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# Mobile Domiciles of the Eurasian Steppe: Archaeological Evidence of Possible Dwelling Space during the Early Iron Age

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**ABSTRACT**

Very little precedent exists in Mongolia for excavating an ephemeral habitation site of prehistoric mobile pastoralists. This is due to an assumption that the kinds of nonpermanent structures constructed from perishable materials by mobile pastoralists (e.g., yurts) would be virtually undetectable in the archaeological record. Working in the Tarvagatai Valley of north-central Mongolia, the goal of the current research is to test the viability of methodological and analytical techniques used in the investigation of Palaeolithic hunter-gatherer habitations for the purpose of identifying a mobile pastoralist domicile of the Early Iron Age. The following study presents an overview of the methodology implemented during the excavation and the analysis used to identify what appear to be indications of one of the earliest mobile structures so far identified in the Mongolian steppe.

**KEYWORDS**

Mobile pastoralism; nomadism; Mongolian steppe; mobile domiciles; Xiongnu

## Introduction

A large expanse of open grasslands occasionally disrupted by a singular and solitary tent has become an iconic image of the Eurasian steppe. Although the picture of a white felt tent (i.e., a *yurt* or *ger*) set against a sea of green grass and an endless blue sky has captured popular attention, the traditional mobile domicile of Eurasian nomadic pastoralists is a poorly studied component of the archaeological record (Andrews 1999). Even though it is well understood that the archaeological remains of a household provide evidence of past sociocultural, economic, and political development, mobile pastoralists' households are rarely considered. The lack of research on mobile pastoralists' households owes to an assumption that nonpermanent structures constructed from perishable materials will be virtually undetectable in the archaeological record (Childe 1936: 81). In an effort to address this lack of research, our study proposes methodological and analytical techniques used in the investigation of Palaeolithic hunter-gatherer camps for the study of pastoral nomadic habitation areas.

### *Project background*

Contemporaneous with the Qin and Han dynasties of China, the Xiongnu confederation (ca. 3rd century B.C. to 2nd century A.D.) was the first historically documented polity of the Mongolian steppe (Sima Qian 1993). A mounted, nomadic group, known by the term "Xiongnu" from the historical texts of China, has come to represent a prototypical example of regional political organization on the Northeast Asian steppe. Our project conducted fieldwork in order to study the emergence of the Xiongnu polity during the later Early Iron Age (ca. 3rd century B.C.) and specifically the transformation of local communities during this process. The study of nomadic households was a critical part of our research; therefore, we focused on detecting traces of mobile habitation sites in order to understand how ancient Mongolian households chose to operationalize these political changes. As part of this research, an intensive, full coverage archaeological pedestrian survey and a habitation area excavation were conducted in the Tarvagatai Valley of Bulgan Aimag, Mongolia (FIGURE 1).

The Tarvagatai Valley is located within the forest-steppe region of the Baikal Rift Zone in north-central Mongolia and comprises approximately 120 km² of inhabitable land surrounded by imposing mountainous topography (FIGURE 2). With a basal elevation of approximately 950 meters above sea level (masl), the east to west flowing Tarvagatai River forms the main geographic feature of the valley. Physical relief in the valley is created by a series of mountains that flank the Tarvagatai to the north (reaching 1850 masl) and the Khantain mountain range to the south (reaching 1650 masl).

The pedestrian survey and site testing portion of the research project resulted in the identification of multiple areas preferred for habitation by mobile pastoralist communities (Gardner 2016) (FIGURE 3). Several locations were documented that possessed either intact hearth features and/or buried cultural material in stable sediments laid down by low energy deposition events. We chose Site 77 for excavation based on the dating of charcoal material collected from a hearth feature (FIGURE 4) to the Early Iron Age period: 2337 ± 25 CAL B.P. (UGAMS# 13204: 511–387 B.C., 95% probability). Subsequent excavation of this habitation site was guided by two objectives. First, to develop excavation methodologies able to recover sufficient evidence of a domicile area in habitation locations where no overt evidence of a domicile is otherwise present. Second, to test the viability of ring and sector analysis (Stapert 1989) in identifying potential temporary domiciles of mobile pastoralists.

Here, we present an overview of the methodology implemented during this excavation and the analysis used to identify what we argue is one of the earliest mobile structures identified in the Mongolian steppe.

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**Figure 1.** Overview map of study area.

**Figure 2.** Overview photograph of the Tarvagatai Valley. Photo taken in the southwest region of the project area facing northwest towards the Tarvagatai River. (Photograph by A. Blanshard).

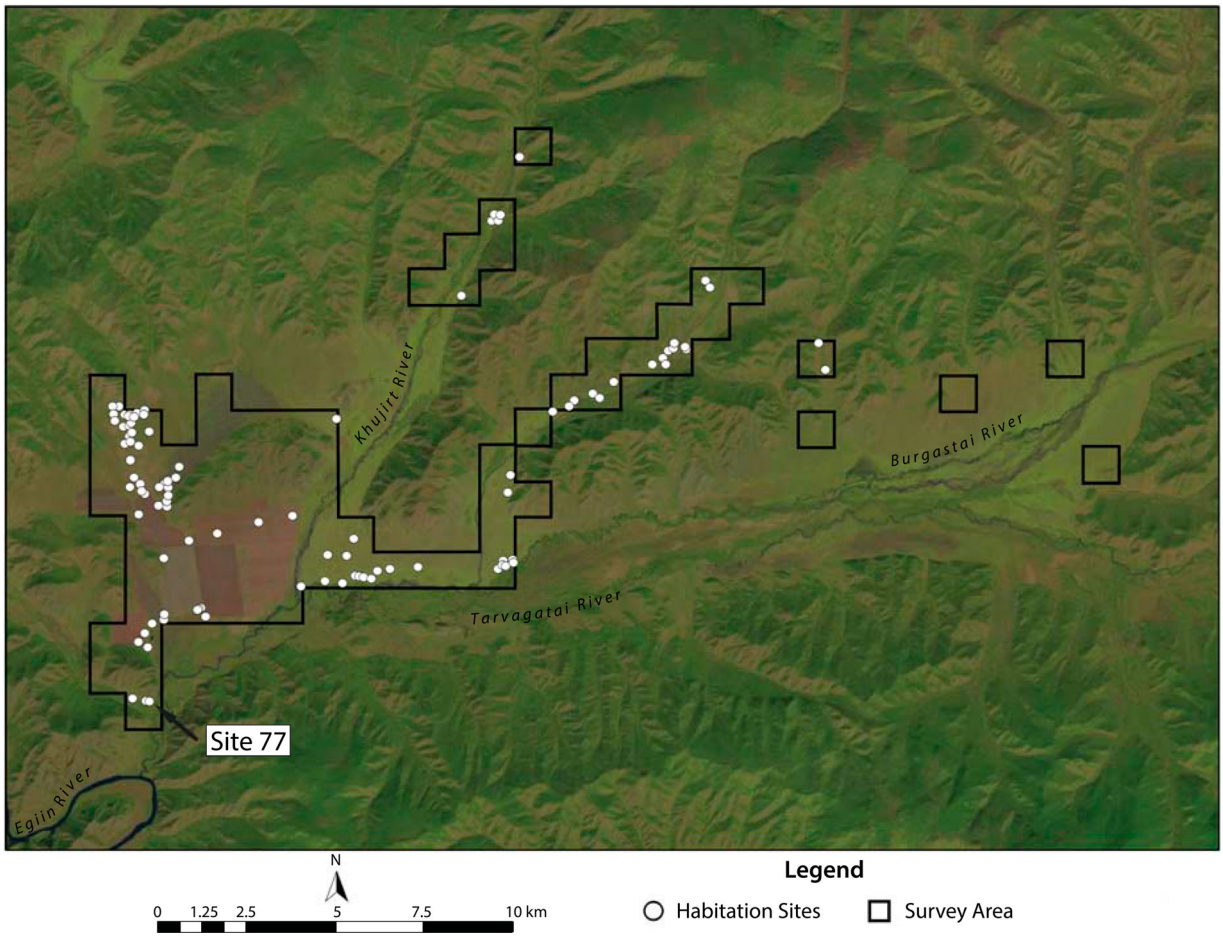


**Figure 3.** Map of habitation sites identified by pedestrian survey of the Tarvagatai Valley.

## Methods

With very little precedent in Mongolia for excavating an ephemeral habitation site of the Early Iron Age (Houle 2010; Ramseyer 2016; Wright 2016; Wright et al. in press), our excavation methodology was largely influenced by the hunter-gatherer archaeological tradition (Frison 1991) and ethnoarchaeological studies of modern hunter-gatherers from around the world (Yellen 1977; Binford 1978). Although no one method is universally applicable, the shared reliance on mobility does create some analogous circumstances between hunter-gatherer groups and mobile pastoralists. For example, the short duration of campsite occupation and a small suite of household artifacts that are often manufactured from perishable material create an archaeological record characterized by a relatively small cultural material assemblage. Drawing on excavations at hunter-gatherer sites during the design of excavation methodologies, careful consideration was given to the range of variables that could potentially impede recovery of the sparse material assemblage associated with a mobile domicile. Owing to the lack of precedent in terms of excavating ephemeral habitations of mobile pastoralists in Mongolia, there were no guidelines that could help predict prehistoric dwelling size. Size of excavation became an important first variable to consider during methodology design.

