Çatalhöyük 2015 Archive Report

by members of the Çatalhöyük Research Project

Edited and compiled by Scott D. Haddow

Cover image: painted & plastered head from Building 132 (Photo: Jason Quinlan)

(Red hand logo designed by Ian Kirkpatrick)

Contents

Cultural and Environmental Materials

Support Teams

Research Projects

Chapter 1

2015 Season Review

Ian Hodder, Stanford University

This has been a season of remarkable finds and new insights. The excavations took place between June 25 and August 22 with about 110 researchers and excavators on the site at any one time. Work continued in the South, North and TPC Areas, and in all areas exceptional finds were made. For example, in the TPC Area, in the rubble infill of a late building a stone figurine was found that ranks with the best that have ever been found at the site (Fig. 1.1). As in many examples, the head was removed at some time before deposition, but the body is well formed. The team has suggested for some time that the well-modeled figurines that occur throughout the occupation of the site but especially in the later levels tend to focus on bellies, buttocks and breasts of older or mature individuals. While the new figurine emphasizes legs and buttocks, it also has a very marked pubic triangle although the central vertical line is less carefully executed than the rest of the figurine. The fact that such figurines tend to occur more commonly in the upper levels of the site fits in with other evidence of social changes that emphasize domestic production rather than rituals associated with wild animals.

Figure 1.1. *Stone figurine found in the TPC Area by the team led by Arek Marciniak (Photograph: Jason Quinlan).*

A remarkable find too was made in the North Area. In Building 132 a head was found that had been modeled in plaster, painted and inserted with obsidian eyes (Fig. 1.2). While a Neolithic statue with obsidian eyes has been found at Şanliurfa, parallels for the Building 132 head are rare. Building 132 occurs probably in Level North F level, roughly comparable to Mellaart's Level VII. The head was multiply replastered, and in some of the replasterings the obsidian eyes were replaced with black paint. The head was originally attached to the wall of B.132, above and looking into or watching over the entrance into the side storage room. It is tempting to interpret the head and its obsidian eyes as monitoring the movement of stores into and out of the side room. In the early and mid-levels at Çatalhöyük, there seem to have been strong constraints on the accumulation of stores and material wealth by individual houses and by individuals in those houses. It is not possible easily to determine whether the head represents a human or animal. When viewed face on, many observers see resemblances to a feline or bear, but when viewed from the side, the head has the type of nose and chin seen on anthropomorphic figurines.

In the South Area, an *in situ* but badly damaged bucranium (plastered bull's cranium) was found in Building 89 (Fig. 1.3). This is of particular interest because it shows the inhabitants of Çatalhöyük, as well as remembering past events by placing bucrania in houses, also at times put bu-

crania out of commission in a process of forgetting. Mellaart had found bucrania that had been allowed to sink into floors as plaster layers were added to them (in his 'Shrine 10' sequence). In Building 89 the bucranium had been defaced and then the floor had risen around it, completely burying it. So while the houses at Çatalhöyük have been described as 'history houses' in which histories were made by the accumulation of objects, they were also 'forgetting houses'.

Figure 1.2. *Plaster head with obsidian eyes and painted surface from Building 132 (Photograph: Jason Quinlan).*

Figure 1.3. *Bucranium in Building 89 (Photograph: Jason Quinlan).*

As well as remarkable new finds, there were also important new insights as a result of the excavations in 2015. Two such insights resulted from the excavation of Building 132, mentioned above in relation to the discovery of the plastered head with obsidian eyes. The first insight resulted from the fact that the building had some unusual characteristics. For example, the building as excavated (Figs. 1.4 and 1.5) is very large; but the building also extends to the west and east below as yet unexcavated buildings, making it by far the largest building yet excavated at Çatalhöyük. In addition the walls are much thicker than other buildings of this time period (Level North F), and the building was abandoned in an unusual way, with 2.5m high walls left standing. All this suggests a building of special significance, an interpretation supported by the fact that the building above it, excavated over the last decade as Building 77, was very elaborate and had an unusually large amount of bodies buried beneath the floors. The main room in Building 132 was largely devoid of platforms in its latest phase before abandonment, but it did have ovens and hearths associated with *in situ* clay balls in its southern half. It is possible that this room acted as a food preparation and consumption area for a larger group than is normally seen at the site. Whether this is a special building for communal activity or just an unusually large building will have to await further excavation. But Building 132 does raise the issue of whether we have been entirely correct in saying that the society at Çatalhöyük was fully egalitarian.

