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Halaf bead, pendant and seal 'workshops' at Domuztepe: technological and reductive strategies.

Ellen H. Belcher

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Halaf bead, pendant and seal ‘workshops’
at Domuztepe: technological and reductive strategies

Ellen H. Belcher

Abstract

Almost a thousand beads, pendants and seals have been excavated from the site of Domuztepe over the past decade. This paper is based on an examination of the general typology and technology of this assemblage. Manufacturing systems based upon social networks of decentralised organisation of small production ‘workshops’ are explored. It is suggested that these networks shared a system of sequenced actions according to raw material and finished products. A group of unfinished beads in the preliminary phase of production suggests evidence of batched reductive and finishing strategies that balanced breakage risk with a high level of proficiency. At Domuztepe the reduction sequences proposed here would have required tools for pecking, cutting, snapping, perforating, grinding and polishing of stones to create beads, pendants and seals of great quantity and variety. This paper is intended to open a dialogue between small finds and lithic specialists about the technological processes and tools used to create stone ornaments in the Neolithic Near East.

Introduction

The beads, pendants and seals found at Domuztepe, a large sixth millennium BC site in south-east Turkey, in many ways comprise a typical Halaf ornament assemblage although the quantity and quality of the corpus, as well as diversity of raw materials, are particularly remarkable (Belcher in prep.). This paper looks at some of the technological aspects of beads, pendants and seals (as a group here referred to as ornaments) from Domuztepe in terms of both the utilisation of raw materials and the evidence for the methods of manufacture of final products. The nature of the organisation of production in which stone workers produced these ornaments, the sequenced actions employed in their manufacture as well as the tools likely to have been utilised will also be discussed.

A preliminary reconstruction of the collective processes involved in the creation of these objects is also considered. Rather than suggest a new word, the term workshop is retained in this paper with the suggestion that we should consider its embedded meaning and perhaps start using new terms with the aim of moving toward more practical and holistic perspectives on ornament manufacture.

Domuztepe: background and region

Located in the foothills of the Amanus Mountains, Domuztepe is one of the western–most excavated sites within the Halaf (6th millennium cal. BC) cultural horizon (Campbell et al. 1999; Campbell and Carter 2006). The site is in close proximity to an assortment of organic, mineral and metallurgical resources as well as near to natural trading routes along riverine valleys and mountain passes (Eissenstat 2004, 196). Beads often produce evidence of the extent of acquisition of raw materials (e.g. Pinnock 1993; Santallier et al. 1997) and

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the assemblage at Domuztepe certainly demonstrates the acquisition of a wide array of rocks and minerals. Definitive identification by scientific analysis is on-going with preliminary results, based on scientific analyses of beads with a variety of methods including Raman Spectroscopy at the British Museum, and Portable X-Ray Fluorescence on site (Lehner pers. comm.) along with macroscopic comparisons, suggest the exploitation of mineral and metallurgical resources from both near and distant sources. Nearby examples include limestone and serpentineite while more distant examples include silver (Yener et al. forthcoming) and obsidian (Healey 2000; Healey and Campbell 2009). Informal site-catchment surveys of the hillsides to the west of Domuztepe have indicated the local availability of a variety of minerals, especially variously coloured silicates, basalt and serpentineite. These stones are represented in great number amongst the artefacts excavated. Raman Spectroscopy of some of the Domuztepe serpentineite beads undertaken by the British Museum suggests that the stones may have come from several sources. In the Kahramanmaraş and Gaziantep provinces mining of silicates, serpentinites and carbonates can be seen today along the modern roads in this geologically rich area (cf. M.T.A. 1994).

Among the great quantity of ornaments excavated at Domuztepe, many display quite complex manufacturing techniques and a few unfinished examples present clues to their creation and use. The transformation of a variety of stones into complete objects seems to have been a skilled endeavour common amongst those living at prehistoric Domuztepe. The broad distribution of these objects within the whole range of excavated contexts indicates their integration into the daily patterns of village life, perhaps ornamenting the garments, hair and appendages of adults, children, animals and architectural features. In addition to decoration, the beads, pendants and seals must have carried symbolic and cultural meaning, and perhaps connotations related to the geographical region from which the raw materials came. (e.g. amongst others Fisher 1984; Sciaama and Eicher 2001; Belcher and Croucher in prep.).