### *Excavation block size—considerations on dwelling size*

Modern Mongolian mobile pastoralists commonly reside in a round tent, referred to as a ger, which is constructed of wool felt coverings over a wood lattice-and-frame structure. Based on the average number of *khana* sold when purchasing a ger at market (a khana is a standardized section of wood lattice that forms the outside rim of the ger), these dwellings average 4.8 meters in diameter but can reach 5 to 6 meters in diameter (FIGURE 5) (Burentogtokh, personal communication 2016). Encompassed in this area are a wide range of modern household items that include, but are not limited to, framed beds, wooden dressers, an iron wood stove for cooking and heating, televisions, and solar or wind power equipment. The increase in modern material objects is also facilitated by use of motorized transportation during seasonal movements. In total, the modern ger makes for an incomplete analogy, but it does at least provide an outside range (5–6 m) of dwelling size for comparison to the Early Iron Age. The modern Mongolian ger also provides hypotheses for testing against the material patterns around an ancient hearth site.

Ethnoarchaeological research among various hunter-gatherer groups suggests that dwelling sites are on average three meters in diameter (Binford 1990; Gamble 1991; Kroll and Price 1991). However, in several instances, the hunter-gatherer groups that ethnoarchaeological researchers have studied did not have access to large domesticated animals, like the horse, that could assist in transportation (Binford 1978). Although it is difficult to determine specifically how access to horse-powered transportation would have altered dwelling size, it should at least be noted that horse-powered movement aided in the transportation of materials used to assemble dwelling structures. Recent archaeological work in Mongolia has documented horse-based traction dating to 1300–1200 B.C., while rock art and excavated evidence suggest that

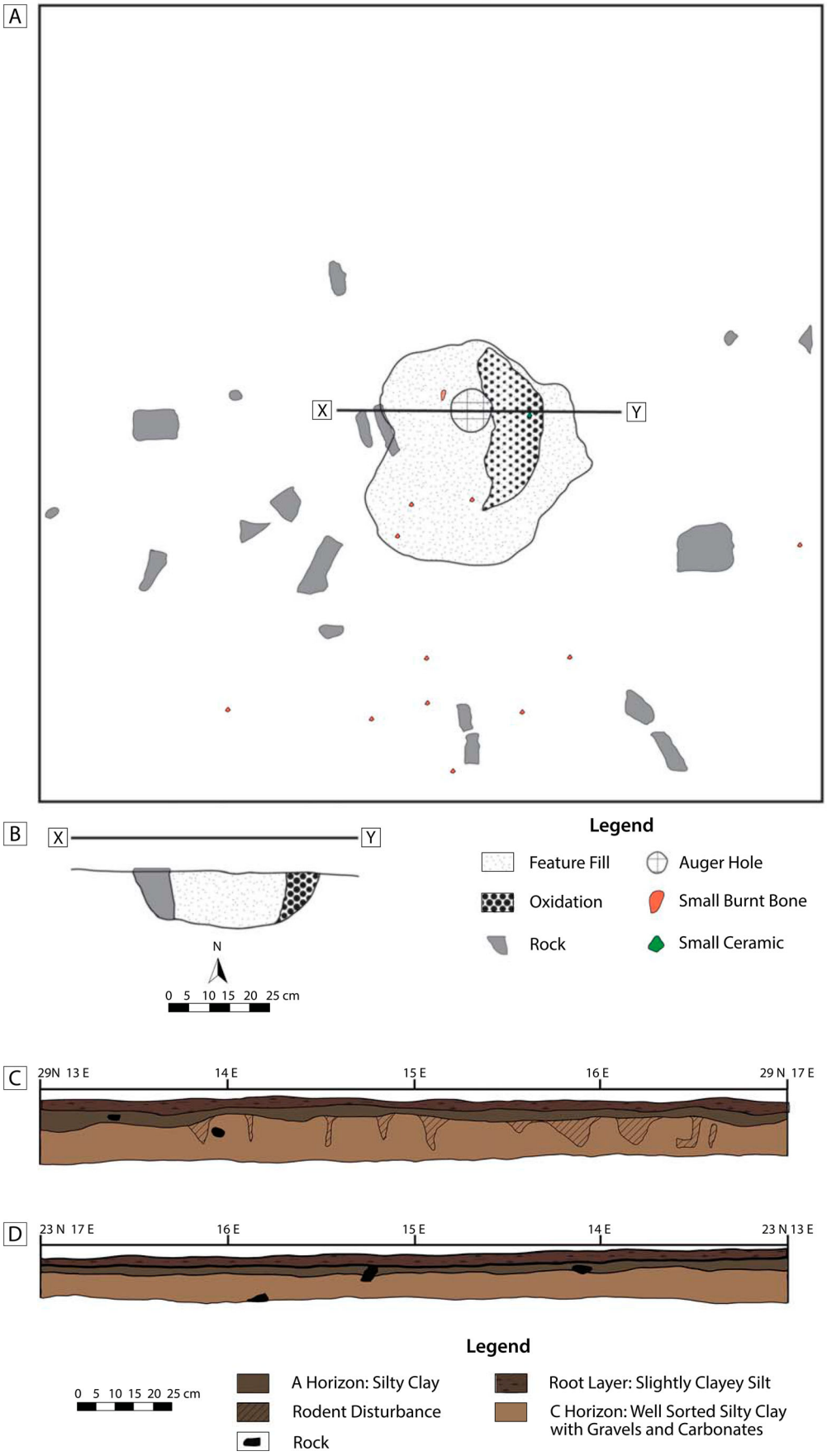


**Figure 4.** A) Plan view map and B) profile map of Site 77 Feature 1, as well as profile maps of Site 77 excavation block's C) north and D) south walls.

camel traction was just as early (Honeychurch 2015: 190; Taylor et al. 2015). The availability of animal traction to transport the bulky components of a typical ger would probably have been a factor encouraging larger dwelling size.

Studying the Dukha nomadic reindeer herders of the Mongolian taiga regions, Surovell and O'Brien (2016) have sought to understand the use of interior space and the effects of available light in the completion of daily tasks. Conducting

**Figure 5.** Photograph of a Mongolian ger's wood lattice and beam materials that form the support structure for the wool felt cover. (Photograph by J. Clark).

their study in a Dukha *ortz* (a dwelling structure that consists of lodge poles arranged vertically in a conical fashion, wrapped in canvas), they note that an ortz ranges in size from 4.6 to 7.2 meters in diameter. They also note the Dukha construction practices can leave very little in the way of permanent features because even potential stone foundation rings are disassembled and reused seasonally.

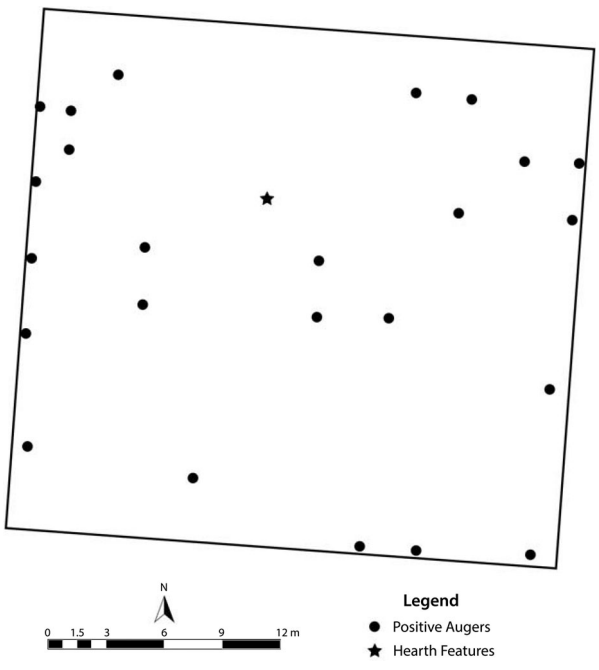


**Figure 6.** Schematic representation of the 30 × 30 m auger block excavated at Site 77.

Although the use of reindeer and horses for transportation makes for an interesting comparison between the Dukha dwellings and ephemeral dwellings of the Early Iron Age, once again certain modern items like televisions, stoves, and solar power equipment are present in the Dukha ortz and appear to also result in increased dwelling size. Evidence from ethnohistorical accounts suggests that in the absence of these modern appliances, dwelling sizes were smaller in the past. Departing from Kiakhta in the southern Baikal region of Russia in November of 1870, Colonel Prejevalsky, a member of the Russian Geographical Society, traveled across Mongolia in an effort to reach Peking, China by camel (Prejevalsky 1876). During his travels, Colonel Prejevalsky documented several aspects and attributes of mobile pastoralist life in Mongolia. Specifically, he noted that Mongolian yurts averaged 12 to 15 feet (3.7 to 4.6 meters) in diameter (Prejevalsky 1876: 50). Based on these historical and ethnographic observations, a plausible range for dwelling diameter is about 4 to 7 meters.