Another insight deriving from the excavation of Building 132 concerned the large number of burials found in the northeast corner of the main room. These, however, are all dated to the period after the aban-

donment of the building. There is much evidence of wall collapse, decay and rebuilding in the later phases of use of this building (again suggesting that a process of 'forgetting' was taking place). After a period of time in which the northeast of the abandoned building was used for refuse deposition, a series of burials were interred. These were placed before and during the foundation of Building 77 that was built above Building 132, and it was the northeast corner that was to become the center of burial and ritual elaboration in Building 77. It seems, then, that Building 77 was constructed over a cemetery located in the northeast corner of the abandoned Building 132. A similar process has now been found in a number of cases, such as the plastered skull placed in a foundation burial in Building 53, and the cemetery found beneath the B.65-B.56-B.44-B.10 sequence of buildings. Another possible example discovered in 2015 is the series of burials found beneath Building 17 in the South Area. Although the floors of Building 17 remain to be fully excavated, there is much evidence that below this building there are midden layers into which elaborate burials were set. In one case, a thick layer of phytoliths seems to suggest a plank placed on or with the body. A very similar plank burial was found in the same building during excavations in the 1990s. Most commentators, including the present team, have interpreted Çatalhöyük as consisting of houses in which burials were placed. Perhaps we need to reformulate this perspective and see the burials as primary, with houses built up around them.

Figure 1.4. *View of the excavated floor of Building 132 (Photograph: Jason Quinlan).*

Another new emerging interpretation concerns the fact that in the North Area we have now excavated four large and elaborate buildings in a row (Fig. 1.5). In 2015 the metal bridge that allowed tourist viewing of Building 5 was removed so that we could excavate a large burned building. Building 131 was situated to the south of Building 5 (that had the burned Building 1 above it), and to the north of Building 132 (with

burned Building 77 above it). We have thus now excavated four large buildings, from north to south Building 5-1, Building 131, Building 132-77 and Building 52. All these buildings are large, long-lasting, have many burials, are often very elaborate and 'rich', and have a final phase of burning. They are surrounded to the west and east by smaller buildings, less elaborate, often with fewer burials, often unburned, and by large areas of midden or open space. We have yet to fully understand what these linear arrangements of special buildings indicate but we have seen similar arrangements in the South Area – for example Mellaart's 'shrines' 1, 8 and 10 form a similar row of elaborate buildings, often with many burials, that end in burning. Might these be spatial representations of lineages of related buildings?