Stone-working was not confined to beads, pendants and seals. Domuztepe was also a centre for extensive stone vessel and tool production, which also exploited a wide variety of raw materials. The manufacturing process of all of these objects involved reducing larger pieces of stone into smaller workable shapes, producingdebitage and by-products potentially useful in the creation of other objects. The curation of by-products from manufacturing to re-work into smaller objects has also been found in the ethno-archaeological excavations of modern bead workshops in Khabhhat, India (Vidale et al. 1993).

The beads, pendants and seals from Domuztepe

Ten years of excavation have revealed nearly one thousand beads, pendants and seals at Domuztepe of which more than two thirds were beads. These numbers reflect widespread manufacture and consumption of ornaments. The ornaments were found scattered in many contexts on site. So far, almost none have been found in identifiable clusters except for a concentration of identical white beads found during the 2008 season (Campbell 2008). Perhaps most remarkable is the variety of types and subtypes present as well as the abundance of raw materials from which they were fashioned. Many objects at Domuztepe appear to have had multiple functional and possibly symbolic applications. For example, pierced figurines also work as pendants, seals could be worn as pendants or buttons, and incised pendants probably could have also functioned as seals.

A representative sample of the smallest beads was recovered by analysis of the heavy residues from systematic sampling of a variety of contexts. Sixty litre whole-earth samples were taken from all stratigraphically well-defined deposits and larger samples, sometimes reaching 100% (from the Death Pit, for example) were taken from specific sealed contexts. Beads and other artefacts were retrieved from careful hand-sorting of the heavy residue of these samples after flotation. Many of the larger beads as well as seals and pendants were recovered during excavation, as well as a surprising number of tiny examples discovered by sharp-eyed workmen. As a consequence of these strategies, the greatest proportion of our recovered beads is the smallest type, i.e. disc beads generally measuring less than 2–3 mm in diameter. Based on the numbers recovered from the controlled samples we can be reasonably sure that hundreds of thousands, or even millions, of tiny disc beads were lost during the prehistoric occupation and are buried in the soil.

Because most of the beads recovered at Domuztepe are complete it seems logical to assume that these beads were lost from their original context of use because the fibre on which they were threaded broke. Modern Anatolian ethnographic dress, visible in many museums and villages in Turkey today, present plenty of examples of the incorporation of small groups of beads threaded together, particularly on the edges of garments. There is also ethnographic evidence for the use of ornaments to adorn animals, architecture and vehicles. It is possible that adornments were constructed so that, if a string broke, only a few beads were scattered, and so the loss may not even have been noticed as it would not noticeably affect the overall integrity of the ornamentation. The stringing of beads in small groups to decorate garments seems probable at prehistoric Domuztepe, where most beads are found singly.

An example might be seen at Domuztepe in Level 5a–b of the ‘Death Pit’, which yielded a great variety of small beads. This was an intra-mural mass burial pit filled with disarticulated animal and human remains, and some fill transferred from other locations (for the most recent descriptions of the Death Pit see Kansa et al. 2009; Campbell and Healey this volume). It was an area of concentrated activity where a large amount of disarticulated human and animal bones and soil were deposited in a wet matrix perhaps by persons with garments decorated with beads. It is possible that the beads fell from these garments and became accidentally incorporated in the deposit, although the possibility that the beads found there had been re-deposited as part of the matrix used as pit-fill cannot be discounted.
A Domuztepe bead ‘workshop’ or staging area?
A concentration of 15 unfinished beads or bead-blanks was found in a small area, adjacent to the ‘Burnt Structure’ excavated in 2002 and 2005 (Figs 1–3). This is an agglomeration of ephemeral structures created of matting, reeds and wood apparently used and reused for different activities. These adjacent structures were eventually destroyed by fire which preserved evidence of the superstructure as well as objects on the plaster and earth floors (Campbell and Carter 2006). Perhaps these bead blanks had been stored in a bag or basket or were on a small work-surface that was destroyed in the fire. Given their uniform size and characteristics, these blanks seem to be part of a phased and batched system of bead production. Because of this discovery, we have tentatively identified this area as a bead workshop.

