Ground Stone, Continuity, and Change at Çatalhöyük

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The Early Chalcolithic in Central Anatolia (6100-3000 B.C.E.) is a period characterized by both significant changes in the way people lived and a continuation of traditional practices. The site of Çatalhöyük West offers a unique opportunity to study the complexities of the Early Chalcolithic. Lying only 300 meters from the Late Neolithic site of Çatalhöyük East, the West Mound shows both continuity and change with its neighbor. The analysis of ground stone artifacts is potentially less affected by chronological gaps resulting from erosion of the mounds since ground stone is considered a relatively conservative class of artifacts in terms of rate of change. My research focuses on the ground stone artifacts excavated from Çatalhöyük West and Çatalhöyük East by several teams over many years. This article will use the ground stone evidence to examine the processes of change and continuity between the East and West Mounds of Çatalhöyük, with special emphasis on raw material and typo-morphological traits.

Introduction

Çatalhöyük West lies 300m from the better known Late Neolithic East Mound, across both the ancient riverbed of the Çarşamba River and its current channel (Fig. 1). The Neolithic East Mound was located on the alluvial fan of the Çarşamba River, an area with a wetland environment at the time of occupation.[1] The West Mound covers approximately eight hectares and was first excavated in 1961 by James Mellaart, who dug two trenches at the top of the mound.[2] The West Mound has received less attention that the neighboring East Mound, but a number of recent excavations have been investigating the site.[3] From 1998-2003, Gibson and Last[4] excavated near Mellaart's 1961 trenches on the top of the mound. Current excavations are proceeding under Burçin Erdoğu at Trench 8[5] and Peter Biehl and Eva Rosenstock at Trenches 5, 6 and 7, with Trench 6 excavations completed.[6]

New data suggest that the habitation sequence from the East Mound to the West Mound was uninterrupted and possibly concomitant. Mellaart had argued for a hiatus between the abandonment of the East Mound and the settlement of the West Mound.[7] Potential erosion off of the East Mound and a poor understanding of the origins of the West Mound may account for this conclusion. New data from excavations on top of the East Mound[8] and from a deep sounding of the West Mound[9] have produced typologically similar pottery, suggesting a continuous habitation. Additionally, the L-shaped 'pot-stands' typical of the West Mound have also been found at the top of the East Mound.[10] In light of the seamless transition in habitation from East to West, we can explore what changes and what does not during the transition. In order to do this, we must expand the research question to include all classes of material culture so that we can construct a holistic picture of the transition from East to West.

This article begins by exploring documented changes in the material culture between the East Mound and the West Mound of Çatalhöyük. This includes changes in pottery, obsidian, animal remains, human remains, and architecture. I then focus on the ground stone assemblage from the West Mound in order to incorporate this previously unstudied material into the larger picture of change and continuity at Çatalhöyük. Finally, I summarize the conclusions from the recent analysis of the Çatalhöyük West Mound ground stone.

Material Culture

The West Mound witnesses a number of changes from the East Mound, in material culture, economy, architecture and space, and social practices. Many of these changes are quite drastic, with some traits completely disappearing (e.g. intramural burials, plastered installations) and others arising without precedents on Çatalhöyük East (e.g. painted pottery, buttressed buildings). Pottery is one of these drastic changes. While a small amount of pottery has been found on the East Mound (about 25 kg), significantly more has been found on the West Mound (680kg), despite the lesser volume of excavated soil.[11] The West Mound pottery is largely painted in tones of red and brown, not unlike other Early Chalcolithic ceramics from Central Anatolia.[12]

Chipped stone also shows a number of changes from East to West, most notably the near total extinction of a variety of projectile points.[13] The West Mound is mostly lacking in projectile points, revealing what was likely a major decrease in the importance and practice of hunting wild animals. This conclusion is also supported in the faunal remains. Sheep/goat emerge as the dominant species on the West Mound, and it appears that they are largely domesticated.[14] Sheep and goats are often classed together due to the morphological similarity of their skeletons. Bovines (auroch and/or cattle) decrease dramatically, reflecting the likely drop in hunting as well as a possible change in the local environment to a cooler, drier climate.[15] In addition to the loss of points, the West Mound also sees an expansion in the source of the obsidian to include Cappadocian obsidian from both Göllüdağ and Nenezidağ.[16]