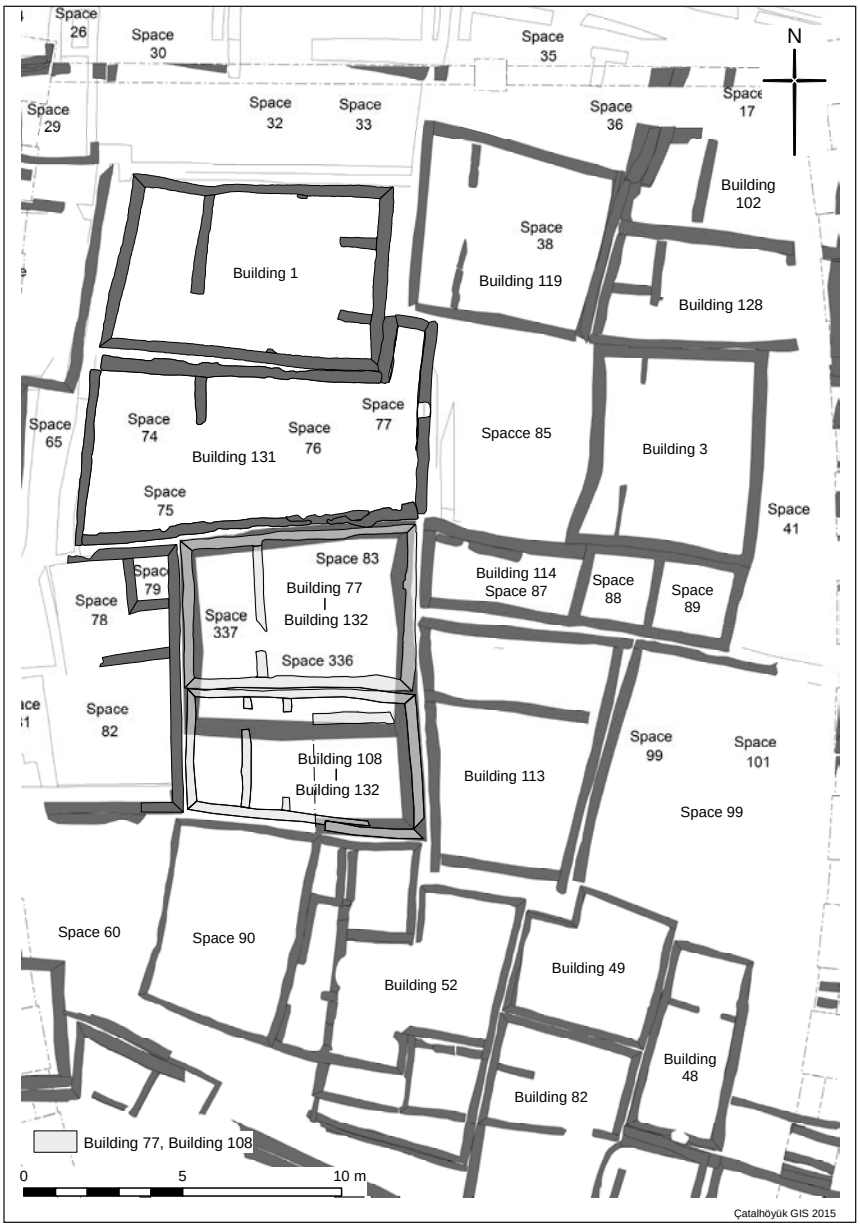


Figure 1.5. *Plan of buildings discovered in the North Area at Çatalhöyük (Source: Camilla Mazzucato).*

Towards the end of the occupation of the Neolithic East Mound there are many changes in economic and social and ritual life at Çatalhöyük. We have come to understand these changes best in the TP, TPC and GDN Areas of the site just to the east of the South shelter. In 2015 excavation and research continued in the TPC and GDN Areas where we discovered often very large buildings with thick walls and multiple rooms and without burials beneath the floors. Another change that had been noted earlier is that wall decoration extends over the whole of the main room of houses in later levels rather than being confined to the walls near burials of adults in the northern part of rooms. This observation was confirmed this year in the excavation of Space 462. The walls of this room were richly decorated with geometric motifs (Fig. 1.6), and had platforms, ovens, benches, bucrania as well as two small painted pillars placed on a bench against the northern wall. In earlier levels of occupation at the site, the walls adjacent to storage rooms are not decorated. But in Space 462 the painted decoration extended over the eastern wall behind which there was Space 493 containing five large storage bins for wheat and barley. So, while in earlier levels of occupation storage areas were not marked and were 'watched over' with obsidian eyes, in later phases there was more open recognition and even celebration of stored wealth. The accumulation of stored wealth became more acceptable in the later phases of occupation at Çatalhöyük.