Additional evidence for this locus as a work area are a total of 16 thin tabular obsidian objects (5 square and 11 rectangular, some of which are partially ground) tentatively identified as pendant blanks (Fig. 4b) as well as a tear-drop shaped flake of obsidian, which may be an unfinished pendant, with some grinding on its surface and edges, a considerable amount of obsidian debitage and several obsidian and flint drills (Fig. 4a) and other flint artefacts. While we are tentatively calling this a work area, it is equally possible that all of these objects could have been produced elsewhere and stored in this location for completion somewhere else. Analysis of the obsidian debitage and micro-debitage recovered in this area is on-going, which may help to establish whether this was in fact an in situ production area (Healey pers. comm.).

Reduction sequences of Domuztepe beads
The concentration of bead blanks described above suggests that the manufacturing sequence of hard-stone beads began with the formation of rough-outs. Grinding on the flat ends suggests preparation for perforation before further reduction of the overall shape. Perhaps the larger size of the blanks made them easier to perforate or perforation belonged in the earlier stages of the sequence because it carried the largest risk of breakage. While we are missing satisfactory examples of the stages of perforation and further production between these and the finished hard-stone beads at Domuztepe, further reduction included grinding and polishing of the sides, which were sometimes carinated (Fig. 5). These blanks fit well with other more fully-known production and reduction sequences published from other sites in which rough-outs...
precede perforation, which is followed by further reduction and finishing. Examples of similar sequences include lapis bead-making at Mehrgarah, Pakistan (Tosi and Vidale 1990), carnelian bead-making at Larsa (Chevalier et al. 1982) and at Kumartepe (Grace 1989) as well as modern agate bead production in Khambhat (Vidale et al. 1993). The bead reduction sequences at these other sites indicate that the final size of the finished bead is significantly smaller than the size of the first 'rough outs'. This is consistent with known obsidian disc beads at Domuztepe which were shaped by flaking and finished by grinding and polishing to measure around 3-5mm in diameter when completed. By contrast, the 'blanks' measure up to 20mm in diameter – ten times the size of their finished counterparts (compare Figs 2 and 5).

A close study of the other disc beads from Domuztepe has revealed that consistent sequenced actions were utilised in their manufacture included flaking, cutting, abrasion, grinding, perforation and polishing. Most of these actions were performed by tools including abrasives, perforators (which could have been of stone, wood or bone), serrated edges and ground stone tools. Each sequence appears to be specific to the type of mineral worked.
Disc beads of untreated, dark coloured serpentinite appear to have been cut or snapped off a rod following piercing. The jagged remains of stone protruding at one edge of the hole (where it was not later ground off) provides evidence of this technique (Fig.6b). White soft stone beads – some of which have been identified as heat-treated serpentinite – appear to have been cut from a rod. For these soft disc beads, there was no further finishing of the flat end, which often bears cut marks (Fig. 7). The sides were only minimally finished, sometimes being polished to a concave shape but more often left straight and rough (Table 2).

Stamp seals, pendants and links
A decade of excavation has yielded nearly a hundred stamp-seals and over one hundred pendants and links (i.e. flat objects pierced at both ends). Many are characterised by geometric and sometimes naturalistic motifs (Figs 8 and 9). Advanced skills were needed to manufacture the seals, pendants and links in order to minimise risk of breakage during the delicate working of these objects. The complexity of their design required a greater investment in their manufacture than the beads. They also represent a larger investment in raw materials, which seem to have been carefully selected for aesthetic reasons. They may, therefore, have been more valued as single objects and might have been more securely attached to the body.

While the majority was made of soft stones, such as serpentine, there are also several fashioned from harder minerals, including silicates and obsidian. Production sequences for pendants, links and pendant-figurines made of soft stone (Fig. 8) are similar to each other (Table 1). The craftspeople who fashioned these objects were skilled at making perforations which were situated at potentially vulnerable areas of the object, such on thin corners or on shanks, requiring advanced skills of manufacture to minimise the risk of breakage. Examples that broke during piercing show that considerable work toward the final form including polishing and finishing was accomplished before perforation took place.

