general assemblages.

6. Conclusions

Although the quality and quantity of data is patchy and much finer chronological resolution is needed, this overview has shown that obsidian as a material was, on occasion at least, used in meaningful ways. This can be documented not only through the finished forms, but also in the techniques of manufacture and skill levels needed and in the choices of type of obsidian. Perhaps inevitably, focus has tended to be on the objects rather than how they relate to things made of other materials or to the wider world, but hopefully any future research will be able to capture their entanglement with other materials, things and cosmologies.

It has also highlighted the need for a recording system which would ideally include information on what happened to an object from its origins to its discard. Once sufficient data has been collected it should enable us to show how a choice at one stage might have affected what happened at another and whether any patterns emerge. The use of appropriate scientific methods and experimental data, not only for determining the origins and quality of the obsidian, but also for investigating manufacturing techniques and evidence for use will contribute new insights. As well as these more objective criteria, it is important to have an interpretative framework that allows the data to be used in such a way as to encapsulate the conception and commissioning of an object, the choice and acquisition of the raw material (remembering any potentially embedded symbolisms), the procedures and processes of production, including methods used and the tools and other materials employed (drills, pounders, borers, shaping tools, chisels, grinding stones, abrasives and so on), how the objects were used or worn (remembering also the materials used to mount or string them) and how they were disposed of.

If the data gathered here, despite its incompleteness and preliminary nature and sometimes vague chronology, demonstrates the potential of such objects for interpreting the meaning of obsidian use more generally, it has achieved its aim. By building a more comprehensive corpus we should gradually get a much better understanding of the ways in which these objects reference the meanings enshrined in the obsidian from which they were made, as well as how their manufacture articulated with the life ways, skills and cosmologies of the society of which they were a part.

Acknowledgements

I am indebted to many people for making this paper possible. It has developed from bits and pieces of information compiled over many years from studying artefacts from several excavations; in particular, Tell Kurdu, Tell Atchana, Tell Zeidan, Kenan Tepe and Domuztepe. Other artefacts have been studied in various museums including the British Museum (Tell Arpachiyah, Chagar Bazar and Ur), the Institute of Archaeology, the University of London (Tell Arpachiyah and Yanik Tepe), Museum of Archaeology and Anthropology Cambridge (Arpachiyah, Ur), the Ashmolean Museum (Arpachiyah, Kish, Ur, Jericho, Nineveh) and the Manchester Museum (Yanik Tepe). Source analysis has been undertaken through the Manchester Obsidian Laboratory mostly using pXRF but the artefacts in the British Museum and the Institute of Archaeology in London from Arpachiyah and Chagar Bazar were analysed by PIXE at the AGLAE facility in the Louvre. Kay Prag kindly drew my attention to the obsidian vessel from Ebla. The Immersed in Lithics conference spurred me on to start to put it all together. I would particularly like to thank Stuart Campbell and Osamu Maeda who not only read earlier drafts of this paper and made useful suggestions but have also discussed the topic endlessly with me; I am also grateful to Osamu Maeda, Hala Alarashi and two other anonymous reviewers for their helpful suggestions; although of course, responsibility for any mis-interpretations or errors remains with me.

Data accessibility statement

To the best of my knowledge the published data is referenced in the text and bibliography. The author would be grateful for notice of any errors and omissions. Details of the unpublished Internal Reports of the Manchester Obsidian Laboratory may be accessed through the author or via <http://manchesterobsidian.rocks> and close spaces contacts on reasonable application.

List of supplementary files

Supplementary file 1

“HEALEY – supplementary file 1 – Supplementary file 1.xlsx”

Details of obsidian objects.

Supplementary file 2

“HEALEY – supplementary file 2 – Supplementary file 2.xlsx”

Summary of main forms by site and date (see also Figure 10).

References

- Abbès, F. 2008, Wadi Tumbaq 1: A Khiamian Occupation in the Bal’as Mountains. *Neo-Lithics*, 1(8): 3-8. URL: https://www.exorient.org/repository/NEO-LITHICS/NEO-LITHICS_2008_1.pdf
- Abu al-Soof, B. 1969, Excavations at Tell Qalinj Agha (Erbil), summer 1968. *Sumer*, 25: 3-43.
- Agha-Aligol, D., Lamehi-Rachti, M., Oliyai, P., Shokouhi, F., Farmahini Farahani, M., Moradi, M. & Farshi Jalali, F. 2015, Characterization of Iranian Obsidian Artifacts by PIXE and Multivariate Statistical Analysis. *Geoarchaeology. An International Journal*, 30: 261-270. doi:10.1002/gea.21509

- Ahrens, A. 2015, Objects from afar – the distribution of Egyptian imports in the northern Levant: parameters for ascertaining the character of diplomatic contacts between Egypt and the Levant during the Bronze Age? In: *Policies of Exchange Political Systems and Model, Proceedings of the International Symposium at the University of Freiburg Institute for Archaeological Studies 30th May to 2nd June 2012* (Eder, B. & Pruzsinszky, R., Eds.), Austrian Academy of Sciences Press, Vienna: p. 141-156.
- Aitken, M.J., Moorey, P.R.S. & Ucko, P.J. 1971, The authenticity of vessels and figurines in the Hacilar style. *Archaeometry*, 13(2): 89-141. doi:10.1111/j.1475-4754.1971.tb00034.x
- Akkermans, P.A., Boerma, J.A.K., Clason, A.T., Hill, S.G., Lohof, E., Meiklejohn, C., Le Mière, M., Molgat, G.M.F., Roodensberg, J.J., Walterbok-van Rooyen, W. & van Zeist, W. 1983, Bouqras revisited: a preliminary report on a project in eastern Syria. *Proceedings of the Prehistoric Society*, 49: 335-72. doi:10.1017/s0079497x00008045
- Akkermans, P.A., Roodensberg, J.J., van Loon, M.M. & Walterbolk, H.T. 1981, Tell Buqras. *Archiv für Orientforschung*, 26: 152-156. URL: <https://www.jstor.org/stable/41637428>
- Akkermans, P.M.M.G., & Duistermaat, K. 2004, More seals and sealings from Neolithic Tell Sabi Abyad, Syria. *Levant*, 36(1): 1-11. doi:10.1179/lev.2004.36.1.1
- Alarashi, H. 2014, *La parure épipaléolithique et néolithique de la Syrie (12^e au 7^e millénaire avant J.-C.): Techniques et usages, échanges et identités*. PhD Thesis at the Université Lumière – Lyon 2, École Doctorale Sciences Sociales 483, Archéorient UMR 5133, Université Lumière – Lyon 2, Lyon, 2 vols., 686 p. (in French) ("Jewelry from the Epipalaeolithic and Neolithic Syria: Techniques and uses, exchanges and identities")
- Alarashi, H. 2016, Butterfly beads in the Neolithic Near East: Evolution, technology and socio-cultural implications. *Cambridge Archaeological Journal*, 26: 493-519. doi:10.1017/s0959774316000342
- Alarashi, H., Ortiz, A. & Molist, M. 2018, Seashells on the riverside: Cowrie ornaments from the PPNB site of Tell Halula (Euphrates, Northern Syria). *Quaternary International*, 490: 98-112. doi:10.1016/j.quaint.2018.05.004
- Alizadeh, A. 2008, *Choga Mish II*. Oriental Institute Press Vol. 130. Chicago, 484 p.
- Altınbilek, Ç., Coşkun, G., Dede, Y., Iovino, M.R., Lemorini, C. & Özdoğan, A. 2001, Drills from Çayönü. A combination of ethnographic, experimental and use-wear analysis. In: *Beyond Tools. Redefining the PPN Lithic Assemblages of the Levant* (Caneva, I., Lemorini, C., Zampetti, D. & Biaggi, P., Eds.), Studies in Early Near Eastern Production, Subsistence, and Environment (SENEPSE) Vol. 9, *Ex Oriente*, Berlin: p. 137-144.
- Altınbilek-Algül, C. & Balcı, S. 2010, Obsidyen ticaretinin merkezi olarak Kültepe. *Harberler* 30: 11-13. (in Turkish) ("Kultepe as the centre of obsidian trade")
- Anderson, E., Almond, M.J., Matthews, W., Cinque, G. & Frogley, M.D. 2014, Analysis of red pigments from the Neolithic sites of Çatalhöyük in Turkey and Sheikh-e Abad in Iran. *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 131(15): 373-383. doi:10.1016/j.saa.2014.03.126
- André-Salvini, B. 1999, L'idéologie des pierres. In: *Cornaline et Pierres Précieuses: La Méditerranée de l'Antiquité à l'Islam* (Caubert, A., Ed.), Musée du Louvre, Paris: p. 373-93. (in French) ("The ideology of stone")

- Arimura, M., Balkan-Atlı, N., Borrell, F., Cruells, W., Duru, G.N., Erim-Özdoğan, A., Ibáñez, J., Maeda, O., Miyake, Y., Molist, M. & Özbaşaran, M. 2000, A new Neolithic settlement in the Urfa region: Akarçay Tepe, 1999. *Anatolia Antiqua*, 8: 227-255. doi:10.3406/anata.2000.949
- Arsebük, G. 1974, Microlithic assemblage from the Tülintepe Chalcolithic. In: *Keban Project 1971 Activities*, Middle East Technical University. Keban Project Publications, Ankara: p. 155-159.
- Artin, G. 2009, *La "Nécropole Énéolithique" de Byblos. Nouvelles Interprétations*, British Archaeological Reports International Series Vol. 1993. Archaeopress, Oxford, 219 p. (in French) ("The Eneolithic Necropolis at Byblos. New Interpretations")
- Aruz, J. & Wallenfels, R. 2003, *Art of the First Cities. The Third Millennium B.C. from the Mediterranean to the Indus*. The Metropolitan Museum of Art, New York, Yale University Press, New Haven and London, New York, 566 p.
- Ascalone, E. & Peyronel, L. 2006, Balance Weights from Tell Mardikh-Ebla and the weighing systems in the Levant during the Middle Bronze Age. In: *Weights in Context. Bronze Age Weighing Systems of Eastern Mediterranean Chronology, Typology, Material and Archaeological Contexts. Proceeding of the International Colloquium Rome 22nd -24th November 2004*, Istituto Italiano di Numismatica, Rome: p. 127-160.
- Asouti, E. 2006, Beyond the Pre-Pottery Neolithic B interaction sphere. *Journal of World Prehistory*, 20(2-4): 87-126. doi:10.1007/s10963-007-9008-1
- Astruc, L. 2001, Lithic tools involved in the manufacture of stone ornaments and utilitarian products at Khirokitia (Cyprus). In: *Beyond Tools. Redefining the PPN Lithic Assemblages of the Levant* (Caneva, I., Lemorini, C., Zampetti, D. & Biagi, P., Eds.), Studies in Early Near Eastern Production, Subsistence, and Environment (SENEPSE) Vol. 9, *Ex Oriente*, Berlin: p. 113-128.
- Astruc, L., Vargiolu, R., Ben Tkaya, M., Balkan-Atlı, N., Özbaşaran, M. & Zahouani, H. 2011, Multi-scale tribological analysis of the technique of manufacture of an obsidian bracelet from Aşıklı Höyük (Aceramic Neolithic, Central Anatolia). *Journal of Archaeological Science*, 38(12): 3415-3424. doi:10.1016/j.jas.2011.07.028
- Aurenche, O. & Cauvin, M.-C. 1982, Qdeir 1, campagne 1980: une installation néolithique du VII^e millénaire. *Cahiers de l' Euphrate*, 3: 51-77. (in French) ("Qdeir 1, 1980 campagne: A Neolithic settlement from the 7th millennium")
- Bader, N. 1993, Tell Magzaliyah: An early Neolithic site in northern Iraq. In: *Early Stages in the Evolution of Mesopotamian Civilization. Soviet Excavations in Northern Iraq* (Yoffee, N. & Clark, J.E., Eds.), University of Arizona Press, Tucson and London: p. 7-40.
- Bains, R., Vasić, M., Bar-Yosef Mayer, D., Russell, N., Wright, K.I. & Doherty, C. 2013, A Technological Approach to the Study of Personal Ornamentation and Social Expression at Çatalhöyük. In: *Substantive Technologies at Çatalhöyük. Reports from the 2000-2008 Seasons* (Hodder, I., Ed.), Çatalhöyük Research Project Vol. 9; British Institute at Ankara (BIAA) Monograph Vol. 48; Monumenta Archaeologica Vol. 31, British Institute at Ankara and Cotsen Institute of Archaeology at UCLA, Ankara and Los Angeles: p. 361-364.