Figure 1.6. *Painted Space 462 in the TPC Area of excavations found by the team led by Arek Marciniak (Photograph: Jason Quinlan).*

Acknowledgements

The main sponsors of the project in 2015 are Yapı Kredi, Boeing and Koçtaş. Other sponsors are Shell and Çumra Şeker Fabrikası. Funding was also received from the Templeton Foundation, The British Institute at Ankara, Imitatio (Thiel Foundation), the Polish Academy of Sciences, SUNY Buffalo, Stanford University and Archaeology Center. We are as ever grateful for the support of Ömer Koç. Our deep gratitude is due to the Turkish Ministry of Culture and Tourism and to our 2015 temsilci Vahap bey, as well as to Konya Museums and its Director Yusuf Benli.

Photo: Jason Quinlan

2015 Field Team

Project Director: Ian Hodder

Project Coordinator: Bilge Küçükdoğan

Assistant Director: Serap Özdöl Kutlu

Government Representative: Vahap Kaya

Camp Manager: Levent Özer

Site Assistant: Ali Muhammed Kavas, Hakan Özer

Translator/Interpreter: Ali Muhammed Kavas

Site Custodians: İbrahim Eken, Mustafa Tokyağsun, Hasan Tokyağsun

Field Supervisors: James Taylor and Burcu Tung

Reflexive Methodology: Åsa Berggren

East Mound Excavations: Renata Araujo, Numan Arslan, Marek Barański, Robert Bergman Carter, Mikolaj Budner, Gesualdo Busacca, Frank Carpentier, Piotr Ciesielski, Maciej Chylenski, Mateusz Dembowiak, Patrycia Filipowicz, Aroa Garcia-Suarez, Remi Hadad, Christoffer Hagberg, Katarzyna Harabasz, Jedrzej Hordecki, Justine Issavi, Erik Johansson, Karolina Joka, Arek Klimowicz, Milena Kubiaczyk, Amanda Lindsey, Serena Love, Julius Lundin, Arkadiusz Marciniak, Allison Mickel, Antoni Nowak, Paul Pettersson, Katarzyna Regulska, Kate Rose, Marta Saj, Weronika Stosik, Onur Yüksel

3D Digging Project: Elisa Biancifiori, Nevio Danelon, Nicolò Dell'Unto, Maurizio Forte, Nicola Lercari, Chiara Mottolese

Bilkent University Field Students: Duygu Ertemin

Cardiff University Field Students: Thomas Allen, Joel Beath, Adam Griffiths, Phillip Holt, Katie O'Connell

Ege University Field Students: Doğu Furkan Acarer, Burcu Demir, Tunç İleda, Özgür Can Uslu

Selçuk University Field Students: Melike Ayhan, Selma Efeler, Kerim E. Ergeç, Kübra Kılıç, Recep Yunus Serin

Stanford Field School: Claudia McKenzie, Halle Payne, Hoang Anh N. (Elizabeth) Trinh

Survey: Marek Baranski, Antoni Nowak

GIS: Piraye Hacıgüzeller, Camilla Mazzucato

Conservation: Ian Channell, Catherine Fairless, Marcin Krzewicki, Ashley Lingle, Olja Mladjenović, Phil Parkes

Database Development and IT Systems: Dominik Lukas

Image and Media: Marta Perlinska, Jason Quinlan

Illustration: Katy Killackey

Finds: Lisa Guerre

Heavy Residue: Dragana Filipović, Jovana Tripković, Milena Vasić

Faunal Team: Julie Daujat, Hayley Foster, Romy McIntosh, Jacqui Mulville, David Orton, Kathryn Twiss, Jesse Wolfhagen

Human Remains: Alexandra Barmettler, Barbara Betz, Michelle Gamble, Bonnie Glencross, Scott Haddow, Christopher Knüsel, Clark Larsen, Marco Milella, Sophie Moore, Marin Pilloud, Eline Schotsmans, Belinda Tibbets, Bright Zhou