Preliminary archaeological data also suggest a possible range of dwelling diameter in antiquity. Two stages of systematic auger probes were excavated prior to intensive block excavation in order to determine the extent of habitation area at Site 77 (Gardner et al. 2015). The first stage of auger excavation was associated with the pedestrian survey phase of the project and resulted in the identification of the site. The second, more intensive, systematic auger probe stage consisted of a 30 × 30 m block placed over a portion of the site where the most subsurface cultural material had

been discovered. Augers were excavated at 3 m intervals and resulted in the discovery of a hearth feature and also noted a lack of material culture within a 4.25 m radius of the hearth feature (FIGURE 6) Given the coarse 3 m resolution of the systematic auger probing and that only large pieces of cultural material were recovered (owing to the use of 6 mm screens to sieve soil excavated from the auger probes) our initial interpretations were limited. Archaeological and ethnoarchaeological accounts of material culture distributions in ephemeral dwellings do document the intentional cleaning of living areas with cleaning refuse being deposited at varying distances from the living area (Schiffer 1987; Stapert 1989). We, therefore, hypothesized that the coarse resolution of our testing strategy did not discover the smaller artifacts passed over by cleaning efforts but did identify the larger refuse artifacts beginning at approximately a 4.25 meter radius from the hearth.

Based on the totality of ethnographic, ethnoarchaeological, ethnohistoric, and initial archaeological investigation, it was assumed that dwelling size would roughly fall within a 4–7 m range, favoring the mid-range measurements. Based on this assumption, we decided that a 6 m long by 4 m wide excavation block was the best starting point. The final determination of excavation size was the result of considering potential size of dwelling space and length of time required to excavate the area.

Our excavation strategy assumed that Early Iron Age dwellings would leave limited to no physical features denoting the presence of a living area. To contend with similar factors, archaeologists studying Paleoindian groups of the American West have developed a series of excavation and analytical techniques able to reconstruct activity areas at sites with limited archaeological assemblages (Frison and Stanford 1982; Kornfeld et al. 2001). For example, excavation techniques employed at the Folsom-aged Mountaineer (Stiger 2006) and Barger Gulch sites (Surovell and Waguespack 2007; Waguespack and Surovell 2014) placed emphasis on documenting refuse distribution patterns through piece-plotting artifact location. We, therefore, determined that a 6 × 4 m block would provide ample space to encompass the anticipated dwelling structure but also be small enough to allow for the recording of precise material locations.

### *Excavation and data collection procedures*

Excavation of Site 77 was conducted during the 2013 field season and employed a team of six field assistants and one excavation team leader. We employed piece-plot mapping to recover accurate locational information on all cultural materials and ecofacts based on the idea that artifact type and volume distributions would provide evidence for activity areas (Kornfeld and Frison 2000; Stiger 2006; Surovell and Waguespack 2007). To ensure tight locational control of excavated materials, all excavation was conducted by trowel (except for the upper sod layer, which was removed with garden spades) and 1 × 1 m excavation units were subdivided, excavated, and screened in 50 × 50 cm quadrants. The subdivision of 1 × 1 m excavation units into quadrants was an added layer of recording to help improve the provenance of all cultural material found in the screens.

Excavation of Test Unit 1 during the 2012 field season had shown that local natural stratigraphic layers consisted of a younger, less-developed fluvisol characterized by a small AO horizon, an A horizon, and a C horizon. Given the compact vertical extent of the cultural deposits and shallow overall nature of cultural deposits, the simple soil structure was too coarse to provide the level of vertical control on artifact provenance required. Therefore, the upper sod layer was removed as a single stratigraphic layer and then arbitrary 5 cm levels were excavated. To facilitate the visualization of possible dwelling features, arbitrary excavation levels were exposed across the entire excavation block.

Piece-plot mapping of in situ cultural material was done using a Topcon total station attached to a Trimble data logger. This combination of total station and data logger provided dual storage of all point plot information. This information was also backed up nightly onto the project computer stored at the project base camp. For the purpose of information organization, each in situ artifact was assigned a unique field specimen number that functioned as an identification number that was put into the total station/data logger at the time of recording. A record of the field specimen numbers was also stored in a master log book and on level records from each 1 × 1 m excavation unit level, creating a total of three independent places of documentation for artifact location information.

## Analysis of Excavated Materials

A life lived in a mobile dwelling is not ordered around permanent structures so much as certain consistent features. For this reason, it is critical to consider that hearths are intentional and consistent habitation features that take on a multitude of purposes. As household features, hearths and the fire they contain aid in the performance of specific activities such as cooking, while also creating a unique microenvironment in a dwelling where other activities can be achieved due to the heat and light produced (Surovell and Waguespack 2007). Thus, hearth features can be analyzed in the archaeological record of an ephemeral dwelling as a unique focal point that structures activity and directly contributes to the distribution and deposition of material culture.

### *Determining preservation of activity areas*

To identify habitation areas based on artifact distributions, the first factor to consider is the natural processes that affect vertical provenience of artifacts. Vertical provenience is an important indicator of potential disturbances caused by post-depositional erosion and intrusion. The examination of sediments at Site 77, identified by profiles of the excavation unit (FIGURE 4), suggests a relatively stable depositional environment. Sediment at Site 77 consists of a silty loam, fluvisol soil with no evidence of high-energy erosional events taking place since the time of site occupation. Some krotovina disturbance was noted, but the difference in color between the O, A, and C soil horizons was sharp enough that all krotovina intrusions were highly distinguishable from the undisturbed soil. All artifacts found in areas of krotovina intrusions were documented and removed from consideration during artifact distributional analysis.

One common concern among archaeologists in Mongolia is the effect that cryoturbation (such as frost heave) has on artifact provenience. Archaeological research at high-elevation sites in the U.S. Mountain West notes that fire hearths are very susceptible to cryoturbation and that frost

heave often results in their destruction (Benedict and Olson 1978: 45). Although the hearth at Site 77 has been impacted by krotovina intrusion, the simple presence of a hearth would suggest that frost heave has not impacted cultural materials at the site.

The second line of evidence that supports this statement is Mongol period burials exposed by fluvial erosion at a site 2 km west of Site 77. Exposed in profile along an abandoned river channel, several graves were observed having flat layers of friable, birch bark matting. Because frost heave alters the orientation of artifacts (Johnson et al. 1977; Wood and Johnson 1978: 339–341; Holliday 2004: 279), the horizontal alignment of these very friable birch bark mats is a strong indication that cryoturbation has not taken place in the Tarvagatai microenvironment. Given the apparent vertical integrity of artifacts, we are confident that determining cultural verticality of artifacts associated with the hearth can be related to specific events of human activity.

### *Determining archaeological units based on artifact depth*

Sitting approximately 15 cm below the modern ground surface, the hearth at Site 77 is located at the Level 3/Level 4 boundary. Juxtaposing the plain of the hearth to a vertical artifact-density profile (FIGURE 7) highlights a co-occurrence between an increase in artifact density of Levels 3 and 4 with the plain of the hearth. Surovell and colleagues (2005: 629) contend that in the absence of occupational history or a clear indication of natural erosional processes altering deposition, the vertically constrained concentrations of artifacts represent occupational areas where inhabitants resided for a length of time, resulting in the deposition of artifacts into a stratigraphic cultural horizon. Working in the absence of point plot material, Paolo Villa (1982) does warn that bulk-level associations do not always indicate distinct archaeological units. The high recovery rate of in situ artifacts at the current site allows for a more in-depth look at the vertical association of artifact densities as they relate to the hearth feature.