- Balcı, S. 2010, Obsidian source-technology-settlement relations: Aşıklı Höyük (Central Anatolia). In: *Proceedings of the 6th International Congress on the Archaeology of the Ancient Near East*, Vol. 2 (Matthiae, P., Pinnock, F., Nigro, L. & Marchetti, N., Eds.), Harrassowitz Verlag, Wiesbaden: p. 295-304.
- Balcı, S. 2016, Tepecik-Çiftlik Höyük'te Obsidiyen Yongalama Alanı. *Journal of Anatolian Prehistoric Research (Anadolu Prehistorya Araştırmaları Dergisi)*, APAD, 2: 148-154. (in Turkish) ("The chipped stone from Tepecik-Çiftlik Höyük")
- Balcı, S. & Altınbilek-Algül, Ç. 2017, Polished obsidian objects: Examples of prestige items from Kültepe. *Colloquium Anatolicum*, 16: 15-30.
- Balcı, S. & Altınbilek-Algül, Ç. 2019, Reflections from prehistory: Obsidian mirrors of Güvercinkayası. In: *Arkeolojiyle Geçen Yarım Asır: Sevil Gülçur Armağanı (Half a Century Dedicated to Archaeology: A Festschrift in Honor of Sevil Gülçur)* (Çaylı, P., Demirtaş, I. & Barış, E., Eds.), Bilgin Kültür Sanat Yayınları, Ankara: p. 555-568.
- Balkan-Atlı, N. & der Aprahamian, G. 1998, Les Nucléus de Kaletepe et deux ateliers de taillé en Cappadoce. In: *L'obsidienne au Proche et Moyen Orient*. (Cauvin M.-C., Gourgaud, A., Gratuze, B., Arnaud, N., Poupeau, G., Poidevin, J.-L. & Chataigner, C., Eds.), British Archaeological Reports International Series Vol. 738. Archaeopress, Oxford, p. 241-257. (in French) ("The cores from Kaletepe and two knapping workshops")
- Balkan-Atlı N., Kuhn S., Astruc L., Kayacan N., Dinçer B., in collaboration with K. Erturaç, M. Grenet, 2011, Göllüdağ Survey 2010. *Anatolia Antiqua*, 19: 259-278. doi:10.3406/anata.2011.1096
- Balkan-Atlı, N., Kayacan, N., Balcı, S., Astruc, L. & Erturaç, K. 2013, Göllüdağ obsidian project. In: *Stone Tools in Transition: from Hunter-Gatherers to Farming Societies in the Near East* (Borrell, F., Ibáñez, J.-J., & Moist, M., Eds.), University Autònoma de Barcelona, Servei de Publicacions, Bellaterra: p. 465-474
- Bar-Yosef Mayer, D. 2014a, Stone Beads. In: *Encyclopaedia of the History of Science, Technology, and Medicine in Non-Western Cultures* (Selin, H., Ed.), Springer Reference, Dordrecht: online. doi:10.1007/978-94-007-7747-7_10042
- Bar-Yosef Mayer, D. 2014b, Towards a typology of stone beads in the Neolithic Levant. *Journal of Field Archaeology*, 38(2): 129-142. doi:10.1179/0093469013Z.000000000043
- Bar-Yosef Mayer, D. E. 2019, The colour of ornaments in the Neolithic and Chalcolithic of the Levant: Their symbolic meaning and economic value. In *The Value of Colour. Material and Economic Aspects in the Ancient World* (Thavapalan, S. & Warburton, D.A., Eds.), Topoi, Berlin: p. 69-98. doi:10.17171/3-70
- Bauer, A.A. 2019, Itinerant objects. *Annual Review of Anthropology*, 48: 335-352. doi:10.1146/annurev-anthro-102218-011111
- Baykal-Seeher, A. 1996, Die Lithischen Kleinfunde. In: *Demircihüyük. Die Ergebnisse der Ausgrabungen 1975-1978 Band I, Die Kleinfunde* (Korfmann, M., Ed.), Verlag Philipp von Zabern, Mainz: p. 7-169. (in German) ("The lithic small finds")
- Baysal, E. 2014, Changing times and faraway places. The beads and pendants of Canhasan I and III. *Heritage Turkey, British Institute at Ankara Research Reports*, 4: 30. doi:10.18866/biaa2015.097

- Baysal, E. 2016, Beadwork in a basket. An ornamental item from the final Halaf level of Mersin, Yumuktepe. *Adalya*, 19: 17-30.
URL: https://dergipark.org.tr/en/pub/adalya/issue/54568/743809#article_cite
- Baysal, E. 2017, Reflections of faraway places: The Chalcolithic personal ornaments of Canhasan I. *Anatolian Studies*, 67: 29-49. doi:10.1017/s0066154617000035
- Baysal, E. 2018, Chalcolithic personal ornaments: transformative technologies, specialisation and long distance contacts. In: *Merging Techniques and Cultures. Technological Approaches in Archaeology. 6^{èmes} Rencontre d'Archéologie de L'IFEA Istanbul 24-25th Novembre 2015* (Godon, M., Ed.), Institut Français d'Études Anatoliennes, Georges-Dumézil, Beyoğlu-Istanbul: p. 85-96.
- Baysal, E.L. 2019, *Personal Ornaments in Prehistory. An Exploration of Body Augmentation from the Palaeolithic to the Early Bronze Age*. Oxbow Books, Oxford and Philadelphia, 243 p.
- Baysal, E., Baysal, A., Türkan, A. & Nazaroff, A. 2015, Early specialised craft? A Chalcolithic stone bracelet workshop at Kanlıtaş, Eskişehir, Turkey. *Oxford Journal of Archaeology*, 34(3): 232-254. doi:10.1111/ojoa.12057
- Baysal, E., & Sağlamtimur, H. 2021, Sacrificial status and prestige burials: Negotiating life, death, and identity through personal adornment at Early Bronze Age I Başur Höyük, Turkey. *American Journal of Archaeology*, 125(1): 3-28. doi:10.3764/aja.125.1.0003
- Beck, H.C. 1928, Classification and nomenclature of beads and pendants. *Archaeologia*, 77: 1-76. doi:10.1017/s0261340900013345
- Becker, A. 1993, *Uruk Kleinfunde 1. Stein. Ausgrabungen in Uruk-Warka Endberichte 6*. Deutsches Archäologisches Institut. Abteilung Baghdad. Phillip von Zabern, Mainz am Rhein, 143p. (in German) ("Small finds from Uruk 1: stone")
- Becker J., Helms T., Possel M., & Vila E. 2007, Ausgrabungen in Tell Tawila, Nordost-Syrien. Bericht über zwei Grabungskampagnen 2005 und 2006, *Mitteilungen der Deutschen Orient-Gesellschaft*, 139: 213-268. (in German) ("Excavations in Tell Tawila, Northeast Syria. Report on two excavation campaigns in 2005 and 2006")
- Belcher, E. 2011, Halaf bead, pendant and seal workshops at Domuztepe: technological and reductive strategies. In: *The State of the Stone Terminologies, Continuities and Contexts in Near Eastern Lithics* (Healey, E., Campbell, S. & Maeda, O., Eds.), Studies in Early Near Eastern Production, Subsistence, and Environment (SENEPSE) Vol. 13, *Ex Oriente*, Berlin: p. 135-143.
- Bernbeck, R., Pollock, S. & Coursey, C. 1999, The Halaf Settlement at Kazane Höyük. Preliminary Report on the 1996 and 1997 seasons. *Anatolica*, 25: 109-147. doi:10.2143/ana.25.0.2015487
- Bialor, P.A. 1962, The chipped stone industry of Çatal Hüyük. *Anatolian Studies*, 12: 67-110. doi:10.2307/3642518
- Binder, D., 2005, Autour de l'obsidienne: un aspect des processus d'interaction entre agro-pasteurs et chasseurs cueilleurs en Anatolie centrale. In: *Populations, économies et environnements, du Néolithique et de l'Âge du Bronze* (Guilaine, J., Ed.), Éditions Errance, Paris: p. 117-134. (in French) ("Concerning obsidian: an aspect of the interaction process between agro-pastoralists and hunter gatherers in Central Anatolia")

- Binder, D., & Balkan-Atlı, N. 2001, Les ateliers de taille d'obsidienne: fouilles de Kömürçü-Kaltepe. *Anatolia Antiqua*, 9: 193-205. (in French) ("The obsidian workshops: excavations at Kömürçü-Kaltepe") doi:10.3406/anata.2001.967
- Binder, D., Gratuze, B., Mouralis, M., & Balkan-Atlı, N. 2011, New investigations of the Göllüdağ obsidian lava flows system: a multi-disciplinary approach. *Journal of Archaeological Science*, 38: 3174-84. doi:10.1016/j.jas.2011.05.014
- Birkenfeld, M. 2018, *Changing Systems: Pre-Pottery Neolithic B Settlement Patterns in the Lower Galilee, Israel*. Studies in Early Near Eastern Production, Subsistence, and Environment (SENEPSE) Vol. 21, *Ex Oriente*, Berlin, 334 p.
- Blackman, M.J. 1984, Provenance studies of Middle Eastern Obsidian from sites in highland Iran. *Advances in Chemistry Series*, 205 (Archaeological Chemistry 3): 19-50. doi:10.1021/ba-1984-0205.ch002
- Boehmer, R.M. 1972, *Die Kleinfunde von Boğazköy: aus den Grabungskampagnen 1931-1939 und 1952-1969*. Mann, Berlin, 247 p. (in German) ("The small finds from Boğazköy from the Excavations 1931-1939 and 1952-1969")
- Bos, J.E.M.F. 2017, The Tutankhamun Beadwork: An Introduction to Archaeological Beadwork Analysis. In: *Not Just for Show. The Archaeology of Beads, Beadwork, & Personal Ornaments* (Bar-Yosef, M.D., Bonsall, C. & Choyke, A., Eds.), Oxbow Books, Oxford and Philadelphia: p. 115-126.
- Braidwood, L.S. & Braidwood, R. 1960, *Excavations in the Plain of Antioch Vol 1. The Earlier Assemblages Phases A-J*. Oriental Institute Publications Vol. 61. Oriental Institute, Chicago, 601 p.
- Brandl, B. 2014, Three Canaanite design scarabs, one Egyptian scarab and one Syrian cylinder seal from a burial cave near Ras 'Ali, in Nahal Zippori. *Atiqot*, 78: 1-11.
- Breniquet, C. 1987, Les petit objets de la fouille de Tell el'Oueili 1983. In: *Larsa, 10^e campagne, 1983 et Oueili, 4^e campagne 1983. Rapport Préliminaire* (Huot, J.-L., Ed.), Mémoire, 73. Publications de la Délégation Archéologique Française en Irak no 4. Publication du Centre de Recherche d'Archéologie Orientale, Université de Paris, 5. Éditions Recherche sur les Civilisations, Paris: p. 225. (in French) ("The small finds from the excavation of Tell el 'Oueili 1983")
- Breniquet, C. 1991, Les petits objets de l'époque d'Obeid découverts à Tell el'Oueili en 1985. In: *Oueili. Travaux de 1985*. (Hout, J.-L., Ed.), Éditions Recherche sur les Civilisations. Mémoire 89. ERA no 8. Centre de Recherches archéologiques (CRA), Centre national de la recherche scientifique (CNRS), Paris: p. 313-320. (in French) ("The small finds from the Ubaid era found at Tell el'Oueili")
- Brereton, G.D. 2011, *The Social Life of Human Remains: Burial Rites and the Accumulation of Capital during the Transition from Neolithic to Urban Societies in the Near East*. PhD Thesis at University College London, London, 854 p.
- Burney, C. 1962, The excavations at Yanik Tepe, Azerbaijan, 1961. Second preliminary report. *Iraq*, 24: 134-53. doi:10.2307/4199724
- CAD 1962, *The Assyrian Dictionary of the Oriental Institute of Chicago*. Vol 16 Ş (tsade) (Gelb, I., Lansberger, B., & Oppenheim, A.L., Eds.), The Oriental Institute of Chicago, Chicago, 262 p.
URL: https://oi.uchicago.edu/sites/oi.uchicago.edu/files/uploads/shared/docs/cad_s_tsade.pdf