Button-shaped stamp-seals are created using the same overall design at nearly all Halaf sites (von Wickenburg 1990), including Domuztepe (Carter et al. 1999, Fig. 14), suggesting similar technological processes over a wide geographic area. Other types of stamp seals were more varied and, as well as one of the largest assemblages, Domuztepe has some of the widest variety. A particular feature of Halaf stamp-seals (and some pendants) is the pierced shank which allowed for them to be suspended on a cord or sewn onto a garment. At Domuztepe other seals were pierced longitudinally after much of the seal was completed, as evidenced by a few examples not yet completely pierced. There are also several examples of seals that were re-pierced through the centre after the shank had broken (Fig. 9, lower centre).

It seems possible that pendants, seals and links were created in the same workshop-networks as beads and other artefacts since they required similar understandings of raw materials, sequenced actions and tools to notch, cut, incise, grind, polish and pierce the stones. The sequenced steps of production for pierced stamp seals are suggested in Table 1.

Lithic tool terminologies and typologies: a critical perspective
The study of the Domuztepe bead, pendant and seal assemblage suggests that a variety of chipped as well as ground tools were utilised in their production. Unfortunately, the specialist who is trying to identify and reconstruct the manufacturing tool kit of the bead-maker is not always well
served by typologies of lithic tools, the nomenclature and description of which is often based upon manufacture or appearance of the tool itself rather than the original functional qualities. Also, in the absence of experimental and use-wear analysis, it is difficult to identify the tools likely to been used in ornament manufacture (Healey pers. comm.)

Furthermore, the modern boundaries between the specialisms of ground and knapped tools probably do not reflect ancient workshop practices. Certainly both abrasive and cutting tools were employed in the manufacture of ornaments as well as other objects at Domuztepe. In fact, as pointed out by Karen Wright (Wright and Garrard 2003), many stone objects, including tools, are both knapped and ground in their manufacture.

An apparent exception might be drills which are presumably used to create holes, although many seem to be too large for use in the manufacture of these ornaments. Although it is tempting to see the flint drills as being used to perforate the beads and other ornaments it is also possible that modern typological distinctions between tools such as drills and certain types of arrowheads might not have made a difference to bead-makers, who simply needed a point to complete a perforation, and by extension to the modern bead specialists attempting to understand tool kits. Indeed recent experimental studies have clearly demonstrated that certain types of so-called projectile points had multiple functions including drilling (see for example Coşkunsu and Lemorini 2001; Smith 2007). It is also clear than some unmodified flakes and blades were used as ad hoc tools (Caneva et al. 2001; Iovino and Lemorini 2001) in the working of various materials.

I would suggest, therefore, that there needs to be a more integrated approach to the study of different categories of artefacts. For example, a system has been used in which the tools and other objects from the site of Basta can be charted according to their ‘biographies’ (Gebel 2008). Interpretative trends such as these will hopefully begin to ‘return’ tools to the hands of craftspeople who used them, so we can better understand the interactive relationship with manufactured objects. The outcome could be an integrated interpretation of excavated assemblages in which tools can be considered as objects with negotiated place(s) amidst community life-ways and craft production networks (cf Altınbilek et al. 2001; Astruc 2001).

**Approaching beads holistically – beyond perforation**

Much of the research literature on bead manufacture has focused on drilling and other techniques of perforation. A series of in-depth microscopic studies of patterns of drilling marks from ancient, experimental and ethnographic examples, particularly by Gwinnet and Gorelek (1979; 1981; 1990; 1991) have been particularly helpful for understanding this particular step in bead production. However, very little analysis has been published for other steps in the production of pierced objects (with the notable exceptions aforementioned Chevalier et al. 1982; Grace 1989; Tosi and Vidale 1990; and Vidale et al. 1993).

While data collected from drilling is crucial for classifying pierced ornaments within existing bead taxonomies (Beck 1928), drills are only one of a variety of tools of different materials and hardness in the bead-maker’s toolkit. The manufacture of beads employed skill sets which were geared toward completing the whole object, not just the perforation.
In order to move bead and ornament studies forward, we should look at these objects holistically and consider the characterisation of raw materials, skills and tools as well as the risks of breakage during manufacturing sequences.