Architectural changes abound between the two mounds. The West Mound houses are missing the elaborate decorations from the East Mound, such as bucrania and wall murals. The introduction of interior buttresses on the West Mound allowed for larger houses and, considering the thickness of the walls, may have served as basement level supports for multi-story dwellings.[17] The West Mound also displays an increase in the variation of construction materials. The mudbrick used for house construction often contain debris in the form of pottery, seeds, and other rubbish, with the material from different houses coming from different sources, as opposed to the East Mound, where the mudbrick appears to be made from virgin soil dug from the plain.[18]

The transition from the East to the West Mound is also related to a number of social changes. The absence of intramural burial beneath house floors on the West Mound stands in stark contrast to the East Mound, where the practice was well acknowledged. How the inhabitants of the West Mound treated their dead remains a mystery. Other than a pair of infants, no burials have been found in Chalcolithic contexts on the West Mound.[19]

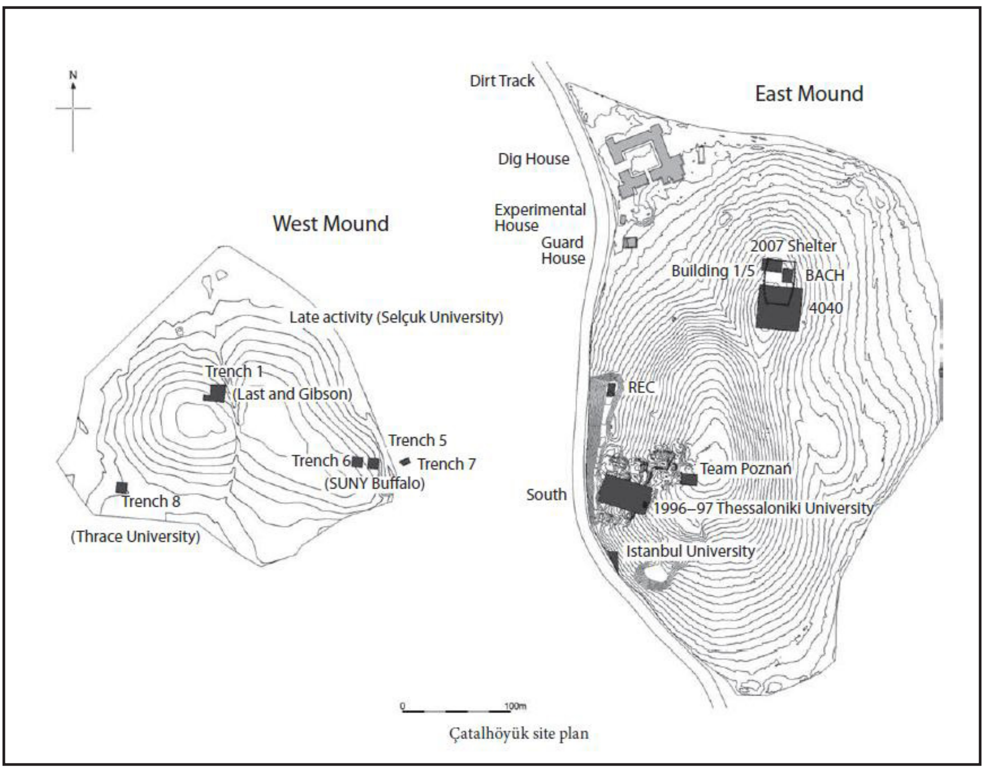

Figure 1: Çatalhöyük Site Plan (Hodder 2006, 13)

Ground Stone Raw Material Use

We will now consider the ground stone assemblage from the West Mound of Çatalhöyük, focusing on the use of raw material and the distribution of tool types. The results of this analysis will then considered in comparison to the assemblage from the East Mound of Çatalhöyük in order to expose differences and similarities between the assemblages.