The increase in artifact density at roughly the same plain as the hearth is argued to be the result of an activity area, supported as such by the mean depth of artifact occurrence in relation to the hearth feature (FIGURE 7). Accounting for 65% of all artifacts recovered in situ, the mean vertical distance of artifacts in Level 3 is 4.04 cm above the plain of the hearth, while the mean depth of artifacts in Level 4 is 0.35 cm below the hearth plain. The 4.39 cm range of artifacts in Levels 3 and 4 closely aligns with observed ranges of vertical displacement of artifacts on living surfaces (Gifford-Gonzalez et al. 1985: 807–810). At a mean height of 9.75 cm above the hearth plain, observations on site formation and depositional processes suggest a very poor vertical association between artifacts in Level 2 and the hearth feature (Villa and Courtin 1983; Gifford-Gonzalez et al. 1985). Artifacts in Level 1 were never considered to be spatially associated with the hearth because they were primarily recovered near the surface in the O soil horizon and consisted of a wide range of artifact types dating from the A.D. 1800s to the modern era.

At approximately 5 cm below the suspected activity area, ceramics from Level 5 fall just outside the range of observed downward movement of artifacts due to trampling in more compact, silty, loam soils (Gifford-Gonzalez et al. 1985). Based on the vertical distance and the lack of clear ceramic wares or decoration styles that could corroborate a possible association, the ceramic material from Level 5 was excluded from spatial analysis.

In total, the assessment of the vertical association of artifacts indicates that at the very least, an intact activity area is present at Site 77 in Levels 3 and 4. The following analysis of the horizontal distribution of artifacts from Levels 3 and 4 will seek to determine if activities occurred around an open-air fire or in the confines of a ger-like tent structure. It is important to note that this analysis will be of bone, ceramics, and lithic materials, as these artifact types comprise 98% (n = 145) of all material remains recovered from Levels 3 and 4. The remaining 2% (n = 3) of cultural material recovered from Levels 3 and 4 consists solely of unidentifiable bronze objects.

### *Horizontal distributional patterns of material culture*

Drawing on archaeological (Stapert 1989, 1990; Stapert and Terberger 1989), ethnoarchaeological (Bartram et al. 1991; Kamp 2000) and ethnographic work (Binford 1990; Boismier 1991), specific continuities in the horizontal distribution of artifacts have been observed around hearth features. These continuities depend on the hearth being directly engaged (e.g., by cooking) or indirectly employed (e.g., utilization of light for conducting tasks). In some instances, the archaeological footprint of hearth-based activities is so strong that it can be used to identify hearth locations at sites where post-depositional processes have erased direct evidence of a fire hearth (Waguespack and Surovell 2014). Here, we consider distinct trends in the frequency of artifact occurrence radiating outward from a hearth (Stapert 1989; Gamble 1991; Stevenson 1991; Audouze and Enloe 1997) and explore newer studies that have discovered important relationships between lithics, processed bone, and hearth features (Waguespack and Surovell 2014).

In the absence of other lines of evidence that would suggest a surrounding structure, determining whether a hearth feature was located inside or outside remains a challenge. Analyzing artifact occurrence around an open-air hearth is a standard procedure that looks at artifact types and densities to determine activity areas like tool manufacturing or food preparation (Leonova 2003). Conversely, habitations are more dynamic spaces where processes like cleaning create a structured relationship between occurrence and nonoccurrence of multiple types of artifacts relating back to a central point that structures activity. To this end, the "ring and sector" analysis method developed by Dick Stapert (1989) is useful for examining patterns of material around a hearth. In addition to creating a better sense of activity zones, this method can also be used to infer the presence of an enclosing structure (Stapert 1989, 1990; Stapert and Terberger 1989).

Building on the "drop-and-toss" model where open-air hearth placement allows unimpeded dispersal of artifacts (Binford 1983), Stapert notes that the presence of walls will constrict the even dispersal of artifacts in the "toss" zone. Stapert also suggests that the extended use of a hearth coupled with the absence of prevailing winds will result in an even distribution of artifacts around the hearth (Stapert 1989: 11–12; Surovell and Waguespack 2007: 237). By anchoring all analytical units on the hearth, this analytical technique divides space into concentric zones radiating outward from

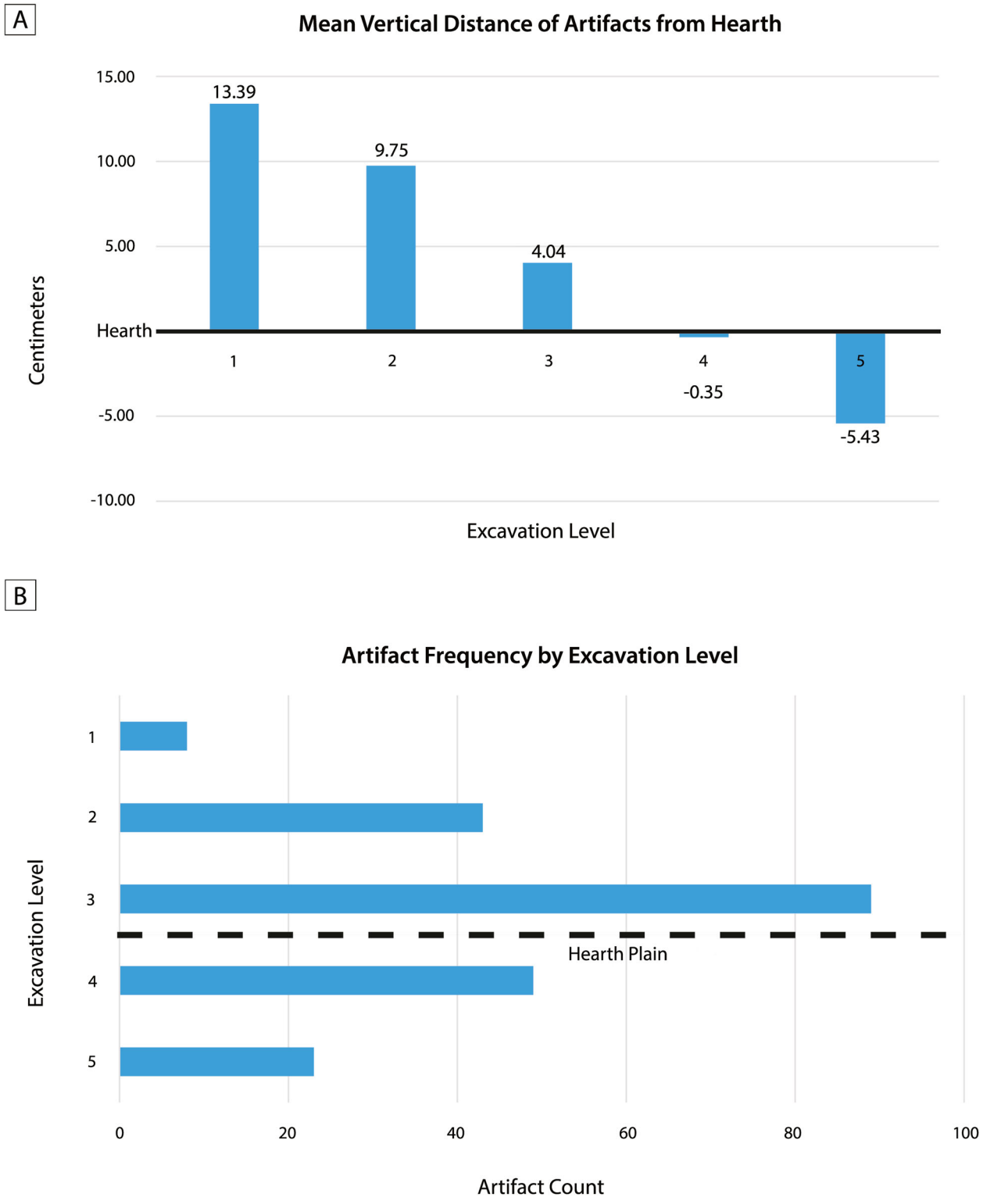


**Figure 7.** A) Mean vertical distance of artifacts from the top of the hearth and B) artifact frequency by excavation level.

the hearth. The number of artifacts in each concentric ring can then be further partitioned by direction sectors divided according to cardinal directions. Within each sector, a ring by ring count can be made and a bar graphed to show artifact densities as a function of directional distance from the hearth feature.