A diverse package of skills, materials and tools were employed in the sequenced actions which produced a bead, pendant or seal at Domuztepe (Tables 1 and 2). Given the amount of grinding and polishing required in the bead and pendant making process, perhaps the most important manufacturing ‘tool’ was the abrasive grit. This grit may well have been of different materials and hardness, and could have been carefully curated. Abrasives would have been readily available by-products from the other stone-working carried out at Domuztepe, which may have occurred in adjacent or even in the same work areas. Of course, concentrations of abrasives are difficult to identify and separate from soil matrices in the archaeological record, but there is philological evidence for their ancient use (Heimpel et al. 1988). There is also ethnographic evidence for the curation of by-products and especially abrasives in adjacent stone working areas (Vidale et al. 1993).

**A critical look at ‘workshops’**

The terms *workshop* and *craft production* are loaded with implications ethnographically related to the characterisation of social complexity and a specific location (summarised by Stein 1998, 18-23; Costin 1991; but see also Belcher and Croucher in prep.). However, no such ‘workshops’ have been identified with any certainty at Domuztepe. It may be that this definition of ‘workshop’ doesn’t fit into the practical realities of prehistoric village life. Perhaps the relationships between craft production, raw materials and finished objects were more amorphous than is reflected in the scholarly literature, and adaptive according to several factors. Perhaps there were certain seasons or years when one type of object or stone was worked instead of another because of availability, need or fashion. Perhaps particular stones, or ornament type or phase of production mandated different skill sets and tool kits, and were restricted to particular communities and therefore had a different social and physical location within the settlement.

The level of knowledge of materials as well as the sophisticated skill sets required to make the beads, pendants, seals, etc., found at Domuztepe suggests that an advanced and integrated system of production must have existed for object manufacture there. For want of a better term and for the purposes of this discussion, such a system is called a *workshop*, meaning a network of individuals and groups with particular skill sets and decentralised *loki* for specific activities rather than a single physical location or group of craftspeople. It may be that, at least at Domuztepe, a loose network of craftspeople who were skilled at a range of actions on a variety of objects might replace the traditional version of a central nucleus of structured craft production that could be physically or socially identified archaeologically. Perhaps the answer is to reject the term *workshop* in favour of *craft-system* or *production-network*. These craftspeople probably interacted closely with each other to share materials, specialised tools, skills and by-products, and may have involved workers of a variety of ages, permanence and abilities and may also have acted as a learning environment. Therefore, a workshop might not be a physical *place* of production which can be identified as a single, bounded feature in excavation. The physical and social place of workshops within a settlement structure may have been transitory according to the season or material worked or secondary to and incorporated with other activities. Some characteristics of the physical places of production must have been chosen for practical reasons. For example, tiny beads probably had to be finished indoors so they would not blow away; chipping stone might have required a secluded outdoor location for safety purposes.

It is, therefore, suggested that we should consider workshops as small groups of people linked by skills, toolkits and materials knowledge as well as a locus for acquisition and reinforcement of learned strategies. Such groups might also be linked to a certain group, family or clan, perhaps connected to a geographical area and the raw materials found there or the long-standing role of a certain social group within the community.

**Conclusion**

In order to move bead and ornament studies beyond manufacturing sequences, we should look at them within the wider contexts of stone usage. It seems not unreasonable to consider whether beads, pendants, seals and links could have been created in the same workshop networks as other stone objects since they required similar skills including an understanding of raw materials, knowledge of the capability of tools to shape, notch, cut, incise, grind, polish and pierce the stones. Further work is needed on the few ornaments found made of unusual exotic materials, such as shell and silver (Yener et al. forthcoming) to determine how the techniques and tools of their manufacture fits with those known at Domuztepe and other sites.

It seems obvious that that some advanced and integrated system of production must have existed for object manufacture at Domuztepe. It is entirely possible that networks of individuals with skill sets and decentralised *loki* for specific activities rather than a single physical location or a group of individuals. It may be that, at least for Domuztepe, a loose network of small workshops that were skilled at a range of actions on a variety of objects might replace the traditional version of a central nucleus of structured craft production which could be physically or socially identified archaeologically.

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