Initial analysis of the raw material of ground stone from the West Mound revealed some definite patterns (Table 1). The Çatalhöyük West Mound ground stone sample is composed of 351 pieces of worked stone. The West Mound ground stone material includes igneous, metamorphic, and sedimentary rocks as well as a small number of minerals.

Igneous Rocks

Igneous rocks make up the vast majority of the sample, at 78.35% (n=275) of the total sample analyzed. Of the igneous rocks, andesite is by far the most common, representing 66.95% (n=235) of the total igneous rocks. Andesite is a commonly used material for food processing tools like querns and handstones. Karen Wright's analysis of a large sample of ground stone material, mostly from the East Mound, shows a similar usage of raw material.[20] Basalt is the next most common type of rock, making up 7.98% (n=28) of the total sample. Pumice (1.42%, n=5), gabbro

Material	**Total**	**% Total**	**% Rock Type**	
Andesite	235	66.95%	78.35%	Igneous
Basalt	28	7.98%		
Pumice	5	1.42%		
Gabbro	3	0.85%		
Diabase	4	1.14%		
Sandstone	8	2.28%	8.26%	Sedimentary
Limestone	19	5.41%		
Chert	1	0.28%		
Conglomerate	1	0.28%		
Undifferentiated Metamorphic	6	1.71%	9.97%	
Marble	21	5.98%		
Serpentinite	6	1.71%		
Metaquartzite	1	0.28%		
Steatite	1	0.28%		
Undifferentiated Mineral	1	0.28%	2.28%	Minerals
Calcite	1	0.28%		
Quartz	5	1.42%		
Pigment	1	0.28%		
Undifferentiated	4	1.14%	1.14%	N/A
	351	**100.00%**	**100.00%**	

Table 1: Raw Material Usage of West Mound

Figure 2: Andesite Grinding Handstone

(0.85%, n=3), and diabase (1.14%, n=4) make up the rest of the igneous rocks.

Wright found that 73% (n=4841) of the worked stone from the East Mound was made from igneous rocks, and 59.4% (n=3983) of the total number of worked stone was andesite, compared to 78.35% igneous and 66.95% andesite in the West Mound sample. There appears to be a slight increase in the use of igneous rocks and andesite in particular. This may be indicative of an increased cultivation of grains and the need for greater food processing capabilities. However, the increase in igneous rocks may be the result of either the sample size and/or the fragmentation of the sample.

Andesite

Andesite is the most common type of rock in the study sample, representing 67% (n=235) of the sample. It seems logical to ask why andesite is so common in the ground stone material from the West Mound. The answer must be a function of several factors including, but not limited to, the physical properties desired for a given tool's design, the availability of the raw material, and traditions of tool conceptualization and manufacture.

Andesite is a durable, hard, and mostly course type of igneous rock. Andesites are less dense than basalts, meaning that they weigh less by volume. This characteristic would come in useful at Çatalhöyük, owing to its location and the need to bring in andesite from the volcano of Karadağ, 35 km away , as this is the closest source of igneous rocks in the area.[21] At such great distances, the lower density of andesite would make bringing the material to the site much easier than heavier basalts. Grinding and abrading tools tend to be larger in size, so the effort required to bring these large stones to the site must have been considerable. The durability of andesite is especially desirable for food processing tools, in which the detachment of rock grains is undesirable. Andesite is therefore the rock most functionally suitable to food processing that is readily available to the people of Çatalhöyük West.

Figure 3: Serpentinite Grooved Axe Bit

Metamorphic Rocks

Metamorphic rocks make up 9.97% (n=35) of the total sample, with marble as the predominant type at 5.98% (n=21). Other metamorphic rocks represented in the sample include serpentinite (1.71%, n=6), metaquartzite (0.28%, n=1), and steatite (0.28%, n=1). Another six rocks (1.71%) were identified as metamorphic but were unable to be further defined.