The application of the ring and sector analysis to 30 Palaeolithic and Mesolithic sites in Europe (Stapert 2003) and to Paleoindian sites in the western United States (Surovell and Waguespack 2007) documented two distinct distributional patterns: unimodal and multimodal. Instances of unimodal artifact distribution are attributed to open-air hearths, like that described by Binford (1983), where the activity around a hearth creates a peak in artifact occurrence and subsequent tossing of debris results in an exponential decline in artifact occurrence that is a function of distance from the hearth (FIGURE 8). Multimodal distributions of artifacts are interpreted as the result of a hearth being placed in a tented structure and consist of bimodal or trimodal artifact density patterns. The bimodal distribution scenario consists of a small initial peak in artifacts in the immediate proximity to the hearth as the result of a "drop zone" produced by a work and activity area. A second, larger peak in artifact density occurs within 1.5 to 2 meters from the hearth where walls

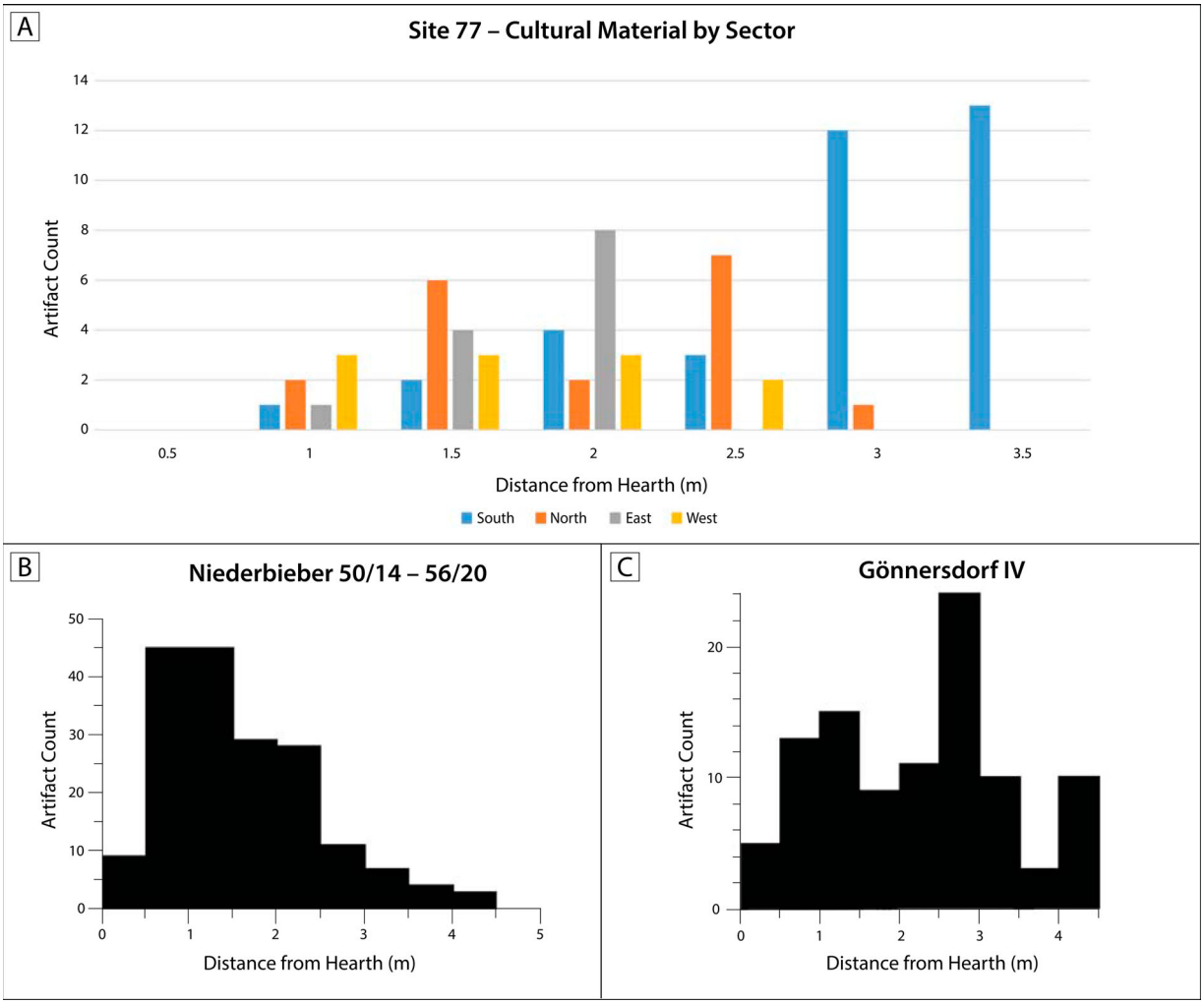


**Figure 8.** A) Ring and sector analysis of Site 77's cultural material (adapted from Stapert [1989: fig. 15]), B) example of unimodal artifact distribution associated with an open air hearth at the *Federmesser* tradition, Niederbieber IV site and C) a bimodal artifact distribution at the Upper Paleolithic site of Gönnersdorf, Germany, where archaeologists recovered the remnants of a tent ring (adapted from Stapert [1989: fig. 19]).

act as a barrier to the centrifugal movement of artifacts, resulting in their accumulation (Stapert 2003: 7). Figure 8c illustrates the classic example of a bimodal artifact distribution recorded at the Upper Palaeolithic site of Gönnersdorf, Germany where excavation in the Gönnersdorf IV block recovered a preserved tent ring. A trimodal distribution follows a bimodal pattern but with a third peak at distances greater than 2 meters from the hearth. This third peak in artifact occurrence is interpreted as a dumping zone of refuse outside of a dwelling structure. In certain instances, sector analysis has documented a strong directionality of outside dumping known as a "door dump," in which a dwelling's entrance way influences the artifact dispersal pattern (Stapert 1989: 19; Surovell and Waguespack 2007: 238).

### *Application of ring and sector analysis at Site 77*

A total area of 24 $m^2$ was excavated around the Site 77 hearth and this area was subsequently divided into a series of rings each measuring 25 cm in width. A total of 16 rings were used to compile artifact counts and these were then grouped according to cardinally oriented sectors of 90 degrees each (i.e., north = 315° to 45°, west = 45° to 135°, etc.). Analysis of the resulting bar charts reveals a clear bimodal distribution (FIGURE 8). To help visualize and verify the bimodal distribution pattern suggested by ring and sector analysis we applied locally weighted scatterplot smoothing (Lowess) to the two-dimensional point plot data (Cleveland 1979) (FIGURE 9).

Unlike observations made at Palaeolithic sites, ceramic and lithic material culture at Site 77 does not primarily cluster near the hearth. Instead, general artifact distribution patterns indicate that these items first appear in low frequency at a distance of 0.75 meters from the hearth and then peaks at approximately 1.75 meters from the hearth (or within a 3.5 m diameter centered on the hearth). Artifact rates drop off slightly before they again increase to their highest frequency at a 3.25 m radius from the hearth feature (i.e., a 6.5 m diameter). We interpret this bimodal pattern as artifacts clustering around a barrier at approximately a 1.75 m radius from the hearth with the dumping of refuse occurring at approximately 3.25 meters from the hearth.

At Site 77, two unique directional distribution patterns were documented on a sector by sector basis (FIGURE 8). Along the north to south axis, an accumulation of artifacts at a potential barrier appears to occur at a 2.25 m radius in the northern sector and a 2.0 m radius in the southern sector. The east to west axis appears to be slightly smaller with a noticeable peak in artifact accumulation at 1.75 m from the hearth in the eastern sector and a very weak accumulation of artifacts from 1.25 to 1.75 m from the hearth in the western sector. The western sector artifact distribution is harder to

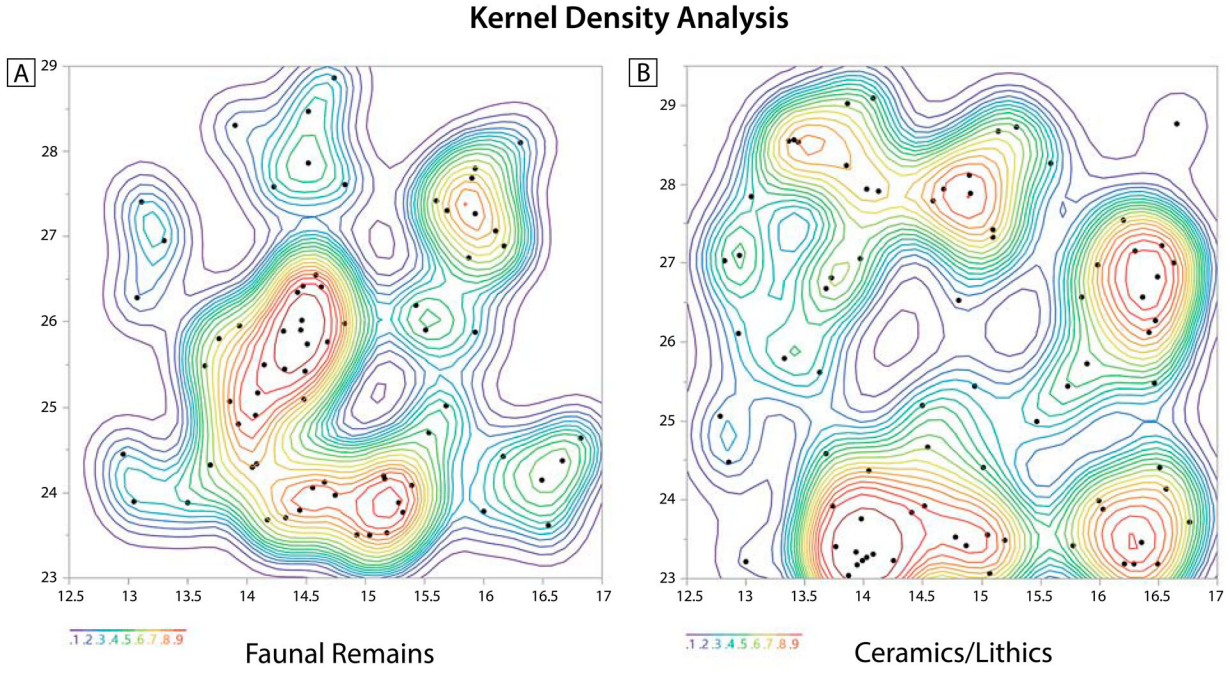


**Figure 9.** Illustration of experimental kernel density analysis A) of faunal remains and B) of ceramic/lithic artifacts recovered from excavation at Site 77 (10% occurance contour intervals).

determine overall since this portion of the excavation returned the lowest total number of artifacts.