- Calley, S. 1989, L'atelier de fabrication de perles de Kumartepe: quelques observations technologiques. *Anatolica*, 17: 57-184. (in French) ("The bead workshop at Kumartepe: some technological observations")
- Calley S., & Grace R. 1988, Technology and function of micro-borers from Kumartepe (Turkey). In: *Industries Lithiques: Tracéologie et Technologie, Vol. 1: Aspects Archéologiques* (Beyries, S., Ed.), British Archaeological Reports International Series Vol. 411(i). Archaeopress, Oxford: p. 69-81.
- Campbell, S. & Healey, E. 2013, The obsidian at Arpachiyah, Iraq; an integrated study. In: *Stone Tools in Transition: From Hunter Gatherers to Farming Societies in the Near East* (Borrell, F., Ibáñez, J.-J., & Molist, M., Eds.), Universitat Autònoma de Barcelona, Servei de Publicacions, Bellaterra, Barcelona: p. 529-542.
- Campbell, S. & Healey, E. 2017, The sources of some obsidian beads found at Kish, southern Iraq. In: *The Exploitation of Raw Materials in Prehistory: Sourcing, Processing and Distribution* (Pereira, T., Terradas, X. & Bicho, N., Eds.), Cambridge Scholars Publishing, Newcastle on Tyne: p. 538-548.
- Campbell, S., Kuzmin, Y.V., Healey, E. & Glascock, D.M. 2019, Reflections of the *Magus*. The provenance of an obsidian mirror associated with the sixteenth century polymath, John Dee (oral presentation). Presented at the International Association for Obsidian Studies conference, Hungary, 27-29 May 2019.
- Campbell, S., Healey, E., Kuzmin, Y.V. & Glascock, M.D. (2021), The mirror, the magus and more: Reflections on John Dee's obsidian mirror. (accepted for publication) *Antiquity*, (first view): 19 p. doi:10.15184/aqy.2021.132
- Campbell Thompson, R. & Hutchinson R.W. 1929, The excavations on the Temple of Nabû at Nineveh. *Archaeologia*, 79: 103-148. doi:10.1017/S0261340900008808
- Campbell Thompson, R. & Mallowan, M.E.L. 1933, The British Museum Excavations at Nineveh, 1931-32. *Annals of Archaeology and Anthropology issued by the Institute of Archaeology, University of Liverpool*, 20: 71-186. doi:10.1017/s0035869x00075778
- Cann, J.R., Dixon, J.E. & Renfrew, C. 1969, Obsidian analysis and the obsidian trade. In: *Science in Archaeology. A Survey of Progress and Research. Second Edition, Revised and Enlarged* (Brothwell, D. & Higgs, E.S., Eds.), Thames and Hudson, London: p. 578-591.
- Caputo, G.B., Lynn, S.J. & Houran, J. 2020, Mirror- and eye-gazing: An integrative review of induced altered and anomalous experiences. *Imagination, Cognition and Personality: Consciousness in Theory, Research, and Clinical Practice*, 40(4): 418-457. doi:10.1177/0276236620969632
- Carter, R. & Crawford, H. (Eds.) 2010, *Maritime interactions in the Arabian Neolithic: evidence from H3, As-Sabiyah, an Ubaid-related site in Kuwait*. Brill, Leiden: 362 p.
- Carter, R. 2018, Globalising interactions in the Arabian Neolithic and the Ubaid. In: *Globalization in Prehistory: Contact, Exchange, and the 'People Without History'* (Boivin, N. & Frachetti, M. Eds.), Cambridge University Press, Cambridge: p. 43-79.
- Carter, T. 2012, The chipped stone archive report 2012. In: *Çatalhöyük 2012 Archive Report*, Çatalhöyük Research Project: p. 195-203.
URL: https://www.catalhoyuk.com/sites/default/files/media/pdf/Archive_Report_2012.pdf

- Carter, T., Contreras, D.A., Campeau, K. & Freund, K. 2016, Spherulites and Aspiring Elites: The Identification, Distribution, and Consumption of Giali Obsidian (Dodecanese, Greece). *Journal of Mediterranean Archaeology*, 29(1): 3-36.
doi:10.1558/jmea.v29i1.31011
- Carter, T., Dubernet, S., King, R., Le Bourdonnec, F.-X., Milić, M., Poupeau, G. & Shackley, M. S. 2008, Eastern Anatolian obsidians at Çatalhöyük and the reconfiguration of regional interaction in the Early Ceramic Neolithic. *Antiquity*, 82: 900-1009.
doi:10.1017/s0003598x00097660
- Carter, T. & Kilikoglou, V. 2007, From reactor to royalty? Aegean and Anatolian obsidians from Quartier Mu, Malia (Crete). *Journal of Mediterranean Archaeology*, 20: 115-143.
doi:10.1558/jmea.v20i1.115
- Carter, T. & Milić, M. 2013, The Chipped Stone. In: *Substantive Technologies at Çatalhöyük. Reports from the 2000-2008 Seasons*, Vol. 9 (Hodder, I., Ed.), Çatalhöyük Research Project Series Vol. 9, British Institute at Ankara and Cotsen Institute of Archaeology, Ankara and Los Angeles: p. 417-478 and App. 21.
- Cauvin, J. 1962, Les outillages néolithiques de Byblos et du littoral libanais, In: *Fouilles de Byblos IV* (Dunand, M., Ed.), Maisonneuve, Paris, 360 p. (in French) (“The Neolithic Tools of Byblos and the Lebanese Coast”)
- Cauvin, J. 1998. La signification symbolique de l’obsidienne. In: *L’obsidienne au Proche et Moyen Orient: Du volcan à l’outil*. (Cauvin M.-C., Gourgaud, A., Gratuze, B., Arnaud, N., Poupeau, G., Poidevin, J.-L. & Chataigner, C., Eds.), British Archaeological Reports International Series Vol. 738. Archaeopress, Oxford, p. 379-382. (in French) (“The symbolic meaning of obsidian”)
- Cauvin, J. 2000, *The Birth of the Gods and the Origins of Agriculture*. Cambridge University Press, Cambridge: 259 p.
- Cauvin, J., Aurenche, O., Cauvin, M.-C. & Balkan Atli, N. 2011, The pre-pottery site of Cafer Höyük. In: *The Neolithic in Turkey*. Vol.2 (Özdoğan, M., Başgelen, N. & Kuniholm, P., Eds.). Archaeology and Art Publications, Istanbul: p. 1-40.
- Cauvin, M.-C. 1972, Note préliminaire sur l’outillage lithique de Tell Assouad (Djézireh). *Annales Archéologiques Arabes Syriennes*, 22: 90-93. (in French) (“Preliminary note on the lithic artefacts at Tell Assouad, Jezireh”)
- Cauvin, M.-C. 2000, L’obsidienne d’El Kowm 2 au Néolithique. In: *El Kowm 2. Une île dans le désert. La fin du Néolithique précéramique dans la steppe syrienne* (Stordeur, D., Ed.), Centre national de la recherche scientifique (CNRS) Éditions, Paris: p. 161-176. (in French) (“The obsidian at El Kowm 2 in the Neolithic”)
- Çelik, B. 2014, Şanlıurfa-Yeni Mahalle Höyüğü in the light of novel C14 analysis. In: *Armizzi. Engin Özgen’e Armağan (Studies in Honor of Engin Özgen)* (Engin, A., Helwing, B. & Uysal, B., Eds.), Asitan Kitap, Ankara: p. 101-104.
- Chataigner, C. 1998, Sources des artefacts du Proche-Orient d’après leur caractérisation géochimique. In: *L’obsidienne au Proche et Moyen Orient, Du volcan à l’outil* (Cauvin, M.C., Gourgaud, A., Gratuze, B., Arnaud, N., Poupeau, G., Poidevin, J.-L. & Chataigner, C., Eds.), British Archaeological Reports International Series Vol. 738. Archaeopress, Oxford: p. 273-324. (in French) (“Sources of artefacts of the Near East according to their geochemical analysis”)

- Chataigner, C., Poidevin, J.-L. & Arnaud, N. 1998, Turkish occurrences of obsidian and use by prehistoric peoples in the Near East from 14,000 to 6,000 BP. *Journal of Volcanology and Geothermal Research*, 85: 517-537.
doi:10.1016/s0377-0273(98)00069-9
- Chevalier, J., Inizan, M.-L. & Tixier, J. 1982, Une technique de perforation par percussion de perles en cornaline (Larsa, Iraq). *Paléorient*, 8(2): 55-65. (in French) (“A technique of perforation by percussion of carnelian beads”) doi:10.3406/paleo.1982.4320
- Collon, D. 1986, *Catalogue of the Western Asiatic Seals in the British Museum: Cylinder Seals III: Isin-Larsa and Old Babylonian Periods*. British Museum Publications, London, 241 p.
- Collon, D. 1987, *First Impressions. Cylinder Seals in the Ancient Near East*. British Museum Publications, London, 208 p.
- Connor, S., Laboury, D., Marée, M., Ben-Tor, D., Martin, M., Ben-Tor, A. & Sandhaus, D. 2017, Egyptian Objects. In: *Hazor VII. The 1990-2012 Excavations. The Bronze Age* (Ben-Tor, A., Zuckerman, S., Bechar, S. & Sandhaus, D., Eds.), Israel Exploration Society and the Institute of Archaeology, The Hebrew University of Jerusalem, Jerusalem: p. 547-603.
- de Contenson, H. 1992, *Préhistoire de Ras Shamra: Les sondages stratigraphiques de 1955-1976*. Ras Shamra-Ougarit VIII. Éditions Recherche sur les civilisations, Paris, 283 p. (in French) (“The prehistory of Ras Shamra: Stratigraphic surveys from 1955 to 1976”)
- de Contenson, H. 2000, *Ramad. Site Néolithique en Damascène (Syrie). Aux VIII^e et VII^e millénaires avant l'ère Chrétienne*. Institut Français d'archéologie du Proche-Orient, Beyrouth, 304 p. (in French) (“Ramad, A Neolithic site in the Damascene. From 8th to 7th millennia BC”)
- Copeland, L. 1996, The flint and obsidian industries. In: *Tell Sabi Abyad: The Late Neolithic Settlement, Vol. 2* (Akkermans, P.M.M.G., Ed.), Nederlands Historisch-Archaeologisch Insitut te Istanbul, Istanbul: p. 285-338.
- Coqueugniot, É. 1996, Oueili: Le travail de l'obsidienne et des roches siliceuses à l'époque d'Obeid (Campagnes de 1987 et 1989). In: *Oueili: Travaux de 1987 et 1989 sous la direction de Jean-Louis Huot* (J.-L. Huot, Ed.), Éditions Recherche sur les Civilisations. Paris: p. 289-306. (in French) (“Oueili: The working of obsidian and siliceous rocks in Ubaid times”)
- Coqueugniot, É. 1998, L'obsidienne en Méditerranée orientale aux époques post-néolithiques. In: *L'obsidienne au Proche et Moyen Orient, Du volcan à l'outil* (Cauvin, M.C., Gourgaud, A., Gratuze, B., Arnaud, N., Poupeau, G., Poidevin, J.-L. & Chataigner, C., Eds.), British Archaeological Reports International Series Vol. 738. Archaeopress, Oxford: p. 351-36. (in French) (“Obsidian in the eastern Mediterranean in the post Neolithic Age”)
- Coşkunsu, G. 2008, Hole-making tools of Mezraa Teleilat with special attention to micro-borers and cylindrical polished drills and bead production. *Neo-Lithics*, 1/08: 25-36.
URL: https://www.exorient.org/repository/NEO-LITHICS/NEO-LITHICS_2008_1.pdf