Sedimentary Rocks

Sedimentary rocks are 8.26% (n= 29) of the total sample, including sandstone, limestone, chert, and conglomerate. . Limestone makes up 5.41% (n=19) of the total sample while sandstone is 2.28% (n=8). While lake marls, chalks, and soft limestone are the only rocks in the local area of Çatalhöyük, these do not appear to have been used to make ground stone tools on the West Mound.[22] The limestone and sandstone in our sample is most likely brought in from some distance and is harder and more useful for tool manufacturing than the local soft rocks. It is likely that lake marl and chalk are the main components of the wall plaster at Çatalhöyük West, but this falls outside the scope of the present research.

Minerals

Minerals comprise 2.28% (n=8) of the total sample. This small group of minerals includes quartz, calcite, and ochre. It must be noted that this group only includes individual pieces and does not account for pigment residues on other pieces of ground stone material. While the sample contains only one piece of ochre, as a pigment it is present on several other pieces.

Quartz is the most commonly represented mineral in the sample, representing 1.42 % (n=5) of the total sample and 62.50% of the mineral group. Quartz appears in a few different forms, including carnelian, rose quartz, and common quartz. All but one of the pieces of quartz are classed as polishing tools, with the other piece assigned to the miscellaneous class of 'stone balls.'

<u>Worked Stone Analysis</u>

In this section, we will discuss the composition of the sample by tool class and type (Table 2). It is impossible to say how many individual tools are represented by the pieces in the sample. Most of the pieces in the sample are fragments of tools, with only a few complete tools represented. The nature of the fragmentation of the sample is still poorly understood. It is unknown whether the fragmentation occurred in post-depositional contexts, the tools were intentionally fragmented, or the fragmentation was accidental and resulted in the deposition of the pieces.

Grinding and Abrading Tools

Grinding and abrading tools present a couple of unique problems in analysis. Grinding and abrading tools were lumped together in analysis due to the difficulty in distinguishing between the two. In hand samples, grinding wear and abrading wear can appear quite similar in andesite and basalt. In addition, the high rate of

Use Wear Feature/Tool Type	Total	% Total	Class %	
Undiff. Grind/Abrade	148	39.47%	46.93%	Grind/Abrade only
Grind/Abrade Slabs	20	5.33%		
Grind/Abrade Handstones	8	2.13%		
Undiff. Grinding	3	0.80%	3.20%	Grinding only
Grinding Slabs	4	1.07%		
Grinding Handstones	5	1.33%		
Undiff. Abrader	8	2.13%	10.13%	Abrading only
Abrader Slabs	6	1.60%		
Abrader Handstones	24	6.40%		
Undiff. Polishing	4	1.07%	13.07%	Polishers
Polishing Slabs	6	1.60%		
Polishing Handstones	39	10.40%		
Undiff. Pounding	1	0.27%	8.00%	Pounding
Anvils	3	0.80%		
Hammerstones	14	3.73%		
Mortars	3	0.80%		
Pestles	9	2.40%		
Grooved Abrader	4	1.07%	1.33%	Grooved
Incised Pebbles	1	0.27%		
Axes	7	1.87%	1.87%	Cutting
Maceheads	1	0.27%	0.27%	Perforated
Vessels	10	2.67%	2.67%	Vessels
Beads	5	1.33%	1.33%	Beads
Stone Balls	12	3.20%	3.47%	Miscellaneous
Pigments	1	0.27%		
Undiff. Misc.	29	7.73%	7.73%	Undiff. Misc.
	375	**100.00%**	**100.00%**	

Table 2: Tool Types and Use Features

breakage of grinding and abrading tools makes it difficult to determine the type of the tool. Grinding slabs and grinding handstones show similar use-wear patterns, and fragments are difficult to ascribe to a particular type without information on the size or shape of the parent tool.

As a class, grinding tools and abrading tools account for 60.27% (n=226) of the total sample. This is the largest class of tools in the sample, but there are a few caveats and considerations. Grinding tools and abrading tools are separate classes in the Çatalhöyük East technotypology, but were combined due to the difficulties of differentiating between the two types of wear. Combining them into one class will naturally have the effect of increasing the frequency of the class. Additionally, grinding and abrading tools tend to have a high rate of fracture. The large number of fragments skews the representation of grinding and abrading tools. However, recognizing this, it is still safe to say that grinding and abrading tools are a significant proportion of the overall ground stone material.