Overall, a possible dwelling structure at Site 77 appears to be slightly oblong with the longer axis oriented north to south. Kernel density analysis of plotted artifact points provides a rough illustration of the estimated structural shape (FIGURE 9). The strongest confirmation of a barrier effect limiting centrifugal movement of artifacts are the clear outward bimodal peaks in artifact density in the southern sector. This sector contains the largest number of retrieved artifacts, resulting in a noticeable rise and decline of artifacts from 2.0 to 2.5 m, followed by a significant increase in artifacts at a distance greater than 3 m from the hearth (but not exceeding a 3.5 m radius). The isolation of the distinctly higher incident of artifact occurrence beyond the 2 m mark in the southern sector seems to suggest that cleanout practices directed refuse material in this direction, denoting the possible presence of an entrance.

### *Horizontal distribution patterns of bone remains*

Although not originally factored into the initial design of ring and sector analysis (Stapert 1989), archaeologists attempting to identify uncertain hearth localities turned to distributional patterns of burnt and processed bone as a proxy method to determine a feature's location (Sergant et al. 2006; Waguespack and Surovell 2014). These research efforts were largely concerned with the spatial relationship between lithic manufacturing work zones, processed bone occurrence, and the identification of hearth space, but this use of ring and sector analysis highlights the importance of considering multiple kinds of materials in determining site layout.

Precluding the five pieces of bone material found directly within the hearth, ring and sector analysis of the in situ faunal material of Levels 3 and 4 noted a very distinct distributional pattern that was weighted heavily towards the southern sector (FIGURE 8). Like the ring and sector results of sherds and lithics, the east and west sectors exhibit a moderate bimodal distribution that suggests a barrier at the 1.5 to 1.75 m range from the hearth coupled with an exterior discard area. The north sector displays a unimodal distribution but with a peak in artifact density at 1.75 m from the hearth. This distribution of faunal material matches the peaks seen in the material culture distribution and supports the identification of a barrier at 1.75 to 2.0 m outwards from the hearth.

To the south, processed bone patterns are even more informative. Excluding the faunal material documented in the hearth, the faunal material in the southern sector first appears within 25 cm of the hearth and notably spikes at 50 cm out. Moderate levels of faunal material are not noted again until 2.25 m from the hearth, where faunal remains again increase significantly. This second increase roughly coincides with the rise in cultural material at the 2 to 2.25 m range from the hearth, interpreted again as being caused by a barrier. A small dip in faunal remains is followed by a third notable increase accompanied by sustained faunal material occurrence at a distance greater than 3 meters from the hearth. Most faunal material recovered from Levels 3 and 4 shows signs of burning or processing (Burentogtokh et al. 2013) and its strong correlation with the immediate hearth area suggests that cooking activities dominated in the southern sector. Subsequent cleaning associated with food preparation appears to trend to the south as well (see Figure 9 for density analysis).

One might note that the southern artifact cluster could potentially be caused by encroachment of artifacts deposited during habitation of a different shelter at a different time. The potential for a palimpsest of habitations is important to consider and is discussed in greater detail below. We do want to note though, that the artifact cluster in the southern consists largely of faunal material and is confined to a narrow, linear path that extends from the hearth southward (FIGURE 9). The homogeneous collection of cultural material in a linear distribution pattern appears to be more in line with hearth cleanout practices where refuse is being discarded out a possible doorway rather than overlap by a second occupation. If a

second occupation were present we would expect to find a heterogeneous collection of cultural material in a disorganized pattern. In short, these patterns detected using Stapert's ring and sector analysis suggest the presence of a slightly oblong shaped enclosure, measuring approximately 4.25 m north to south and 3.5 m east to west, situated around a hearth with an entranceway to the south.

### *A note on "palimpsests"*

Mobile groups commonly revisit distinct regions of a landscape during seasonal migration rounds (Kelly 2013). The potential for consistent reuse of a campsite requires a consideration of how reoccupation might affect the interpretation of the archaeological remains at Site 77. Specifically, we must consider vertical overlap caused by reoccupation of an exact location and potential horizontal overlap created by later occupations in the immediate area around Site 77.

Recent excavations at Site 74 (located 200 m east of Site 77) have resulted in the discovery of a stratified hearth feature (evidenced by multiple oxidization layers) that has changed structurally over time, denoted by changes in size and shape of the partial rock lining still preserved (Burentogtokh et al. 2015). By comparison, the hearth at Site 77 is smaller and has limited structural components and a singular oxidization layer (FIGURE 4). Although there are a range of potential interpretations to explain these differences, at the very least we can say that the hearth at Site 77 is a simple feature that lacks stratigraphy indicative of vertical overlap resulting from reuse over time.

However, reuse of a campsite does not specifically require reoccupation of an exact shelter location. Multiple shelter locations and activity areas can be found in a singular habitation area (Luke et al. 2017), thereby resulting in horizontal overlap of archaeological remains. Site 77 appears to be free from horizontal overlap. This assessment is based on two lines of evidence. First, we identified a void in high artifact occurrence within a 10.9 m area around the potential enclosed domicile area (as determined by the 30 × 30 m systematic auger probe block discussed above) (FIGURE 6). This statement is also supported by the lack of clear artifact clusters beyond 3.5 m from the hearth (FIGURES 8, 9). Second, the homogeneous collection of faunal material in a linear distribution pattern appears that suggests hearth cleanout practices, in which refuse is being discarded out a possible doorway, rather than a heterogeneous collection of cultural material in a disorganized pattern that would indicate the overlap of a second occupation.

## Discussion

Even though we argue that the patterns discussed here are best understood as resulting from the temporary use of an enclosed structure, it is difficult to definitively conclude whether Site 77 was indeed associated with an indoor or outdoor activity area. This uncertainty rests largely on the absence of clear comparative studies from mobile pastoral settings. Although hunter-gatherer research has provided valuable analytical techniques, the final assessment of artifact density and distribution to infer activity is still in need of refinement in contexts specific to mobile pastoral dwellings. The differences of multimodal artifact distributions and how they denote inside and outside space for mobile pastoralists versus hunter-gatherers would ideally emphasize the critical differences between mobile pastoralists' and hunter-gatherer dwelling spaces.

Unlike Palaeolithic and Mesolithic hunter-gatherer sites, where trimodal artifact distributions have been considered indicative of dumping refuse outside a habitation, Site 77 clearly lacks a drop zone in proximity to the hearth, leaving only two artifact density peaks: a potential structure barrier and an activity/dump area outside the dwelling space. The difference between mobile pastoral and hunter-gatherer patterning is hypothesized to be the result of the different cultural material assemblages relied on by the two varying lifeways. For example, we hypothesized that the heavy reliance on lithic production in the completion of daily tasks by Palaeolithic groups drove the use of space around hearth features for the production of lithic tools**.** Evidence in support of this hypothesis can be found at the Folsom-aged Barger Gulch site where a large percentage of the approximately 8300 pieces of debitage recovered from a 6 × 8 m area were found in close proximity to the hearth feature (Surovell and Waguespack 2007).

Although mobile pastoralists of the Early Iron Age utilized expedient stone tools to an extent, they did not require lithic production at the same intensity, as evidenced by the nine pieces of debitage and five stool tools recovered from Levels 3 and 4 at Site 77. Instead, these individuals relied on a different set of artifact types; for example, ceramics make up 71% (n = 61) of all cultural material analyzed. For this reason, the use of space around a hearth by pastoral nomads would be expected to show differences from that of hunter-gatherers.