Ancient DNA: Nihan Dilşad Dağtaş, Füsun Özer, Mehmet Somel, Eren Yüncü

Palaeoethnobotany: Amy Bogaard, Lara Gonzalez Carretero, Mike Charles, Jon Cogdale, Marvin Demicoli, Dragana Filipovic, Nadja Filipovic, Dorian Fuller, Laura Green, Anne Peterson, Elizabeth Stroud, Talu Tüntas, John Wainwright, Hüseyin Yaşlı

Phytoliths: Judit Barastegui, Juan José García-Granero, Carla Lancelotti, Marco Madella, Abel Ruiz-Giralt

Chipped Stone: Davide D'Errico, Sean Doyle, Christina Lemoniri

Ground Stone: Benjamin Chan, Juliette Hemelaar, Marketa Stovickova, Christina Tsoraki, Sophie Vullings

Pottery: Rosemary Joyce, Serap Özdöl Kutlu, Russell Sheptak, Duygu Tarkan

Figurines and Clay Objects: Lucy Bennison Chapman, Lindsay Der, Lynn Meskell

Dating: Alex Bayliss

Site Visualization: Narcis Burgues, Burcu Demir, Katrina Gargett, Andrew Henderson, Akrivi Katifori, Ian Kirkpatrick, Vasileios Kourtis, Gamze Meşe, Sara Perry, Jenna Tinning, Laia Pujol Tost, Özgür Can Uslu, Maria Vayanou

West Mound Team: Peter Biehl, Jacob Brady, Hallvard Bruvoll, Caitlin Curtis, Ingmar Franz, Wiebke Mainush, Daniel Murphy, Sonia Ostaptchouk, Jana Rogasch, Eva Rosenstock, Daniel Shaw, Elizabeth Stroud, Talu Emre Tüntaş, Chelsea Wiseman

Archaeology Workshop: Selda Eken, Cumhur Ertüzün, Aydan Karademir, Gülay Sert, Bilgehan Usta

House Staff: Ümmügülsüm Eken, Mavili Gemiz, Keziban Sivaz, İdris Uslu

Site Workers: Bayram Bulut, Mevlüt Kalkan, Orhan Kuşçuoğlu, Mevlüt Sivaz, Zekeriya Sivaz, Muhsin Şenol, Mustafa Tutumlular, Gökhan Yeşil, Hüseyin Yaşlı, Lokman Yaşlı

Residue Sorters: Fatma Eken, Hatice Tokyağsun, Şenay Yaşlı

Excavations

Chapter 2

Excavations in the North Area

Burcu Tung, University of California, Merced
with contributions by Robert Bergman Carter, Allison Mickel & Arkadiusz Klimovicz

Introduction

The 2015 excavation season at Çatalhöyük in the North shelter were focused within four building complexes: B.52, B.77 and its predecessor B.132, B.129 and its predecessor B.131, and B.114 (Fig. 2.1). Further work was conducted within B.5 for recording purposes and within midden area Space 490 for health and safety precautions. Below is a summary of the findings of this excavation season.