Polishing Tools

Polishing tools account for 13.07% (n=49) of the total sample, the second most of any class behind grinding and abrading tools. Polishing slabs represent 1.6% (n=6) of the total sample. There were also four pieces that showed polish use wear that could not be assigned to a specific type. The most common type within the class is the polishing handstones, or just polishers. There are 39 (10.4%) polishers in the total sample. As a type, polishers frequently show sign of secondary use, at 20.51% (n=8). Secondary use features identified on polishers include pounding (n=6), cutting (n=1), and grinding/abrading (n=1). The frequency of secondary use could be the result of misinterpretation of polishing wear from manufacturing. This is a problem that needs to be addressed by microscopic wear analysis in future research.

Pounding Tools

As a class, pounding tools make up 8.0% (n=30) of the total sample. Three pieces (0.8%) are identified as worktables or anvils. One of the anvils shows signs of being used as a grinding or abrading slab, including rounded surface grains over percussion scars. Another three pieces (0.8%) are identified as mortars. Two of the mortars also show use-wear indicative of grinding or abrading. There is one undifferentiated pounding tool which could not be assigned to a specific type.

Hammerstones comprise 3.73% (n=14) of the total sample. One of the most interesting features of the hammerstone type is the high frequency of secondary use-wear associated with them. Secondary use-wear is wear that occurs after initial use life and can be the result of tool recycling, in which the purpose and actions associates with the tool may differ from the original. Of the 14 pieces identified as hammerstones, 9 (64%) show signs of secondary use. This is the highest percentage of secondary use among any type of tool. Without microscopic use-wear and chaîne opératoire analysis, it is not yet possible to say whether the use-wear related to hammering is more often a primary or secondary activity or whether use is concomitant. Microscopic analysis is required to observe the sequence of use-wear and could reveal in which order wear had been accumulated. Secondary use-wear on hammerstones is identified with grinding/abrading, polishing, cutting, and other pounding activities (pestle). There are 9 pieces (2.4%) with use-wear indicative of pestles. Of these, 44% (n=4) have secondary use-wear, including grinding/abrading, polishing, and hammering wear.

Cutting Tools

The sample contains seven (1.87%) cutting tools, all of them axes. Two (28.57%) of the axes show signs of secondary use, one as a polisher and one as a hammerstone. The axes do not show macroscopic signs of hafting, and it seems unlikely that the axes were not hafted. Hafting methods are an issue of interest for future research.

Vessels

Vessels make up 2.67% (n=10) of the total sample. No distinction was made between vessel types (i.e. plates, trays, bowls) in the present analysis. Vessels show no signs of secondary use-wear and are all broken. Three vessel fragments were able to be refitted, the only such pieces from the entire sample. These three fragments were originally from two different units. Once refitted, they positively constituted a single artifact and were thereafter treated singularly, being counted as only one vessel.

Figure 4: Macehead from Trench 5, Çatalhöyük West

Other Worked Stone

One of the most aesthetically pleasing pieces of ground stone from Çatalhöyük West is the macehead (CH11 WT5 16967 x19). The macehead was found near the end of the 2011 field season. The macehead appears to be made from meta-andesite. It weighs 310.5 grams and measuring 47.5 mm high and 57.6 mm across. The piece is complete and shows no obvious signs of damage. Stone balls make up a total of 3.2% (n=12) of the total sample. It is still unclear whether some or all of these stone balls were manufactured or collected from streambeds. It is also unknown what the purpose(s) of the stone balls were.

Discussion

A number of conclusions may be drawn about the West Mound ground stone material from this analysis. While these conclusions are drawn from preliminary analysis, they do offer insights into the data and pose questions for future research. Perhaps the largest question to ask of the data is how does it relate to the East Mound ground stone data? We can begin by noticing the overarching similarities in raw material and tool type distribution. Andesite remains a very important rock for any tools that require considerable durability or coarse textures, such as pounding tools and grinding tools. Andesite is well suited for the manufacture and use of the types of tools it was made into. Andesite is quite durable, though not as much as basalt, but can be much less dense and therefore easier to transport from the quarry or during routine use. It is also easier to work with and less resistance to fracture. Particles are not easily detached from the surface of the rock, making it well suited for grinding applications.