### *Evidence suggesting an enclosed mobile dwelling*

While more investigation is needed to determine the nature of the dwelling structures constructed by Early Iron Age mobile pastoralists and the activities that took place inside of them, it is important to note that prior archaeological investigation in Mongolia has clearly shown that the Mongolian record is not devoid of house-like structures occupied on a more permanent basis, nor of large-scale settlements (Perlee 1962; Danilov 2011; Ramseyer 2016). Although previous archaeological investigations have yet to identify a mobile domicile (Honeychurch et al. 2007; Houle 2010; Clark 2014), rock art and artifact depictions, ancient historical records, and other habitation studies (Majidzadeh 1992; Becker and Fassbinder 1999; Wright 2016) provide important secondary lines of corroborating evidence. These additional lines of evidence bolster the argument that the artifact patterns at Site 77 represent an enclosed mobile domicile dating to ca. 400–300 B.C.

For example, in the Minusinsk Basin of southern Siberia, Elena Miklashevich (2011) discusses petroglyphs attributed to the Early Iron Age Tagar culture (ca. 1st millennium B.C.) interpreted as depicting both permanent and tent dwelling structures (FIGURE 10). (Also see Jacobson [1993: 7] on this topic.) The depiction of tent-like dwelling structures has also been documented in Xiongnu period contexts. Excavation of a Xiongnu elite tomb complex in the Tsaraam Valley on the Russian side of the Russia/Mongolia border recovered a birch bark container engraved with images of yurts placed on top of carts (FIGURE 10) (Miller 2012). Historic Chinese records have further corroborated the use of

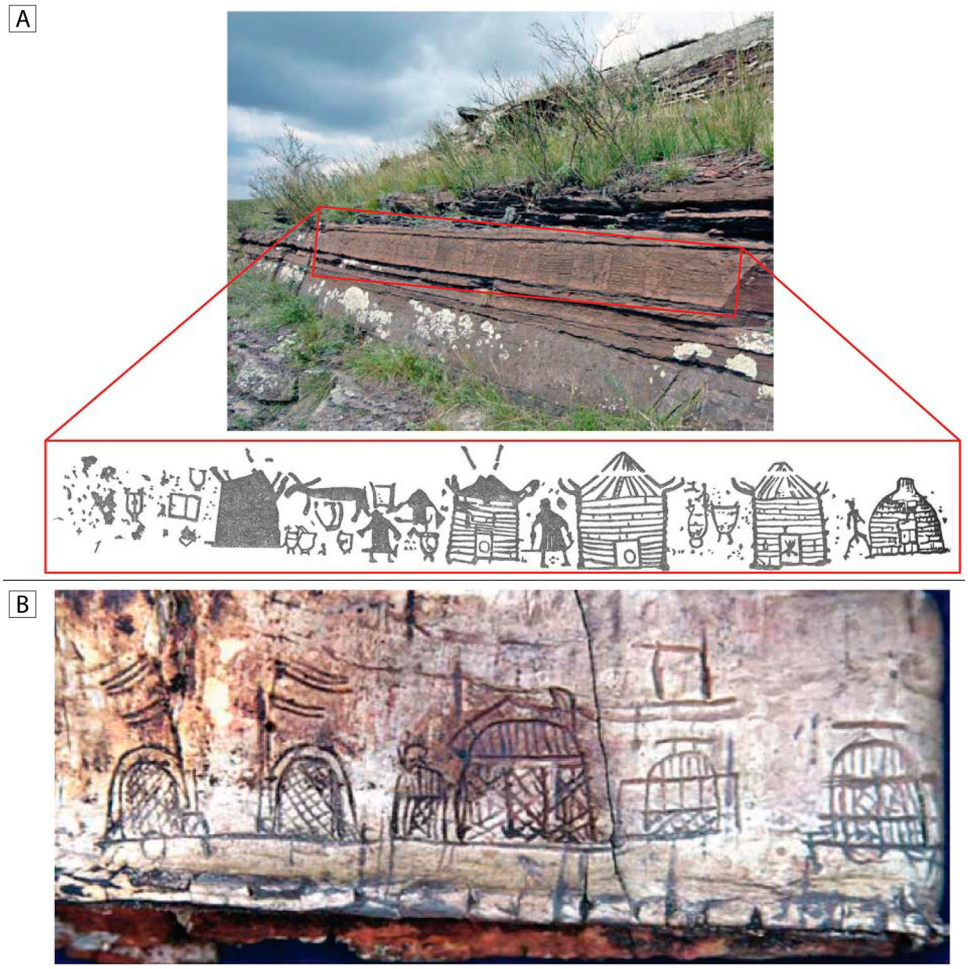


**Figure 10.** A) Petroglyph example of permanent and tent dwellings of the Early Iron Age Tagar culture in the Minusinsk Basin of southern Siberia (adapted from Miklashevich [2011: fig. 3]). B) Engraved birch bark container depicting Xiongnu yurts on carts recovered from excavations at a Xiongnu period royal tomb in the Tsaraam Valley, Russia. (Photo taken from Miniaev and Sakharovskaia [2007: fig. 11]).

yurt structures contemporaneous with the Xiongnu period. Studying Han Dynasty records from the first century A.D., Vainstein (1976) recounts a description of what he terms a "Xiongnu yurt" by Han dynasty eyewitnesses.

In addition, we would expect that mobile domiciles enclosing hearths would have been most practical during the winter months when temperatures today drop as low as -40° C. Ethnographic and archaeological research on mobile pastoralists in Mongolia has documented the habitation of specific areas on the landscape during different seasons (Houle 2016; Wright 2016). An understanding of these locational patterns also sheds light on the nature of the Site 77 study area. In the forest-steppe region of Mongolia, broad open floodplains of larger valleys are preferred for warm season habitation in support of the increased herd sizes that result from community coalescence. Conversely, smaller, topographically confined tributary valleys are preferred habitation sites during cold seasons owing to the natural protection they provide from winter winds and deep snow drifts (Simukov 1934).

Ethnographic research in the Tarvagatai Valley documents a similar habitation pattern in use today (Jamsranjav 2014) and evidence for the same landscape arrangement in the valley has been detected as far back as the Bronze Age (Burentogtokh 2017). These seasonal location preferences have also been documented in other forest-steppe regions of Mongolia, including Egiin Gol and the Khanui River Valley. During the Xiongnu period in these two regions, tributary valley and floodplain habitations can be differentiated in terms of seasonality based on their faunal and botanical assemblages (Honeychurch 2004: 138–140, 155; Houle 2010).

Given these observations, Site 77 is best interpreted as a cold season habitation based on its landscape location and arrangement (Houle 2016). The site is situated in a small, topographically confined tributary valley (FIGURE 3) and, when asked, local herders in the valley describe the area as one well suited for a winter campsite (Jamsranjav 2014). This interpretation is corroborated by archaeobotanical analysis of bulk sediment samples collected from the hearth at Site 77. Unlike the Egiin Gol Valley project in which excavators collected sediment samples from two warm-season habitations and documented plant remains that indicate late spring and summer occupation (Trigg 2003; Honeychurch 2004: 155), sediment samples from Site 77 lacked any trace of warm-season plant remains (Puseman 2014). When we take into consideration the evidence discussed above for tent use during the Early Iron Age and Xiongnu period, and the functionality of an enclosed shelter during the winter season, the combined lines of evidence developed here support the conclusion that Site 77 represents the remains of an enclosed mobile dwelling.

We further propose that the bimodal artifact pattern we identified using ring and sector analysis is indicative of the material dispersal around a hearth within an enclosure used by nomadic pastoralists. In effect, this bimodal pattern of

artifact occurrence approximates that of the trimodal pattern documented for the enclosed dwellings at hunter-gatherer sites (FIGURE 8) (Stapert 1989) and therefore can be used to help identify pastoral mobile dwelling spaces in future investigations.

## *Implications for pastoral nomadic archaeology*

### CENTRAL EURASIA

Wright astutely noted that "the campsite and households of mobile pastoralists have been the subject of much less archaeological and ethnoarchaeological investigation than those of hunter-gatherers" (2016: 135). This is not to say, however, that the study of mobile pastoralists' dwellings is a stagnant area of research (Cribb 1991). For example, archaeologists working in central Eurasia have documented several types of both permanent and nonpermanent dwellings occupied seasonally by mobile pastoralists (Frachetti et al. 2010; Mantellini 2013; Frachetti and Maksudov 2014; Rouse and Cerasetti 2014). Indeed, as implied by the recent research of Claudia Chang (2018), it is possible that in some regions of Early Iron Age Central Asia, permanent habitations, seasonally occupied sites with permanent structures, and mobile dwellings could have been used contemporaneously. Chang argues that these different modes of mobility and semi-sedentary habitation may have marked differentiated social strata involving nomadic elite and commoner farmers or agro-pastoralists (Chang 2012: 140–141).