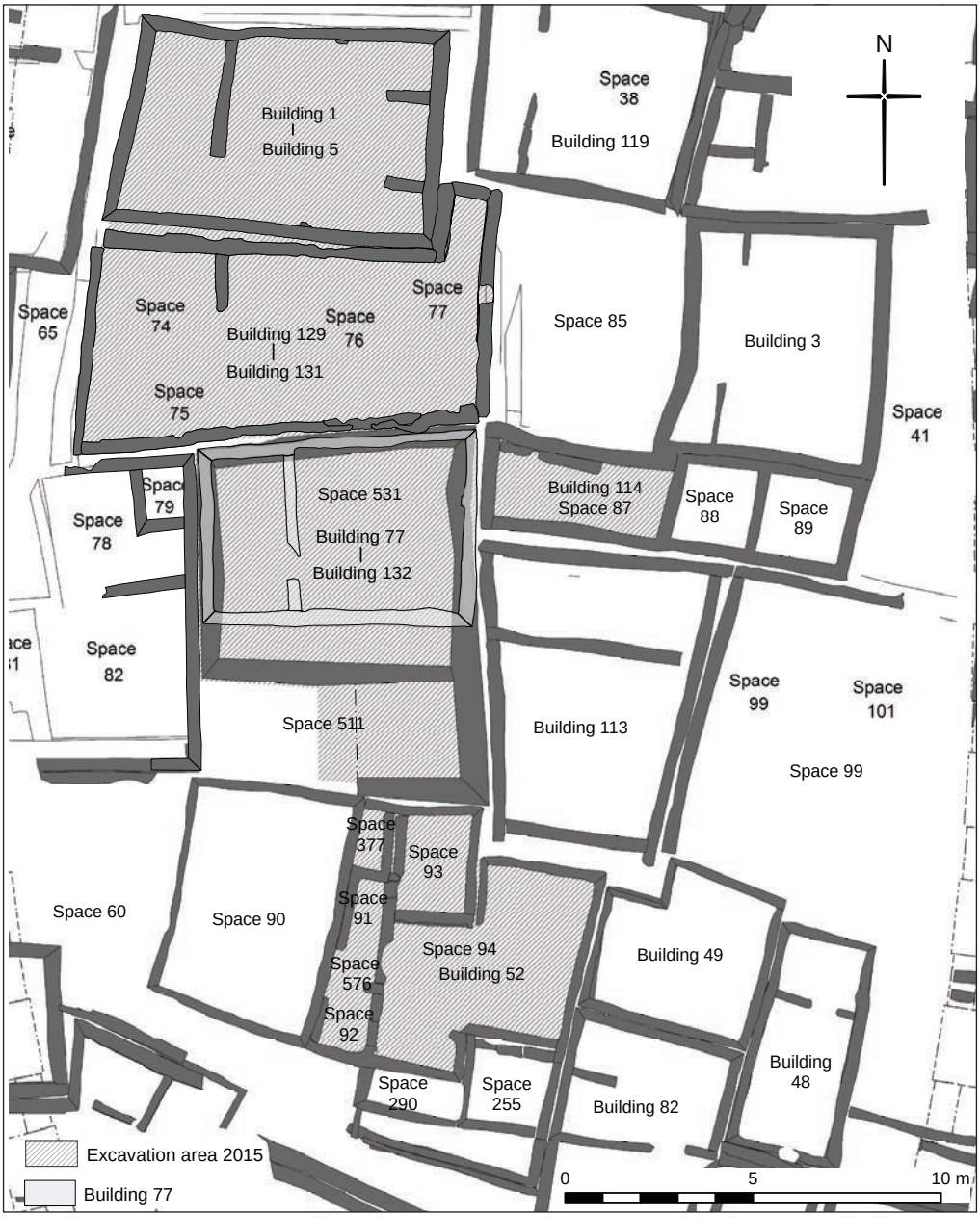


Figure 2.1. *Excavated areas in the North Area in 2015 (plan: Camilla Mazzucato).*

Building 5

with Robert Bergman Carter

This season the digital documentation of B.5 was undertaken to place the building's walls within the site geodatabase. Particular focus was placed on the southern wall (F.224) in order to determine stratigraphic relations between B.5 and B.131 to the south. The initial plan was to excavate a section through F.224.

First a bin-like feature, F.7716, that was abutting the northern wall of B.131 (F.7707) and sitting on top of inter-wall infill between B.5 and B.131 was excavated. The homogenous pisé like structure, (22162), showed signs of burning from the house fire that destroyed B.131. It is possible that this was an external feature most likely contemporary to B.131 (as it did show signs of having been burnt as well as the fact that it was abutting B.131) and that it was not a part of B.1.