- Coşkunsu, G. 2011, Flint and Obsidian Industry of Mezraa-Teleilat (Urfa, South-East Anatolia) PPN-PN. In: *The State of the Stone; Terminologies, Continuities and Contexts in Near Eastern Lithics* (Healey, E., Campbell, S. & Maeda, O., Eds.), Studies in Early Near Eastern Production, Subsistence, and Environment (SENEPSE) Vol. 13. *Ex Oriente*, Berlin: p. 385-394.
- Crowfoot-Payne, J. 1983, The Flint Industries of Jericho. *Excavations at Jericho Vol. 5*. British School of Archaeology, Jerusalem: Appendix C, p.622-758.
- Cruells, W. 2006, Les objets. In: *Chagar Bazar (Syrie) I. Les Sondages Préhistoriques (1999-2001)* (Tunca, O., Baghdo, A. & Cruells, W., Eds.), Peeters, Louvain: p. 81-94. (in French) (“The objects”)
- Davidson, T.E. & Watkins, T. 1981, Two seasons of excavation at Tell Aqab in the Jezireh, northeast Syria. *Iraq*, 43: 1-18. doi:10.2307/4200130
- Decourt, J.-C. 1998, L’obsidienne dans les sources anciennes: notes sur l’histoire du mot et l’utilisation de la roche dans l’antiquité. In: *L’obsidienne au Proche et Moyen Orient. Du volcan à l’outil* (Cauvin, M.-C., Gourgaud, A., Gratuze, B., Arnaud, N., Poupeau, G., Poidevin, J.-L. & Chataigner, C., Eds.), British Archaeological Reports International Series Vol.738. Archaeopress, Oxford: p. 363-378. (in French) (“Obsidian in ancient sources: note on the history of the word and the utilisation of the rock in antiquity”)
- Delougaz, P. 1952, *Pottery from the Diyala Region*. Oriental Institute Publications Vol. 63. Oriental Institute, Chicago, 494 p.
- Delougaz, P., Hill, H.D. & Lloyd, S. 1967, *Private Houses and Graves in the Diyala Region*. Oriental Institute Publications Vol. 88. Oriental Institute, Chicago, 361 p.
- Delougaz, P., Kantor, H. & Alizadeh, A. 1996, *Choga Mish Volume I. The First Five Seasons of Excavations 1961-1971. Part I: Text*. Oriental Institute Publications Vol. 101. Oriental Institute, Chicago, 508p.
- Delougaz, P., Lloyd, S., Frankfort, H. & Jacobsen, T. 1942, *Pre-Sargonid Temples in the Diyala Region*. Oriental Institute Publications Vol. 58. Oriental Institute, Chicago. 320 p.
- Dietrich, L. 2018, The Small Finds. Chapter VIII. In: *The Late Neolithic Site of Shir/Syria Volume 1. The Excavations at the South Area 2006-2009* (Bartl, K., Ed.), Philipp von Zabern, Darmstadt: p. 463-602.
- Dobres, M.-A. 2000, *Technology and Social Agency*. Blackwell Publishers, Ltd. Oxford and Malden, Massachusetts, 300 p.
- Dobres, M.-A. 2010, Archaeologies of Technology, *Cambridge Journal of Economics*, 34: 103-14. doi:10.1093/cje/bep014
- Doyle, S. 2017, Chipped stone from the North and South Areas. In: *Çatalhöyük 2017 Archive Report* (Haddow, S., Ed.): p. 195-206.
URL: https://www.catalhoyuk.com/sites/default/files/Archive_Report_2017.pdf
- Dunand, M. 1973, *Fouilles de Byblos V: l’architecture, les tombes, le matériel domestique, des origines néolithiques à l’avenement urbain*. A. Maisonneuve. Paris. (in French) (“Excavations at Byblos V: architecture, tombs and domestic material from the Neolithic to the beginning of urbanisation”)
- Duru, R. 1994, *Kuruçay Höyük I*. Türk Tarih Kurumu Basımevi, Ankara, 247 p.

- Edmonds, M., 1990. Description, understanding and the *chaîne opératoire*. *Archaeological Review from Cambridge*, 9(1): 55-70.
- Edmonds, M. 1995, *Stone Tools and Society. Working Stone in Neolithic and Bronze Age Britain*. B.T. Batsford Ltd., London, 208 p. doi:10.4324/9780203481080
- Eichmann, R. 1987, Uruk-Warka XXXVIII. Oberflächenfunde III: Steingefäßbohrer. *Baghdader Mitteilungen*, 18: 107-115. (in German) (“Uruk-Warka XXXVIII Surface finds III. Stone borers for vessels”)
- Erim-Özdoğan, A. 2011, Çayönü. In: *The Neolithic in Turkey Volume 1* (Özdoğan, M., Başgelen, N. & Kuniholm, P., Eds.), Archaeology and Art Publications, Arkeoloji ve Sanat Yayınları, Istanbul: p. 185-269.
- d’Errico, F., Roux, V. & Dumond, Y. 2000, Identification des techniques de finition des perles en calcédoine par l’analyse microscopique et rugosimétrique. In: *Cornaline de l’Inde. Des pratiques techniques de Cambay aux techno-systèmes de l’Indus* (Roux, V., Ed.), Éditions de la Maison des sciences de l’homme, Paris: p 97-163. (in French) (“Identification of the finishing techniques of chalcedony beads using microscopic and rugosity analysis”)
- Falci, C.G. 2015, *Stringing Beads Together: A Microwear Study of Bodily Ornaments in Later pre-Colonial North-central Venezuela and North-western Dominican Republic*, Universiteit Leiden, Archeologie, Leiden, 280 p.
- Fiorina, P. 1997, Khirbet Hatara: La Stratigrafia. *Mesopotamia*, 32: 7-62.
- Forster, N. & Grave, P. 2012, Non-destructive PXRF analysis of museum-curated obsidian from the Near East. *Journal of Archaeological Science*, 39: 728-736. doi:10.1016/j.jas.2011.11.004
- Frahm, E. 2010, *The Bronze-Age Obsidian Industry at Tell Mozan (Ancient Urkesh), Syria: Redeveloping Electron Microprobe Analysis for 21st-Century Sourcing Research and the Implications for Obsidian Use and Exchange in Northern Mesopotamia after the Neolithic*. Unpublished PhD thesis, University of Minnesota, Minneapolis, 756 p, plus appendixes.
- Frahm, E. Campbell, S & Healey, E. 2016, Caucasus connections? New data and interpretations for Armenian obsidian in Northern Mesopotamia. *Journal of Archaeological Science: Reports*, 9: 543-564. doi:10.1016/j.jasrep.2016.08.023
- Frahm, E. & Feinberg, J.M. 2013, Empires and resources: Central Anatolian obsidian at Urkesh (Tell Mozan, Syria) during the Akkadian period. *Journal of Archaeological Science*, 40: 1122-1135. doi:10.1016/j.jas.2012.07.019
- Frahm, E., Lassen, A.W. & Wagensohn, K. 2019, Gods and demons, Anatolia and Egypt: Obsidian sourcing of Mesopotamian amulets and cylinder seals using portable XRF. *Journal of Archaeological Science: Reports*, 24: 978-992. doi:10.1016/j.jasrep.2019.03.025
- Freyer, D. W., Nava, A., Tartaglia, G., Vidale, M., Coppa, A. & Bondioli, L. 2020, Evidence for labret use in prehistory. *Bulletin of the International Association for Paleodontology*, 14: 1-23.
- French, D.H. 2010, *Canhasan I: The small finds*. British Institute of Archaeology at Ankara, London, 210 p.

- Fujii, H. [藤井秀夫] 1981a, 「III テル・ソングルA」 『ラーフィダーン』 第II巻 (al-Rāfidān), 2: 50-74 (Japanese), 164-181 (English). (in Japanese) (“Tell Songor A”) URL: https://www.kokushikan.ac.jp/research/ICSAI/publication/pdf/0285_4406_002.pdf
- Fujii, H. [藤井秀夫] 1981b, 「IV テル・ソングルB, C」 『ラーフィダーン』 第II巻 (al-Rāfidān), 2: 75-106 (Japanese), 182-193 (English). (in Japanese) (“Tell Songor B and C”) URL: https://www.kokushikan.ac.jp/research/ICSAI/publication/pdf/0285_4406_002.pdf
- Gadd, C.J. & Legrain, L. 1928, *Ur Excavations Texts I. Royal Inscriptions*. Joint Expedition of the British Museum and of the Museum of the University of Pennsylvania to Mesopotamia, London, 96 p.
- Gatsov, I. & Nedecheva, P. 2018, Bullet core pendants from the south Marmara region. In: *Multas per Gentes et Multa per Saecula. Amici Magistro et Collegae suo Ioanni Christoph Kozłowski Dedicant* (Paweł Valde-Nowak, Sobczyk, K., Marek Nowak & Żrałka, J., Eds.), Institute of Archaeology, Jagiellonian University in Krakow and Alter Publishing House, Krakow: p. 301-305.
- Gebel, H.G., Benz, M., Purschwitz, C., Alarashi, H., Bauer, J., Gresky, J., Heidkamp, B., Abuhelaleh, B., Miškolciová, L., Keßeler, A., Kubíková, B., Štefanisko, D., Strauss, M. & Wellbrock, K. 2019, Household and Death, 2: Preliminary Results of the 12th Season (2018) at Late PPNB Ba’ja, Southern Jordan. *Neo-Lithics*, 2/19: 20-45. URL: https://www.exoriente.org/repository/NEO-LITHICS/e_NEO-LITHICS_2019_Gebel_et_al.pdf
- Getzov, N. 2009, Miscellaneous finds from the Bronze Age in Chapter 3; strat 14-12, C5-C2: The Bronze Age. In: *Horbat ‘Uza. The 1991 Excavations. Volume I: The Early Periods* (Getzov, N., Lieberman-Wander, R., Smithline, H. & Syon, D., Eds.), Israel Antiquities Authority, Jerusalem: p. 129-130.
- van Gijn, A. 2010, *Flint in Focus. Lithic Biographies in the Neolithic and Bronze Age*. Sidestone Press, Leiden, 288 p. URL: <https://www.sidestone.com/books/flint-in-focus>
- van Gijn, A. 2017, Bead Biographies from Neolithic Burial Contexts: Contributions from the microscope. In: *Not Just for Show. The Archaeology of Beads, Beadwork and Personal Ornament* (Bar Yosef Mayer, D., Bonsall, C. & Choyke, A., Eds.), Oxbow Books, London and Philadelphia: p. 102-114.
- Glover, L.L. 2019, *The Trade, Exchange and Manufacture of Stone Ornaments in Korea and Japan ca. 250-700CE*, PhD thesis, ProQuest number 13884281, Department of Anthropology, University of Wisconsin-Madison, Madison, 471 p.
- González-Urquijo, J., Abbés, F., Alarashi, H., Ibáñez, J.-J., Lazuén, T. 2013, Microdrill use at Khiamian sites in central and northern Levant (Syria and Lebanon). In: *Stone Tools in Transition: From Hunter-Gatherers to Farming Societies in the Near East* (Borrell, F., Ibáñez, J.-J. & Molist, M. (Eds.), Universitat Autònoma de Barcelona, Servei de Publicacions, Bellaterra (Barcelona): p. 177-189.
- Goodman, M.E. 1944, The physical properties of stone tool materials. *American Antiquity*, 9: 415-433. doi:10.2307/275093
- Goring-Morris, N. & Belfer-Cohen, A. 2001, The Symbolic Realms of Utilitarian Material Culture. In: *Beyond Tools. Redefining the PPN Lithic Assemblages of the Levant* (Caneva, I., Lemorini, C., Zampeti, D. & Biagi, P., Eds.). Studies in Early Near Eastern Production, Subsistence, and Environment (SENEPSE) Vol. 9. *Ex Oriente*, Berlin: p. 257-71.

- Goring-Morris, N. & Belfer-Cohen, A. 2020, Highlighting the PPNB in the Southern Levant. *Neo-Lithics*, 20: 3-22. URL: https://www.exorient.org/repository/NEO-LITHICS/NEO-LITHICS_2020.pdf
- Gosden, C. & Marshall, Y. 1999, The cultural biography of objects. *World Archaeology*, 31(2): 169-178. doi:10.1080/00438243.1999.9980439
- Gratuze, B., Barrandon, J.N., Al Isa, K. & Cauvin, M.-C. 1993, Non-destructive analysis of obsidian artefacts using nuclear techniques: investigation of provenance of Near Eastern artefacts. *Archaeometry*, 35(1): 11-21. doi:10.1111/j.1475-4754.1993.tb01020.x
- Groman-Yaroslavski, I. & Bar-Yosef Mayer, D. 2015, Lapidary technology revealed by functional analysis of carnelian beads from the early Neolithic site of Nahal Hemar Cave, southern Levant. *Journal of Archaeological Science*, 58: 77-88. doi:10.1016/j.jas.2015.03.030
- Gülçür, S. 2012, The Chalcolithic period in Central Anatolia Aksaray-Niğde region. *Origini*, 24, Nuova Serie 5: 213 -27.
- Gurova, M. & Bonsall, C. 2017, Experimental replication of stone, bone and shell beads from early Neolithic sites in southeast Europe. In: *Not Just for Show. The Archaeology of Beads, Beadwork, & Personal Ornaments* (Bar-Yosef Mayer, D., Bonsall, C. & Choyke, A., Eds.), Oxbow, Oxford: p. 159-167.
- Gwinnett, A.J. & Gorelick, L. 1981, Beadmaking in Iran in the Early Bronze Age derived by scanning electron microscopy. *Expedition*, 24(1): 10-23.
- Gwinnett, A.J. & Gorelik, L. 1991, Bead Manufacture at Hajar Ar-Rayhani, Yemen. *Biblical Archaeologist*, 54(4): 186-196. doi:10.2307/3210280
- Hall, H.R. & Woolley, C.L. 1927, *Al 'Ubaid: a report on the work carried out at Al-'Ubaid for the British Museum in 1919 and for the joint expedition in 1922-3*. The Trustees of the two Museums by the Oxford University Press, Oxford, 244 p.
- Hall, H.R. 1924, Notes on the excavations of 1919 at Muqayyar, el-'Obeid and Abu Sharein. *Journal of the Royal Asiatic Society*, 56: 103-115. doi:10.1017/s0035869x00150646
- Hammade, H. & Yamazaki, Y. 2006, *Tell al-'Abr (Syria): Ubaid and Uruk Periods*. Peeters, Louvain, Paris, Dudley (MA), 409 p.
- Haney, L. S. 2020, *Visualizing Coregency. An Exploration of the Link between Royal Image and Co-Rule during the Reign of Senwosret III and Amenemhet III*. Harvard Egyptological Studies Vol. 8. Brill, Leiden, 512 p. doi:10.1163/9789004422155_005
- Harper, P., Klengel-Brandt, E., Arun, J. & Benzel, K. (Eds.) 1995, *Discoveries at Ashur on the Tigris. Assyrian Origins*. The Metropolitan Museum of Art, New York, New York, 142 p.
- Hauptmann, H. 2003, Eine Frühneolithische Kultfigur au Urfa. In: *From Village to Cities. Early Villages in the Near East 1* (Özdoğan, M., Hauptmann, H. & Başgelen, N., Eds.), Arkeoloji ve Sanat Yayınları, Istanbul: p. 622-636. (in Turkish) (“An early Neolithic cult figure from Urfa”)
- Hayden, B. 1998, Practical and prestige technologies: The evolution of material systems. *Journal of Archaeological Method and Theory*, 5: 1-55. doi:10.1007/BF02428415
- Healey, E. 2004, The chipped stone. *Anatolica*, 30 (special issue: Tell Kurdu Excavations 2001): 56-60.