Fieldwork in other parts of Central Asia has likewise shown a promising diversity of habitation types and mobility profiles. Excavations at the Bronze Age Ojakly site in the Murghab alluvial fan region of Turkmenistan encountered distinct structural features that included both postholes and large fragments of daub with wattle impressions that are interpreted as remnants of the dwelling's superstructure (Rouse and Cerasetti 2014: 37). Research in the foothill region of the Dzhungar Mountains of eastern Kazakhstan (Frachetti et al. 2010) and the Malguzar Mountains of Uzbekistan (Frachetti and Maksudov 2014) discovered raised living surfaces and in some instances, the foundation stones of seasonal dwellings.

It is worth noting that at the Galchasay site in the Malguzar Mountains of Uzbekistan, Frachetti and Maksudov (2014) also discovered an isolated hearth feature that was not surrounded by distinct structural elements. The lack of structural features that suggest an enclosed dwelling space prompted Frachetti and Maksudov (2014: 206) to classify the hearth as a temporary feature comparable to outdoor hearths utilized by present-day pastoralists in the region. Based on our approach, however, the Galchasay site may be an ideal candidate for artifact distribution analysis in order to provide additional lines of evidence for determinating the nature of activity in and around the hearth feature. Moreover, the Galchasay site demonstrates that our Site 77 is not a unique site type; instead, it is the first case study of what may prove to be a robust data set for hearth-based activity among mobile pastoralists.

### ANCIENT NEAR EAST

In the ancient Near East, a long-standing opinion of archaeologists has been that nomads tend to leave behind little evidence of their seasonal habitations (Kenyon 1970; Finkelstein and Perevoletsky 1990). Rosen (1992) provides a contrasting opinion on this issue and recent archaeological field research supports his suggestion that carefully designed surveys will indeed reveal evidence for pastoral nomadic habitations and landscapes (Abdi 2003; Szuchman 2009; Porter 2012; Rosen 2017). Even a brief examination of research on mobile pastoralists in the Near East highlights a significant amount of attention to mobile dwellings. Research on such sites includes ethnoarchaeological studies (Hole 1979; Banning and Köhler-Rollefson 1992; Saidel 2001; Saidel and van der Steen 2007), iconographical studies (Majidzadeh 1992; Stronach 2004), and archaeological investigations (Abdi 2003; Rosen 2008, 2011; Ur and Hammer 2009; Rosen and Saidel 2010; Shahack-Gross 2011; Hammer 2014). It is worth noting that archaeological investigations have even included the identification of tent-dwelling structures at the Tele Tula'i site in Khuzistan, Iran (Hole 1974) and a Middle Chalcolithic campsite at the Tuwah Khoshkeh site in the Zagros Mountains of Iran (Abdi et al. 2002).

One interesting case study worth considering is the excavation of Giv'ot Reved, a Roman-period pastoral camp in the Negev desert region of Israel (Rosen 1993). In this particular instance, the identification of the pastoral campsite and the placement of excavation units were guided by exposed partial stone alignments that ranged in form from semi-circular to small arcs. These stone alignments were interpreted as partial walls placed along the backside of tents with the tent opening opposite the wall, an arrangement that closely resembled modern Bedouin tent camps (Rosen 1993: 445).

Although artifact density was low, ceramic distributions recorded at a course 5 m scale suggest that activity was concentrated around the hearth feature with refuse from the dwelling being deposited behind the stone wall opposite the assumed entryway (Rosen 1993: 447, fig. 9). This artifact distribution suggests additional effort in the removal of waste and contrasts with the expedient disposal of waste immediately outside the entryway at Site 77. The potential contrast in waste disposal practices illustrates that as research on mobile pastoralists' hearth-centered activity develops, we will begin to see a diversity of how mobile pastoralists conceptualize living space and place differing value on managing household activities (such as waste disposal). But again, a more detailed record of artifact distribution is needed to verify this pattern in waste disposal and to fully develop a clearer understanding of activity areas within such spaces.

### EAST AFRICA

Moving further abroad, we find another important body of literature being produced by archaeologists attempting to better understand mobility and the pastoral archaeological record of East Africa (Ashley et al. 2016). Archaeologists in this region have encountered a unique set of problems in distinguishing pastoralist campsites from hunter-gatherer sites. This results from stylistic similarities in the lithic and ceramic assemblages utilized by the two groups, as well as the trade of herd animals from pastoralists to hunter-gatherers which resulted in similar butchered faunal assemblages (Gifford-Gonzalez 1998; Shahack-Gross et al. 2004). The difficulty determining the primary lifeway of the individuals residing in a habitation area has resulted in a series of research strategies that are broadly applicable to archaeological investigation of mobile dwelling spaces. Specifically, phytolithic (Shahack-Gross et al. 2003), isotopic (Shahack-Gross et al.

2008), and micromorphic sedimentary (Boles and Lane 2016) analyses have been applied in an effort to identify the size of an animal population at a site. The premise of research on animal population size is that while butchered herd animal remains are present at both hunter-gatherer and pastoralist campsites, the pastoralist campsite will be distinguished by a larger animal population maintained by a lifeway reliant on herd animal resources. Initial investigations have had success at making this distinction owing to the impact that an animal herd has on site taphonomy as seen through soil chemistry and sediment compaction (Shahack-Gross 2011).

One interesting case study to consider comes from excavations conducted at the Maili Sita site in Laikipia region of Central Kenya. Here, vegetation types and soil chemistry guided excavation unit placement, which resulted in the identification of a hearth feature in close proximity to a linear row of postholes (Lane 2005: 98–101). Preliminary interpretation suggests that these features might be the remnants of a Maasai-style household that consisted of dung plastering over a wattle frame (Boles and Lane 2016: 511). Boles and Lane (2016) were quick to point out, however, that the collection of features did not totally mirror that of the only other known pastoral dwelling unit identified in eastern Africa (Robertshaw 1990), as it lacked a plaster floor platform. Once again, as in the case of the Galchasay site in Uzbekistan, a detailed analysis of cultural material around the hearth feature at Maili Sita could clarify the nature of activity at the time of occupation. More importantly, the use of vegetation types and soil chemistry to guide excavation unit placement at Maili Sita is an excellent example of how the study of mobile dwelling space has potential to develop into a robust set of techniques using multiple-lines of inquiry to explore such activity areas.

## Conclusion

These examples as well as others from the greater Eurasian steppe (Anthony 2007; Hanks 2010), elsewhere on the African continent (di Lernia 2013), and the Andes (Vining 2011; Capriles 2014; Capriles and Tripcevich 2016) illustrate the importance of understanding dwelling spaces of mobile pastoralists and how such sites may be detected in the archaeological record. As we have seen in the above discussion, however, the identification of dwelling space commonly relies on the presence of some form of distinguishable structural feature (Alizadeh and Ur 2007; Rosen and Saidel 2010; Hammer 2014; Rouse and Cerasetti 2014). In the absence of distinguishing physical features, relatively little guidance has been provided as to how to reconstruct dwelling space from artifact accumulations.

The study presented here hopefully illustrates that a lack of permanent structural features does not necessarily diminish the archaeologist's ability to determine whether a site was a dwelling space or not. Archaeologists can identify mobile dwelling spaces because a habitation without evidence for permanent structures is much like any other household—it is a locus for a range of everyday activities (Wright 2016: 134). These everyday activities revolve around consistent features, such as a hearth area. These consistent features become focal points that structure activity and result in distinct distributions of cultural material. As shown here, efforts to reconstruct these unique artifact distributions can begin to tell a more vivid story about the range of activities at a site, including the identification of internal versus external space.

Although this the present study is not able to immediately address the methods of mobile domicile construction, a combination of high-resolution excavation, point plot artifact mapping, and ring and sector analysis can recover sufficient evidence of an enclosed dwelling area in habitation locations where no overt evidence of a domicile is otherwise present. In relation to the stated research goals, we hope that the excavation and analytical methodologies presented here will prove to be a viable way of identifying the dwelling spaces of prehistoric mobile pastoralists. Out of this research we hope that more case studies are developed and that a better understanding of mobile habitation space is gained, so that we can begin to ask larger questions about mobile pastoral households. For example, were certain spaces consistently utilized for specific activates such as food preparation or household rituals or did the practice of mobility itself result in a loose codification of household space? Again, much work is still needed, however the simple ability of this study to recognize a pattern in refuse removal suggests that not only can we identify enclosed dwelling space but we can also begin to interrupt the types of activates that took place within them.

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## Disclosure Statement

No potential conflict of interest was reported by the author(s).

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