Figure 2.2. *The southern wall of Building 5 (orthophoto: Robert Bergman Carter).*

A niche in F.224, Sp. 154, was initially sectioned and partially excavated to determine its boundaries and to find out the relations between B.5 and B.131. The niche had not been previously visible as it had been covered by layers of wall plaster that had eroded and fallen off. Looking at plan drawings from the excavation season in 1998, there was a shallow niche in the wall at this location though all of the building's phases. This niche was however unusually deep, which was evident by the extent of the plaster layer that was followed to an arm's length (approximately 70cm) into the wall and through the next wall to the south. The second wall to the south through which the niche has been cut is most certainly belongs to a building older than B.131. This was confirmed by a small sondage that was made in the eastern lower side of the cut of the niche to determine whether or not a 1cm stripe of plaster was a continuation of a floor beneath a later buttress wall of B.5 or if the wall was undercut and F.244 was indeed the southernmost and original external wall of B.5. The sondage proved that F.224 is not a buttressing wall, and therefore B.5 is definitely older than B.131. The combined result of excavating F.7716, F. 7717 and the sondage rendered the planned excavation of a section through F.224 unnecessary as the stratigraphic relation between B.5 and B.131 became clear.

Building 52

Building 52 (Fig. 2.3) was first excavated in 2006. The building contained elaborate architectural features such as a bucranium and a horned bench and was therefore left for display for visitors. In 2012 excavations recommenced in the building. This season, excavations continued where they were left off in 2014, with the aim of understanding the architectural development of the building. As such much of the work aimed to reveal the relationships between the different spaces of the building. Building 52 consists of a number of rooms that were in use during the life history of the building at different times. This season, quite a bit of focus was placed into understanding the relationship of Spaces 91 and 92, located to the west of main

Sp.94, and Sp.290 and Sp.255 located to the south of main Sp.94. Further, work was carried out within Sp.93 and on the western end of Sp.94. To summarize the main findings, excavations made it apparent that wall F.2183, which makes up the western wall Sp.91 and Sp.92 actually belonged during an earlier remodeling phase of B.52 which also founded Sp.90. Prior to the modeling Sp.576 defined the western extent of the building. The relationship of Spaces 290 and 255 are on the other not as clear, and may represent even earlier phases of the building. In discussing the new finds of the season, phases of building will not be referred to systematically but rather in general terns as further post-excavation work is required to synthesize the very complex life history of the building.

Figure 2.3. *Overview of Building 52 at the end of the 2015 season (west-facing view; photo: Jason Quinlan).*

Space 576

Space 576 underlies Spaces 91 and 92 and represents and belongs to an earlier architectural phase of the building. This phase may very well likely the first expression of B.52. During this earlier phase of the building, Sp.576 was located at the western end of the building, its western wall F.2140 being the outer western wall of the building. As we understand the space today, it is defined by wall F.2140 to the west, an earlier construction of wall F.2012 to the south (new feature number to be allocated), and wall F.2106 to the east. The northern end of the space seems to have been truncated. Here, in a later phase of the building Spaces 377 and 93 were formed with the addition of various wall constructions. In 2008 the northern end of wall F.2185 was excavated. In 2014 wall F.2035 was removed. Below these spaces were infill (14197) and (22221). The removal of infill (22221) revealed an even earlier architectural phase of the building, or possibly part of predecessor Sp.146. Further work is required to confirm this, but as it stands the northern end of

Sp.576 is out of phase. If the space extended to the earlier construction of wall F.2008 (new feature number to be allocated), the trapezoidal space was 6.4m long, 0.9m wide to the north and 2.2m wide to the south.