The prevalence of andesite is largely due to access. It can be found at the volcanos of Karadağ and Karacadağ, the closest sources of the rock. Andesite from the volcanos may have been transported using draught animals, as domesticated cattle were kept by the people of Çatalhöyük West. However, there is as yet no direct evidence of draught power in use at such an early date. An even closer reservoir of stone would have been the East Mound itself. It is difficult to identify a tool as originating from the East Mound unless it shows indicative typological markers. There are definitely great quantities of material originally from the East Mound found on the West Mound. Pottery and chipped stone from the Late Neolithic have been found in the walls and buttresses of Trench 5.[23] While such positively Late Neolithic materials have not been found in room fill or on house floors, it is at least apparent that the people of Çatalhöyük West were incorporating East Mound material into their buildings. Another similarity between the materials from the two mounds is the emphasis on grinding/abrading tools. These tools make up the majority of both assemblages, with slightly more on the West Mound. It is still unclear whether the greater percentage of grinding/abrading tools on the West Mound is the result of actual patterns, the overrepresentation of fractured pieces, or research methodology. It may be that increasing exploitation of domesticated cereals required more grinding tools, however the use life of the tools appears to be short and this could result in an overrepresentation of the actual number of tools in use. The grinding/abrading tools from the West Mound have comparatively little use wear and appear to have been fractured before the end of the tool's life. This is contrary to the pattern of curation observed by Baysal and Wright in the East Mound material, which showed long lifespans and a strong tendency for reuse and recycling.[24]

The little use-wear and high fracture rate of the West Mound material deserves further mention. This phenomenon may be called 'wasteful' because of the greater amount of new raw material that must be manufactured into tools, only to have those tools smashed early in their lives while they still had potential for use. This 'wastefulness' may have correlates in the treatment of pottery and butchered animals. The West Mound pottery contains formed, unfired pottery that is sometimes painted.[25] This pottery was discarded before the completion of the production process, even though it could have easily been reused. Animals bones show a similar pattern, with the carcasses being only lightly processed.[26] This recurring 'wastefulness' could be related to increasing exploitation of the environment and increasing trade connections, although it is still a topic of ongoing study.

The transition from the East Mound to the West Mound includes changes in a number of artifact types and practices. Combined, these changes create a community that appears unrecognizable compared to the 'classic' Late Neolithic levels of Çatalhöyük East (e.g. level 6). However, the West Mound ground stone artifacts see both changes and continuity from the East Mound. The approximately similar distribution of tool types between the two Mounds suggests that the inhabitants of the West Mound engaged in an economy not entirely dissimilar from that of the East Mound. The people of the West Mound continued to practice a small scale, subsistence food economy, using similar food processing technologies as their predecessors. There remained a focus on craft industries, but with an increased focus on ceramic production. If ground stone tools represent a broad cross-section of the economic technology, then the evidence suggests that while many things changed from East to West, life continued on the West Mound much as it had for their ancestors.

Endnotes:

1 Rosen & Roberts 2005
2 Mellaart 1965
3 Gibson & Last 2003a, 2003b, Biehl & Rosenstock 2009, 2010, Erdoğu 2010
4 Gibson and Last 2003a, 2003b
5 Erdoğu 2010
6 Biehl & Rosenstock 2009, 2010
7 Mellaart 1965
8 Team Poznan area, Czerniak and Marciniak 2008
9 Trench 7, Biehl and Rosenstock 2007, 128-129
10 Czerniak and Marciniak 2003
11 Biehl et al. 2012:55
12 Düring 2010
13 Biehl et al. 2012:58
14 Orton 2010
15 Biehl et al. 2012
16 Ostaptchouk 2012
17 Biehl & Rosenstock 2009
18 Biehl et al. 2012
19 Biehl at al. 2012
20 Wright 2011
21Wright 2011
22 Wright 2011: 9
23 Biehl et al 2012, 81-82
24 Baysal and Wright 2005
25 Franz 2010
26 Biehl & Rosenstock 2010

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