- Healey, E. 2007, Obsidian as an indicator of inter-regional contacts and exchange: three case-studies from the Halaf period. *Anatolian Studies*, 57: 171-189.
doi:10.1017/s0066154600008590
- Healey, E. 2013, Exotic, aesthetic and powerful? The non-tool use of obsidian in the later Neolithic of the Near East. In: *Interpreting the Late Neolithic of Upper Mesopotamia*. (Nieuwenhiuyse, O.P., Bernbeck, R., Akkermans, P.M.M.G. & Rogash, J., Eds.), Brepols, Turnhout, Belgium: p. 251-266.
- Healey, E. (2016), *The lithic artefacts from the Ubaid period contexts at Kenan Tepe*. In: *The Upper Tigris Archaeological Research Project: The Ubaid Period at Kenan Tepe* (Parker, B.J., Ed.), manuscript submitted, Cotsen Institute, Los Angeles, 38 p.
- Healey, E. 2020a, The ostentatious use of obsidian in Bronze Age Mesopotamia, Anatolia and the Northern Levant. In: *Alalakh and its Neighbours. Proceedings of the 15th Anniversary Symposium at the New Hatay Archaeology Museum, 10-12 June 2015*. (Yener, K.A. & Ingman, T., Eds.), Ancient Near Eastern Studies Supplement Series, Vol. 55, Peeters, Leuven, Paris, Bristol (CT): p. 75-102.
- Healey, E. 2020b, Tell Atchana Lithics from LBII contexts. In: *Tell Atchana, Alalakh Volume 2, The Late Bronze Age II City: 2006-2010 Excavation Seasons* (Yener K.A., Akar M., Horowitz M.T., Eds.), Koç University Press, Istanbul, chapter 6: p. 167-192.
- Healey, E. & Campbell, S. 2014, Producing adornment: evidence of different levels of expertise in the production of obsidian items of adornment at two late Neolithic communities in northern Mesopotamia. *Journal of Lithic Studies*, 1(2): 79-99.
doi:10.2218/jls.v1i2.966
- Healey, E. & Campbell, S. (2021), *Innovation, adaptation or just a development? Alternative uses of obsidian the Early Neolithic of the Near East*. Manuscript submitted. In: *Proceedings of the 9th International Conference on PPN Chipped and Ground Stone Industries of the Near East Tokyo November 2019*. 17 p.
- Helms, M. 1993, *Craft and the Kingly Ideal*. University of Texas Press, Austin, Texas, 287 p.
- Hodder, I. 2012, *Entangled: An Archaeology of the Relationships between Humans and Things*. Wiley Blackwell, Malden, 252 p. doi:10.1002/9781118241912
- Hole, F., Flannery, K.V. & Neely, J.A. 1969, *Prehistory and Human Ecology of the Deh Luran Plain. An Early Village Sequence from Khuzistan, Iran. Vol. 1*. Memoirs of the Museum of Anthropology, University of Michigan, Ann Arbor, 438 p.
- Hurcombe, L. M. 2007, *Archaeological Artefacts as Material Culture*. Routledge, Abingdon and New York, 286 p.
- Ibáñez, J.-J. & Gonzales-Urquijo, J. 2011, Social and Symbolic meanings of lithic technology during the PPN in the Middle Euphrates. In: *The State of the Stone; Terminologies, Continuities and Contexts in Near Eastern Lithics* (Healey, E, Campbell, S. & Maeda, O., Eds), Studies in Early Near Eastern Production, Subsistence, and Environment (SENPSE) Vol. 13, *Ex Oriente*, Berlin: p. 147-156.
- Ibáñez J. J., Ortega, D., Campos, D., Khalidi, L., Méndez, V., & Teira, L. 2016, Developing a complex network model of obsidian exchange in the Neolithic Near East: Linear regressions, ethnographic models and archaeological data. *Paléorient*, 42(2): 9-32.
doi:10.3406/paleo.2016.5718

- Ilan, D. 2016, The ground stone components of drills in the ancient Near East: Sockets, flywheels, cobble weights, and drill bits. *Journal of Lithic Studies*, 3(3): 261-277. doi:10.2218/jls.v3i3.1642
- Jervis, B. 2019. *Assemblage Thought and Archaeology*. Routledge, Abingdon and New York, 196 p. doi:10.4324/9781315158594
- Jordan, J. & Preusser, C. 1928, Uruk-Warka: nach den Ausgrabungen durch die Deutsche Orient-Gesellschaft. J. C. Hinrichs, Leipzig, 76 p. (in German) (“Uruk-Warka: after the excavations by the German Oriental Society”)
- Kamada, H. & Ohtsu, T. 1991, Second Report on the Excavations at Songor A - Ubaid Graves. *ラーフィダーン*, *al-Rafidan*, 12: 221-248.
- Kepinski, C., Dessène, F. & Herveux, L. 2011, New evidence from Grai Resh, Northern Iraq - the 2001 and 2002 seasons. A pre-Uruk expansion site from the Late Chalcolithic period. *Zeitschrift für Orient-Archäologie, Deutsches Archäologisches Institut Orient Abteilung*, 4: 26-81.
- Keulemans, G. 2016, The geo-cultural conditions of Kintsugi, *The Journal of Modern Craft*, 9: 15-34. doi:10.1080/17496772.2016.1183946
- Khalidi, L. 2014, Fifth-millennium BC obsidian production and consumption in Area TW, Tell Brak. In: *Preludes to Urbanism. The Late Chalcolithic of Mesopotamia. In Honour of Joan Oates* (McMahon, A. & Crawford, H., Eds.), McDonald Institute for Archaeological Research, Cambridge: p. 69-88.
- Kopetzky, K. 2018, Tell El-Dabba and Byblos: New Chronological Evidence. *Egypt and the Levant*, 28: 309-358.
- Kopytoff, I. 1986, The cultural biography of things: commodification as process. In: *The Social Life of Things: Commodities in Cultural Perspective* (Appadurai, A., Ed.), Cambridge Studies in Social and Cultural Anthropology. Cambridge University Press, Cambridge: p. 64-91.
- Kremer, R. 2013, *Middle Assyrian Jewelry of Tell Sabi Abyad, Syria. Jewelry from Tell Sabi Abyad in Comparison to other Middle Assyrian Sites*. BA thesis at the Archaeology of the Near East, Leiden University, Leiden, 90 p.
- Lebeau, M. 1983, Les objets du niveau 4 de Tell el Oueili. Rapport Préliminaire. In: *Larsa (8^e et 9^e campagnes, 1978 et 1981) et Oueili (2^e et 3^e campagnes 1978 et 1981) Rapport préliminaire*, (Huot, J.-L., Ed.), Mémoire 26, Publications de la Délégation Archéologique Française en Irak, 3. Publications du Centre de Recherche d'Archéologie Orientale. Université de Paris 1 No. 4., Édition Recherche sur les civilisations, Paris: p. 133-140. (in French) (“The objects of level 4 from Tell Oueili, Preliminary report”)
- Lemonnier, P. (Ed.), 1993, *Technological Choices. Transformation in Material Cultures since the Neolithic*. Routledge, London and New York, 420 p. doi:10.4324/9781315887630
- Lemonnier, P. 2012, *Mundane Objects. Materiality and Non-Verbal Communication*. Left Coast Press, Walnut Creek, California, 203 p.
- Leroi-Gourhan, A. 1943, *L'homme et la matière*. Albin Michel, Paris, 352 p. (in French) (“Man and matter”)

- Léon, S. & Casseyras, C. 2014, Les brassards d'archer à la période de Halaf: une tentative d'interprétation des plaquettes en obsidienne et en pierre dure. *Paléorient*, 40(1): 117-134. (in French) ("Archer's bracers in the Halaf Period: An attempted interpretation of obsidian and hard stone plaques") doi:10.3406/paleo.2014.5619
- Levine, M. & Carballo, David M. (Eds.) 2014, *Obsidian Reflections. Symbolic Dimensions of Obsidian in Mesoamerica*. University Press of Colorado, Boulder. 331 p.
- Lindermeyer, E. & Martin, L. 1993, *Uruk: Kleinfunde III: Kleinfunde im Vorderasiatischen Museum zu Berlin: Steingefässe und Asphalt, Farbreste, Fritte, Glas, Holz, Knochen/Elfenbein, Muschel/Perlmutter/Schnecke Ausgrabungen in Uruk-Warka. Endberichte; Bd. 9*. von Zabern, Mainz, 325 p. (in German) ("Uruk: Small finds III: Small finds in the Vorderasiatisches Museum in Berlin. Stone vessels and asphalt, traces of paint, frit, glass, wood, bone/ivory/bones /ivory, shell/mother of pearl/snail. Excavations in Uruk-Warka. Final reports, Vol. 9")
- Lingle, A., Dell 'Unto, N., Der, L., Doyle, S., Killackey, K., Klimowicz, A., Meskell, L., Parkes, P. & Tung, B. 2015, Painted Plaster Head. In: *Çatalhöyük 2015 Archive Report* (Haddow, S., Ed.), Çatalhöyük Research Project, p. 275-289.
URL: http://www.catalhoyuk.com/sites/default/files/media/pdf/Archive_Report_2015.pdf
- Lloyd, S. 1940, Iraqi government soundings at Sinjar. *Iraq*, 6: 13-21. doi:10.2307/4241662
- Lloyd, S. & Safar, F. 1945, Tell Hassuna. Excavations by the Iraq Government Directorate of Antiquities in 1943 and 1944. *Journal of Near Eastern Studies*, 4: 255-89.
doi:10.1086/370765
- Loding, D. 1981, Lapidaries in the Ur III period. Written sources concerning stoneworkers (ca. 2000 B.C.). *Expedition*, 23(4): 6-14.
URL: <https://www.penn.museum/sites/expedition/lapidaries-in-the-ur-iii-period/>
- Ludvic, G. 2012, Stone beads of ancient Afghanistan: Stylistic and technical analysis. *Field Notes: A Journal of Collegiate Anthropology*, 3: 1-8.
URL: <https://dc.uwm.edu/fieldnotes/vol3/iss1/2>
- Ludvic, G., Kenoyer, J.M., Pieniżek, M. & Aylward, W. 2015, New perspectives on stone bead technology at Bronze Age Troy. *Anatolian Studies*, 65: 1-18.
doi:10.1017/s0066154615000046
- Ma, C. & Rossman, G.R. 2013, Nanomineralogy of gemstones: From genesis to discovery. Goldschmidt 2013 Conference abstracts, *Mineralogical Magazine*, 77(5): 1661.
doi:10.1180/minmag.2013.077.5.13
- Maeda, O. 2007, Meanings of obsidian exchange and obsidian use at Akarçay Tepe. In: *Systèmes techniques et communautés du Néolithique précéramique au Proche-Orient (Technical Systems and Near Eastern Communities)* (Astruc, L., Binder, D. & Briois, F., Eds.), Editions Association pour la promotion et la diffusion des connaissances archéologiques (APDCA), Antibes: p. 245-254.
- Maeda, O. 2013, Cultural Affinities and the Use of Lithics during the 8th to 7th millennium cal BCE in the Northern Levant and Northern Mesopotamia. In: *Interpreting the Late Neolithic of Upper Mesopotamia* (Nieuwenhuijse, O.P., Bernbeck, R., Akkermans, P.A. & Rogash, J., Eds.), Brepols, Turnhout, Belgium: p. 267-276.
- Mallowan, M. 1936, Excavations at Tall Chagar Bazar and an archaeological survey of the Habur region 1934-5. *Iraq*, 3: 1-86. doi:10.1017/s0021088900020714

- Mallowan, M. & Rose, J.C. 1935, Excavations at Tall Arpachiyah 1933. *Iraq*, 2: 1-178. doi:10.2307/4241576
- Maréchal, C. 1985, Les bracelets néolithique en pierre de Cafer Höyük (Turquie). *Cahiers de l'Euphrate*, 4: 109-115. (in French) (“Neolithic stone bracelets from Cafer Höyük (Turkey)”)
- Maréchal, C. 1995, Les éléments de parure de Tell Aswad. In: *Aswad et Ghoraiyé. Sites néolithiques en Damscene (Syrie) aux IX^{ième} et VIII^{ième} millénaires avant l'ère chrétienne* (de Contenson, H., Ed.), Institut français du Proche-Orient, Beirut: p. 129-162. (in French) (“Ornaments from Tell Aswad”) doi:10.2307/506411
- Masry, A.H. 1997, *Prehistory in Northeastern Arabia: The Problem of Interregional Interaction*. Kegan Paul International, London, 252 p.
- Mattson, H.V. 2016, Ornaments as socially valuable objects: Jewelry and identity in the Chaco and post-Chaco worlds. *Journal of Anthropological Archaeology*, 42: 122-139. doi:10.1016/j.jaa.2016.04.001
- McCown, D.E., Haines, R.C., Biggs, R.D. & Carter, E.F. 1978, *Nippur II. The North Temple and Sounding E. Excavations of the Joint Expedition to Nippur of the American Schools of Oriental Research and the Oriental Institute of the University of Chicago*. Oriental Institute Publications Vol. 97. Oriental Institute, Chicago, 105 p.
- McMahon, A., Oates, J., Al-Quntar, S., Charles, M., Colantoni, C., Hald, M.M., Karsgaard, P., Khalidi, L., Soltysiak, A., Stone, A. and Weber, J., 2007. Excavations at Tell Brak 2006-2007. *Iraq*, 69: 145-171. doi:10.1017/s0021088900001091
- Mellaart, J. 1963, Excavations at Çatal Hüyük. *Anatolian Studies*, 13: 43-103. doi:10.2307/3642490
- Mellaart, J. 1964, Excavations at Çatal Höyük 1963: third preliminary report. *Anatolian Studies*, 14: 139-119. doi:10.2307/3642466
- Mellaart, J. 1967, *Çatal Hüyük: a Neolithic Town in Anatolia*. Thames and Hudson, London and Southampton, 232 p.
- Mellaart, J. 1970, *Excavations at Hacilar*. Edinburgh University Press for the British Institute of Archaeology, Ankara, Edinburgh, 249 p.
- Merpert, N. & Munchaev, R.M. 1993a, Yarim Tepe I. In: *Early Stages in the Evolution of Mesopotamian Civilization. Soviet Excavations in Northern Iraq* (Yoffee, N. & Clark, J.J., Eds.), The University of Arizona Press, Tucson and London: p. 73-114.
- Merpert, N. & Munchaev, R.M. 1993b, Yarim Tepe II: the Halaf levels. In: *Early Stages in the Evolution of Mesopotamian Civilization. Soviet Excavations in Northern Iraq* (Yoffee, N. & Clark, J.J., Eds.), The University of Arizona Press, Tucson and London: p. 128-162.
- Merpert, N. & Munchaev, R.M. 1993c, Yarim Tepe III: The Halaf Levels. In: *Early Stages in the Evolution of Mesopotamian Civilization. Soviet Excavations in Northern Iraq* (Yoffee, N. & Clark, J.J., Eds.), The University of Arizona Press, Tucson and London: p. 163-206.
- Merpert, N. & Munchaev, R.M. 1993d, Burial Practices of the Halaf Culture. In: *Early Stages in the Evolution of Mesopotamian Civilization. Soviet Excavations in Northern Iraq* (Yoffee, N. & Clark, J.J., Eds.), The University of Arizona Press, Tucson and London: p. 207-223.

- Merpert, N. & Munchaev, R.M. 1993e, Yarim Tepe III: the Ubaid levels. In: *Early Stages in the Evolution of Mesopotamian Civilization. Soviet Excavations in Northern Iraq* (Yoffee, N. & Clark, J.J., Eds.), The University of Arizona Press, Tucson and London: p. 225-240.
- de Meyer, M. 2011, Inlaid eyes on Old Kingdom coffins: a history. *The Journal of Egyptian Archaeology*, 97: 201-203. doi:10.1177/030751331109700113
- Michel, C. 1992, Les 'diamants' du roi de Mari. *Florilegium Marianum* 1: 127-136. (in French) ("The king of Mari's 'diamonds'")
- Midant-Reynes, B., Piriou, B., & Tillier A.M. 1985, Un ensemble de sépultures en fosses fosses sous cairn à Khor (Qatar): étude des rites funéraires. *Paléorient*, 11(1): 129-144. doi:10.3406/paleo.1985.4369
- Moholy-Nagy, H. 1983, Jarmo artefacts of pecked and ground stone and of shell. In: *Prehistoric Archaeology Along the Zagros Flanks*, (Braidwood, L., Braidwood, R., Howe, B., Reed, C.A. & Watson, P.J., Eds.), Oriental Institute Publications Vol. 105. Oriental Institute, Chicago, p. 289-346.
- Molist, M., Mateu, J. & Palomo, T. 1994, Étude préliminaire sur les industries lithiques du PPNB moyen et récent de Tell Halula (Haute Vallée de l'Euphrate, Syrie). In: *Neolithic Chipped Stone Industries of the Fertile Crescent* (Gebel, H.G. & Kozłowski, S.K., Eds.) Studies in Early Near Eastern Production, Subsistence, and Environment (SENEPSE) Vol. 1. *Ex Oriente*, Berlin: p. 349-362. (in French) ("Preliminary study of the Middle and Late PPNB lithic industries from Tell Halula (Upper Euphrates Valley, Syria)")
- Molist, M., Barrachina, C. & Gangonells M. 1996, Mobiliario diverso. In: Tell Halula (Siria). Un yacimiento neolítico del Valle Medio del Éufrates. Campañas de 1991 y 1992. (Molist, M., Ed.), Ministerio de Educación y Cultura, IPHE, Madrid: p. 125-134. (in Spanish) ("Miscellaneous items")
- de Montet, P. 1928a, Les Tombeaux Contemporains de la XIIIe Dynastie. In: *Byblos et L'Égypte*, Geuthner, Paris: p. 143-148. (in French) ("The Tombs contemporary with the 12th dynasty")
- de Montet, P. 1928b, Le Mobilier Funéraire des Tombeaux I, II, III, IV. In: *Byblos et L'Égypte. Quatre Campagnes de Fouilles. 1921-1924* (de Montet, P., Ed.), Geuthner, Paris: p. 155-159. (in French) ("The funerary furniture from tombs I, II, III, IV")
- Moorey, P.R.S. 1966, A Re-Consideration of the Excavations on Tell Ingharra (East Kish), 1923-33. *Iraq*, 28(1): 18-51. doi:10.2307/4199794
- Moorey, P.R.S. 1994, *Ancient Mesopotamian Materials and Industries. The Archaeological Evidence*. Clarendon Press, Oxford, 414 p.
- Morero, E. 2015, Mycenaean Lapidary Craftsmanship: The Manufacturing Process of Stone Vases. *Annual of the British School at Athens*, 10: 121-146. doi:10.1017/s0068245415000039
- Morero, E. 2016, *Méthodes d'analyse des techniques lapidaires. Les vases de pierre en Crète à l'Age du Bronze (III^e-II^e millenaire av. J.-C.)*. Cahiers archéologiques de Paris 1 n° 4. Publications de la Sorbonne, Paris, 311 p. (in French) ("Methods of analysis of lapidary techniques. The stone vases in Crete in the Bronze Age (3rd to 2nd millennia B.C.)")
- Mortensen, P. 1970, *Tell Shimshara: the Hassuna period*. Historisk-filosofiske skrifter: 5:2. Munksgaard, København, 148 p.

- Mortensen, P. 1973, A sequence of Samarran flint and obsidian tools from Choga Mami. *Iraq*, 35: 37-55. doi:10.2307/4199950
- Moutsiou, T. 2014, *The Obsidian Evidence for the Scale of Social Life during the Palaeolithic*. British Archaeological Reports International Series Vol. 2613. Archaeopress, Oxford, 170 p.
- Moutsiou, T. 2019, Colour in the Palaeolithic. In: *The value of Colour. Material and Economic Aspects in the Ancient World* (Thavapalan, S. & Warburton, D. A., Eds.). Topoi, Berlin: p 55-68. doi:10.17171/3-70
- Müller-Neuhof, B. 2015, *Die Frühneolithischen und urukzeitlichen Silex - und Obsidianindustrien aus Tell Sheikh Hassan*. Tell Sheikh Hassan V.1. Vorderasiatisches Museum Staatliche Museen Berlin, PeWe-Verlag, Berlin, 140 p. (in German) (“The early Neolithic and Uruk flint and obsidian industries from Sheikh Hassan”)
- Naville, É. & Clermont-Ganneau, C. 1922, Le vase à parfum de Byblos. *Syria*, 3(4): 291-297. (in French) (“The perfume vase from Byblos”) doi:10.3406/syria.1922.8852
- Neumann, H. 1993, *Handwerk in Mesopotamien: Untersuchungen zu seiner Organisation in der Zeit der III. Dynastie von Ur* (2. Aufl ed.). Akademie Verlag, Berlin, xi, 206 p. (in German) (“Crafts in Mesopotamia: Investigations into their organization in third dynasty of Ur”)
- Nishiaki, Y. & Matsutani, T. (Eds.) 2003, *Tell Kosak Shamali. Vol 2. The Archaeological Investigations on the Upper Euphrates, Syria. Chalcolithic Technology and Subsistence*. UMUT Monograph Vol. 2. Oxbow Books in association with the University Museum and the University of Tokyo, Oxford, 240 p.
- Oates, D. 1959, Fort Shalmaneser, An interim report. *Iraq*, 21: 98-129. doi:10.2307/4199655
- Oates, D. & Oates, J. 1994, Tell Brak: a stratigraphic summary 1976-1993. *Iraq*, 56: 67-176. doi:10.2307/4200394
- Oates, J. 1969, Choga Mami 1967-68: A Preliminary Report. *Iraq*, 21(2): 115-152. doi:10.2307/4199877
- Oates, J. 1987, A Note on 'Ubaid and Mitanni Pottery from Tell Brak. *Iraq*, 49:193-198. doi:10.2307/4200272
- Oliveira, F.D., Boehmer, R.M., Hauptmann, H. and Bittel, K. 1983. Tülintepe: some aspects of a prehistoric village. In: *Beiträge zur Altertumskunde Kleinasien 1. Band: Text, 1*. Philipp von Zabern, Mainz: p. 51-58.
- von Oppenheim, M. & Schmidt, H. 1943, *Tell Halaf I: Die Prähistorischen Funde*, De Gruyter, Berlin, 140 p.
- Orange, M., Carter, T., Le Bourdonnec, F.-X. & Lefrais, Y. 2012, *Obsidian economy in Neolithic Syria: The case of Tell Aswad (Middle/Late PPNB)* (Poster). Presented at the ASAS Symposium 2012. URL: https://www.academia.edu/18216946/ASAS_2012
- Özdoğan, A. 1999, Çayönü, In: *Neolithic in Turkey. The Cradle of Civilization, New Discoveries*, (Özdoğan, M. & Başgelen N., Eds.), Ancient Civilization Series, 3. Arkeoloji ve Sanat Yayınları, Istanbul: p. 35-63.
- Özdoğan, E. 2006, Neolithic Beads of Anatolia: An Overview. *Anatolian Metal 7, Der Anschnitt*, 31: 135-151.

- Özguç, N. 1988, Samsat kazıları 1987. *Belleten Turk Tarih Kurumu*, 52(202): 291-294. (in Turkish) (“Samsat excavations 1987”)
- Özguç, N. 1996, An obsidian storehouse close to the temples built by Anitta, king of Nese. In: *Collectanea orientalia: histoire, arts de l'espace en industries de la terre. Études Offerts en Hommage à Agnès Spyket* (Gasche, H. & Hroudá, B., Eds.), Recherches et publications, Neuchâtel and Paris: p. 279-283.
- Özguç, T. 1986, *Kultepe-Kaniş II. New Researches at the Trading Centre of the Ancient Near East*. Türk Tarih Kumuru Basimevi, Ankara, 123 p.
- Özguç, T. 1999, *The Palaces and Temples of Kültepe-Kaniş/Neša*. Türk Tarih Kumuru Basimevi, Ankara, 160 p.
- Özkaya, V. & Coşkun, A. 2011, Körtik Tepe. In: *The Neolithic in Turkey*. Vol. 1 (Özdoğan, M., Başgelen, N. & Kuniholm P., Eds.), Archaeology and Art Publications, Istanbul: p. 89-127.
- Özten, A. 1988, Acem Taş Kapları. *Bulletin*, 52(203): 393-405. (in Turkish) (“Acemhöyük, stone vessels”)
- Palumbi, G., Gratuze, B., Harutyunyan, A. & Chataigner, C. 2014, Obsidian-tempered pottery in the Southern Caucasus: a new approach to obsidian as a ceramic-temper. *Journal of Archaeological Science*, 44: 43-54. doi:10.1016/j.jas.2014.01.017
- Palumbi, G., Guilbeau, D., Astruc, L., Chataigner, C., Gratuze, B., Lyonnet, B. & Pulitani, G. 2018, Between cooking and knapping in the southern Caucasus: Obsidian-tempered ceramics from Aratashen (Armenia) and Mentesh Tepe (Azerbaijan). *Quaternary International*, 468: 121-133. doi:10.1016/j.jas.2014.01.017
- Parker, B.J & Dodd, L. 2005, The Upper Tigris Archaeological Research Project A Preliminary Report from the 2002 Field Season. *Anatolica*, 31: 69-110. doi:10.2143/ANA.31.0.2011752
- Parker, B.J., Foster, C.P., Nicoll, K., Kennedy, J.R., Graham, P., Smith, A., Hopwood, D.E., Hopwood, M., Butler, K., Healey, E., Uzel, M.B., Jensen, R., 2009, The Upper Tigris archaeological research project (UTARP): a preliminary report from the 2007 and 2008 field seasons at Kenan Tepe. *Anatolica*, 35: 85-152. doi:10.2143/ana.35.0.2038073
- Parrot, A. 1948, *Tello: vingt campagnes de fouilles 1877-1933*. Albin Michel, Paris, 368 p. (in French) (“Tello: Twenty campaigns of excavation 1877-1933”)
- Pétrequin, P. & Pétrequin, A.-M. 2020, *Ecology of a Tool. The Ground Stone Axes of Irian Jaya, Indonesia*. Oxbow, Oxford and Philadelphia, 310 p.
- Petrie, S.F. 1932, *Ancient Gaza Tell el-Ajjul I to IV*. British School of Archaeology in Egypt, London, 104 p.
- Petrie, S.F. 1934, *Ancient Gaza IV*. British School of Egyptian Archaeology. Publications series, Vol. 64. British School of Egyptian Archaeology: Quatitch, 21 p.
- Petrie, S.F., Mackay, E. & Murray, M. 1952, *City of Shepherd Kings, and, Ancient Gaza V*. British School of Egyptian Archaeology. Publications series, Vol. 64. British School of Egyptian Archaeology: Quatitch, 44 p.
- Pfaffenberger, B. 1992, Social Anthropology of Technology. *Annual Review of Anthropology*, 21: 491-516. doi:10.1146/annurev.an.21.100192.002423

- Porada, E. 2014, Why Cylinder Seals? Engraved Cylindrical Seal Stones of the Ancient Near East, fourth to first millennium B.C. *The Art Bulletin*, 75: 563-582.
doi:10.2307/3045984
- Postgate, J.N. 1997, Mesopotamian petrology: Stages in the classification of the material world. *Cambridge Archaeological Journal*, 7(2): 205-224.
doi:10.1017/s0959774300001943
- Potts, D.T. 2016, (2nd edition), *The Archaeology of Elam: Formation and Transformation of an Ancient Iranian State*. Cambridge World Archaeology, Cambridge University Press, Cambridge, 485 p. doi:10.1017/CBO9781316148501
- Prausnitz, M.W. 1969, The excavations at Kabri. *Eretz Israel*, 9: 122-129.
- Rainey, A.F. & Schniedewind, W.M. 2015, *The El-Amarna Correspondence: a new edition of the Cuneiform letters from the site of El-Amarna based on collations of all extant tablets. Handbuch der Orientalistik, 1. Abt., Nahe und der Mittlere Osten v. 110 (2 volumes)*, Brill, Leiden, Boston, 1671 p. doi:10.1017/s0364009400010473
- Renfrew, C., & Dixon, J.E. 1976, Obsidian in western Asia: a review. In: *Problems in Economic and Social Archaeology* (Sieveking G. de G., Longworth I.H., & Wilson K.E., Eds.), Duckworth, London: p. 137-50.
- Renfrew, C., Dixon, J.E. & Cann, J.R. 1966, Obsidian and early cultural contact in the Near East. *Proceedings of the Prehistoric Society*, 32: 30-71.
doi:10.1017/s0079497x0001433x
- Renfrew, C., Cann J. R., & Dixon, J. 1968. Further Analysis of Near Eastern Obsidians. *Proceedings of the Prehistoric Society* 34: 319-331. doi:10.1017/S0079497X0001392X
- Richard, S. & D'Andrea, M. 2004, A Syrian Goblet at Khirbat is-Kandar, Jordan: a study of interconnectivity in the EBIII/IV period. *Studies in the History and Archaeology of Jordan*, 12 (Transparent Borders): 561-586.
URL: <http://publication.doa.gov.jo/Publications/ViewChapterPublic/28>
- Richardson, A. 2019, Pre-pottery clay innovations in the Zagros foothills. *Oxford Journal of Archaeology*, 38(1): 2-17. doi:10.1111/ojoa.12155
- Richardson, A. 2020, Material Culture and Networks of Bestansur and Shimshara. In: *The Early Neolithic of the Eastern Fertile Crescent. Excavations at Bestansur and Shimshara, Iraqi Kurdistan* (Matthews, R., Matthews, W., Rasheed Raheem, K. & Richardson, A., Eds.), Oxbow books, Oxford and Philadelphia: p. 533-566.
- Robb, J. 2015, What do things want? Object design as a middle range theory of material culture. *Archaeological Papers of the American Anthropological Association*, 26: 166-180. doi:10.1111/apaa.12069
- Robin, A.-K, Mouralis, D., Kuzucuoğlu, C., Akköprü, E., Gratuze, B., Doğu, A., Erturaç, K., Cétoute, J. 2015, "Les affleurements d'obsidiennes du Nemrut (Anatolie Orientale): Mise en évidence d'une source exploitable, premiers résultats." *Géomorphologie*, 21(3): 217-234. (in French) ("The obsidian outcrops from Nemrut (Eastern Anatolia): identification of an exploitation source, preliminary results")
doi:10.4000/geomorphologie.11055

- Robin, A.-K., Mouralis, D., Akköprü, E., Gratuze, B., Kuzucuoğlu, C., Nomade, S., Pereira, A., Doğu, A.F., Erturaç, K., Khalidi, L. 2016, Identification and characterization of two new obsidian sub-sources in the Nemrut Volcano (Eastern Anatolia, Turkey): The Sıcaksu and Kayacık obsidian, *Journal of Archaeological Science: Reports*, 9: 705-17. doi:10.1016/j.jasrep.2016.08.048
- Robinson, D. 2004, The mirror of the sun. Surface, mineral applications and interface in California Rock-Art. In: *Soils, Stones and Symbols. Cultural Perceptions of the Mineral World*. (Boivin, N. & Owoc, M.A., Eds.), Routledge, Oxford: p. 91-105.
- de Romanis, F. 1996, *Cassia, Cinnamomo, Ossidiana. Uomini e Merci tra Oceano Indiano e Mediterraneo*. Saggi di Storia Antica 9. “L’Erma” di Bretshneider, Rome: 324 p. (in Italian) (“Cassia Cinnamon Obsidian. Men and goods between the Indian and Mediterranean Oceans”)
- Roodenberg, J.J. 1986, *Le Mobilier en Pierre de Bouqras. Utilisation de la Pierre dans le Néolithique du Moyen Euphrate*. Nederlands Historisch-Archaeologisch Instituut, Istanbul, 207 p. (in French) (“Stone objects from Bouqras. The use of stone in the Neolithic of the Middle Euphrates”)
- Rothman, M. 2002, *Tepe Gawra. The Evolution of a Small Prehistoric Centre in Northern Iraq*. Museum of Archaeology and Anthropology, Philadelphia, 494 p.
- Roux, V. (ed.) 2000, *Cornaline de l’Inde. Des pratiques techniques de Cambray aux techno-systèmes e l’Indus*. Éditions de la Maison des sciences de l’homme, Paris: 545 p. (in French) (“Carnelian in India, from Cambray’s technical practices to Indus techno-systems”)
- Safar, F., Mustafa, M.A. & Lloyd, S. 1981, *Eridu*. Baghdad State Organisation of Antiquities and Heritage (Ministry of Culture and Information), Baghdad, 360 p.
- Said, M. 2020, Radiance and the power of erasure in an obsidian lamaštu amulet. *Metropolitan Museum Journal*, 55: 100-111. doi:10.1086/712773
- Sasaki, T. 1981, Remaining objects; other finds. In *Telul eth-Thalathat (Fukai, S. Matustani, T. & Horiuchi K., Eds.)*, The Institute of Oriental Culture, The University of Tokyo, Tokyo: p. 54-60.
- Saunders, N.J. 2001, A Dark Light: Reflections on Obsidian in Mesoamerica. *World Archaeology*, 33(2): 220-236. doi:10.1080/00438240120079262
- Schechter, H., Gopher, A., Getzov, N., Rice, E., Yaroshevich, A. & Milevski, I. 2016, The obsidian assemblages from the Wadi Rabah occupations at Ein Ziporri, Israel. *Paléorient*, 42(1): 27-48. doi:10.3406/paleo.2016.5692
- Schechter, H., Marder, O., Barkai, R., Getzov, N. & Gopher, A. 2013, The obsidian assemblage from Neolithic Hagoshrim, Israel: pressure technology and cultural influence. In: *Stone Tools in Transition: From Hunter-Gatherers to Farming Societies in the Near East* (Borrell, F., Ibáñez, J.-J. & Molist, M., Eds.), Universitat Autònoma de Barcelona, Servei de Publicacions, Bellaterra, Barcelona: p. 509-528.
- Sela, A. & Roux, V. 2000, La perforation des perles en calcédoine: approche mécanique des techniques harappéennes. In *Cornaline de l’Inde. Des pratiques techniques de Cambray aux techno-systèmes de l’Indus*. (Roux, V., Ed.), Éditions de la Maison des sciences de l’homme, Paris: p. 173-204 (in French) (“The perforation of chalcedony beads: mechanical approaches to Harappan techniques”)

- Sheridan, A. 2017, Towards a methodology for the study of prehistoric jet and jet-like jewellery. In: *Written in Stone. Papers on Function, Form, and Provenancing of Prehistoric Stone Objects in Memory of Fiona Roe* (Shaffrey, R., Ed.), The Highfield Press, St Andrews: p. 249-274.
- Shimelmitz, R., Friesem, D.E., Clark, J.L., Groman-Yaroslavski, I., Weissbrod, L., Porat, N. & Handel, A.W. 2017, The Upper Paleolithic and Epipaleolithic of Sefunim Cave, Israel. *Quaternary International*, 464 Part A: 106-125. doi:10.1016/j.quaint.2017.05.039
- Sparks, R.T. 2001, Stone Vessel Workshops in the Levant: Luxury Products of a Cosmopolitan Age. In: *The Social Context of Technological Change. Proceedings of a Conference Held at St Edmund Hall, Oxford 12-14 September 2000* (Shortland, A. J., Ed.), Oxbow, Oxford: p. 93-112.
- Sparks, R.T. 2007, *Stone Vessels in the Levant*. Routledge, London and New York, 512 p. doi:10.4324/9781315087665
- Stein, G. 2010, *Tell Zeidan*. University of Chicago Annual Report 2009-2010: p. 105-118.
- Stocks, D.A. 1993, Making stone vessels in ancient Mesopotamia and Egypt. *Antiquity*, 67: 567-603. doi:10.1017/s0003598x00045804
- Stout, D. 2002, Skill and cognition in stone tool production: an ethnographic case study from Irian Jaya. *Current Anthropology*, 43(5): 693-722. doi:10.1086/342638
- Stronach, D. 1961, Excavations at Ras al'Amiya. *Iraq*, 23: 95-137. doi:10.2307/4199702
- Süel, A. 1998, Ortaköy-Şapinuwa: Bir Hitit Merkezi. *Tüba-ar*, I: 37-60 (in Turkish) ("Ortaköy-Şapinuwa: A Hittite Centre") doi:10.22520/tubaar.1998.0004
- Süel, A. 2002, Ortaköy Şapinuwa. In: *Recent Developments in Hittite Archaeology and History* (Güterbock, H.G., Yener, K.A., Hoffner, H.A. & Dhesi, S., Eds.), Eisenbrauns, Winona Lake: p. 157-166.
- Taçon, P. 1991, The power of stone: symbolic aspects of stone use and tool development in western Arnhem Land, Australia. *Antiquity*, 65: 192-207. doi:10.1017/s0003598x00079655
- Talbot, G.C. 1983, Beads and pendants from the Tell and Tombs. Appendix K. In: *Excavations at Jericho*, Vol. 5 (Kenyon, K. & Holland, T.A., Eds.), British School of Archaeology in Jerusalem, London: p. 788-801.
- Tawil, H. 2006, Two biblical architectural images in the light of cuneiform sources (Lexicographical note 10), *Bulletin of the American Schools of Oriental Research (BASOR)*, 341: 37-52. doi:10.1086/basor25066932
- Thalmann, J.-P. 2006a, Obsidian at Tell Arqa, North Lebanon: a stop-over point on a trade route? *Baghdader Mitteilungen*, 37: 575-92.
- Thalmann, J.-P. 2006b, *Tell Arqa I. Les niveau de l'age du Bronze*. Bibliothèque Archéologique et Historique, T.177, Institut Français du Proche Orient, Beirut, 256 p. (In French) ("Tell Arqa I. The Bronze Age levels")
- Thomas, J., (Ed.), 2000, *Interpretative Archaeology. A Reader*. Leicester University Press, London and New York, 622 p.

- Thuesen, I. 1981, The chipped stone industry of Tell Razuk. In: *Uch Tepe I. Tell Razuk Tell Ahmed al-Mughir, Tell Ajamat* (Gibson, M., Ed.), The State Organisation of Antiquities and Heritage, Baghdad. Hamrin Report 10, Ministry of Culture and Information, Republic of Iraq, Oriental Institute Chicago, Institute of Assyriology Copenhagen, and the Institute of Classical and Near Eastern Archaeology, Chicago and Copenhagen: p. 88-98.
- Tixier, J. 1982, Nucléus-pendentif de Suse. *Paléorient*, 8(2): 109-10. (in French) (“Core pendant from Susa”). doi:10.3406/paleo.1982.4327
- Tobler, A.J. 1950, *Excavations at Tepe Gawra. Vol. II, Levels IX-XX*. University of Pennsylvania Press, Philadelphia, 260 p.
- Torrence, R. 2005, Valued stone - how so? In: *Many Exchanges: archaeology, history and community and the work of Isabel McBryde*, (Macfarlane, I., Mountain, M.-J. & Paton, R., Eds.), Aboriginal History Monograph 1, Australian National University, Canberra: p. 357-372. doi:10.1017/s0003598x00094709
- Torrence, R., Swadling, P., Kononenko, N., Ambrose, W., Rath, P. & Glascock, D.M. 2009, Mid-Holocene social interaction in Melanesia: New evidence from hammer-dressed obsidian stemmed tools. *Asian Perspectives*, 48: 119-148. doi:10.1353/asi.0.0014
- Tsuneki, A., Arimura, M., Maeda, O., Tanno, K.I. & Anezaki, T. 2006, The Early PPNB in The North Levant: A New Perspective from Tell Ain el-Kerkh, Northwest Syria. *Paléorient*, 32: 47-71. doi:10.3406/paleo.2006.5170
- Tuffen, H., Flude, S., Berlo, K., Wadsworth, F. & Castro, J. 2020, Obsidian. In: *Elsevier Reference Collection: Earth Systems and Environmental Sciences Encyclopaedia of Geology (2nd edition)*, 1-13. Elsevier. doi:10.1016/b978-0-12-409548-9.12527-8
- Unger-Hamilton, R., Grace, R., Miller, R. & Bergman, C. 1987, Drill bits from Abu Salabikh, Iraq. In: *La Main et l'Outil. Manches et emmanchements préhistoriques. Table Ronde C.N.R.S. tenue à Lyon du 26 au 29 novembre 1984* (Stordeur, D., Ed.), Travaux de la Maison de l'Orient 15, Maison de l'Orient et de la Méditerranée Jean Pouilloux, Lyon: p. 269-285.
- Ünlüsoy, S. 2002, Neolithische und chalkolithische Steinarmringe: Untersuchungen zur Chronologie und Verreitung von Steinarmringen im Nahen Osten und in der Ägäis. In: *Mauer Schau. Festschrift für Manfred Korfmann, Vol. 2* (Aslan R. S., Blum, S., Kastl, G., Schweizer, F. & Thumm, D., Eds.), Verlag Bernhard Albert Greiner, Remshalden-Grünbach: p. 541-566. (in German) (“Neolithic and Chalcolithic stone arm rings: research into the chronology and distribution of stone armrings in the Near East and Aegean”)
- Valdés, C.P. 1995, Pequeños objetos del ajuar de las dos tumbas del locus 12 de Tell Qara Quzaq, Siria, campaña de 1992. *Aula Orientalis*, 13: 59-66. (in Spanish) (“Small items from the trousseau of the two graves at locus 12 of Tell Qara Quzaq, Syria, 1992 campaign”)
- Vardi, J., Yegorov, D. & Khalaily, H. 2020, Daily life at the Final Pre-Pottery Neolithic B megasite of Motza (Judean Hills) based on the material culture. In: *The Mega Project at Motza (Moza): The Neolithic and Later Occupations up to the 20th Century* (Khalaily, H., Re'em, A., Vardi, J. & Milevski, I., Eds.), New Studies in the Archaeology of Jerusalem and its Region, Israel Antiquities Authority, Jerusalem: p. 101-130.

- Vedder, J.F. with Swogger, J.G.H. 2005, The obsidian mirrors of Çatalhöyük. In: *Changing Materialities at Çatalhöyük: Reports from the 1995-99 seasons* (Hodder, I., Ed.), Çatalhöyük Research Project Vol. 5; British Institute at Ankara (BIAA) Monograph 39, British Institute at Ankara: p. 597-619.
- Virolleaud, C. 1922, Découverte à Byblos d'un Hypogée de la douzième Dynastie Égyptienne, *Syria* 3: 273-290. (in French) ("Discovery of an hypogeum from the twelfth Egyptian Dynasty in Byblos"). doi:10.3406/syria.1922.8851
- Vit, J. & Rappenglück, M. A. 2016, Looking through a telescope with an obsidian mirror. Could specialists of ancient cultures have been able to view the night sky using such an instrument? *Mediterranean Archaeology and Archaeometry*, 16(4): 7-15. doi:10.5281/zenodo.207255
- el Wailly, F. & Abu Soof, B. 1965, Excavations at Tell es Sawwan. *Sumer*, 21: 17-32.
- Wartke, Ralf-B. 1999. Les objets de parure de la tombe n° 45 à Assur. In: *Cornaline Et Pierres Précieuses: La Méditerranée de l' Antiquité à l' Islam* (Caubert, A., Ed.) Musée du Louvre, Paris: p. 317-40. (in French) ("Adornment objects from tomb n° 45 in Assur")
- Watkins, T. 2008, Supra-regional networks in the Neolithic of south west Asia. *Journal of World Prehistory*, 21(1):139-171. doi:10.1007/s10963-008-9013-z
- Watkins, T. 2010, New light on the Neolithic revolution in south-west Asia. *Antiquity*, 84(325): 621-634. doi:10.1017/S0003598X00100122
- Watson, P.J. 1983, The soundings at Banahilk. Chipped stone industry. Chapter 17. In: *Prehistoric Archaeology along the Zagros Flanks*, (Braidwood, L., Braidwood, R., Howe, B., Reed, C.A. & Watson, P.J., Eds.), Chicago University Press, Oriental Institute Publication, Vol. 105. Oriental Institute, Chicago: p. 569-575.
- Wentzel van Huyssteen, J. 2014, The historical self: Memory and religion at Çatalhöyük. In: *Religion at Work in a Neolithic Society: Vital Matters* (Hodder, I., Ed.), Cambridge University Press, Cambridge: p.109-133. doi:10.1017/cbo9781107239043.007
- White, R. 2007, Systems of personal ornamentation in the Early Upper Palaeolithic: Methodological challenges and new observations. In: *Rethinking the Human Revolution: New Behavioural and Biological Perspectives on the Origin and Dispersal of Modern Humans* (Mellars, P., Boyle, K., Bar-Yosef, O. & Stringer, C., Eds.), McDonald Institute Monographs, McDonald Institute for Archaeological Research, Cambridge: p. 287-302
- White, R. & Beaudry, M.C. 2008, Artifacts and personal identity. In: *International Handbook of Historical Archaeology* (Gaimster, D. & Majewski, T., Eds.), Springer, New York: p. 209-25.
- Williams-Thorpe, O. 1995, Obsidian in the Mediterranean and Near East: A provenancing success story. *Archaeometry*, 37: 217-248. doi:10.1111/j.1475-4754.1995.tb00740.x
- Winter, I. J. 1999, The aesthetic value of lapis lazuli in Mesopotamia. In: *Cornaline et Pierres Précieuses: La Méditerranée de l' Antiquité à l' Islam* (Caubert, A., Ed.), Musée du Louvre, Paris: p. 43-58.
- Woodward, A. & Hunter, J. 2015, *Ritual in Early Bronze Age grave goods. An examination of ritual and dress equipment from Chalcolithic and Early Bronze Age graves in England*. Oxbow Books, Oxford and Philadelphia, 578 p. doi:10.15184/aqy.2016.10

- Woolley, C. L. 1934, *Ur Excavations: Volume II, the Royal Cemetery: a Report on the Predynastic and Sargonid Graves Excavated Between 1926 and 1931*. The British Museum and the University Museum of Pennsylvania. London and Philadelphia, 604 p.
- Woolley, C. L., 1955a, *Ur Excavations Volume IV. The Early Periods: A Report on the Sites and Objects Prior in Date to the Third Dynasty of Ur Discovered in the Course of the Excavations*. The British Museum and the Museum of the University of Pennsylvania to Mesopotamia, Philadelphia, 225 p.
- Woolley, C. L. 1955b, *Alalakh: An Account of the Excavations at Tell Atchana in the Hatay, 1937-1949*. Society of Antiquaries, London, 411 p.
- Woolley, C. L. 1974, *Ur Excavations VI: The Buildings of the Third Dynasty*. The Trustees of the Two Museums: The British Museum and the University Museum of Pennsylvania. London and Philadelphia, 110 p.
- Wright, K. & Garrard, A. 2003, Social identities and the expansion of stone bead-making in Neolithic Western Asia: New evidence from Jordan. *Antiquity*, 77(296): 267-284. doi:10.1017/s0003598x00092267
- Wright, K.I. , Critchley, P., Garrard, A., with contributions by Baird, D., Bains, R. & Groom, S. 2008, Stone bead technologies and early craft specialization: Insights from two Neolithic sites in eastern Jordan. *Levant*, 40: 131. doi:10.1179/175638008x348016
- Yelözer, S. & Sönmez, D. 2018, Continuity and change through personal ornaments: Aşıklı Höyük, Central Anatolia, Turkey. *Routes de l'Orient*, Actes 1: 169-206.
- Yener, K.A., Edens, C., & Cassana, J., Diebold, B., Ekstrom, H., Loyet, M. & Özbal, R. 2000a, Tell Kurdu excavations 1999. *Anatolica*, 26: 31-118. doi:10.2143/ana.26.0.2015494
- Yener, K.A., Edens, C., Harrison, T.P., Verstraete, J. & Wilkinson, T.J. 2000b, The Amuq Valley Regional Project 1955-1998. *American Journal of Archaeology*, 104: 163-220. doi:10.2307/507449
- Zarins, J. 1987, Obsidian and the Red Sea trade. *South Asian Archaeology*, 1: 507-541.
- Zarins, J. 1989, Ancient Egypt and the Red Sea Trade: The case for obsidian in the Predynastic and Archaic periods. In: *Essays in Ancient Civilization Presented to Helene J. Kantor* (Leonard, A.J. & Williams, B., Eds.), Chicago: p. 339-368.