Space 576 had a sizable oven (F.2195) located at its southwestern corner. Two basin-like features were placed centrally (F.7777 and F.7778). Floor (31409) may be an earlier floor exposed in the northern end of the building. Unexcavated floor (31408) that is above (31409), lips up towards the passageway, F.2109, that connects Sp.576 to Sp.94. This is an important line of evidence showing that the Sp.576 actually belongs to B.52 rather than its predecessor. The passageway had a threshold (Fig. 2.4) that was formed by a single wooden beams laying flat, (22234), connected to two upright beams at its both ends. The passageway remains *in situ* on site. A circular pit, F.7772, is located immediately north of the oven. It is possible that the cut, (31410) belongs to a burial. It is interesting that the final activity in Sp.576 was the pit, and once it was sealed by infill (31407), which remains to be excavated, the residents of B.52 decided to remodel their habitat. As such, much of the features described above, were heavily truncated by foundation trench (31402) that was used in the construction of wall F.2183, the western wall for Spaces 91 and 92 (see below).

Figure 2.4. *The threshold between Spaces 94 and 576/Space 92 (photo: Jason Quinlan).*

Space 90, Spaces 91 and 92, and the remodeling of B.52

It has been noted before that Sp.90 was most likely created during the construction of wall F.2183 which is the western boundary of Spaces 91 and 92 and the eastern wall of Sp.90. However, it wasn't quite clear whether this modification was a part of the making of B.52 or whether it was a secondary architectural phase that belonged to B.52. Perhaps the most important understanding that has been reached by the current excavations has been that this major modification did not mark the establishment of B.52 but rather a renovation to the already established building. This renovation incorporated a large enclosure, Sp.90, to the

west of the already massive building spanning about 4.5m by 6.5m. It is important to note here that except for its eastern wall, the walls that define sSp.90 were not excavated due to time constraints.

This remodeling phase first involved partially dismantling wall F.2140. Then a foundation trench (31402) was laid for the western wall of Spaces 91 and 92. In the construction of wall F.2183, first a layer of foundation bricks were set in the foundation. These orangish grey bricks contained a large number of plant – particularly straw imprints on their bottom, indicating that they must have been relatively wet when placed within the trench. The rest of the wall was constructed with re-used bricks (22294) as evidenced by their variability and the presence of plaster on the surface of some. Further, some even had evidence for fire exposure. It is possible that the roof of B.52 had to be at least partially dismantled for such a remodeling to have taken place.

It seems as though the boundary between Spaces 91, 92 and 94, wall F.2106 was also constructed at this stage, immediately above an earlier wall (F.7776). Wall F.2106 also comprised of a foundational mortar, (22259), before the wall was constructed using bricks (22253) and mortar (22254).

A number of very badly preserved and trampled fine floors and their corresponding makeup was excavated as a single unit, (22287) within Sp.92 and the southern part of Sp.91. These floors, at Sp.91 were sealed by a leveling deposit/infill (22216) that marks the construction of wall F.2185.

F.2185, abuts wall F.2183 and about 1.5m before it hits the northern most wall of B.52, F.2008, it dog-legs 0.1m to the east to form Sp.377. Its northern most section was excavated in 2008. This season, the remainder of the wall was excavated. Its lowest course was a grayish brown foundational mortar, (22286). The bricks, (22231), that constituted the wall were a light orangish brown sandy clay and similar in their matrix to the mortar, (22232). Support wall F.4062 situated at the southwestern corner of Sp.92, abutting the western and southern walls of the space, was constructed at the same time with the use of the same materials as wall F.2185. A number of partial and truncated floors excavated correlate with the newly founded more constricted space ((22224), (22211), (22217), (22213)). Sealed by the construction of oven F.4060, floors (22217) and (22213), essentially floating at the southwest corner, likely correlate with dirty floors (16744) and (16764) that were excavated in 2008.

Oven F.4060, situated in the southwestern corner of Sp.92, was in a deteriorated state, having been exposed to the elements since 2008. Further, stratigraphically, it was no longer linked to any other features or deposits. About 1m in length and 0.7m in width, the oven abutted the southern wall of Sp.92, F.2012 as well as support wall F.4062. Its superstructure (16772) was a grayish brown sandy deposit that was plastered (22205) before having been prepared with the addition of make-up (22203) for floors (22202). The oven had a second set of floors (16771) which were badly preserved. No finds were associated with the scoured floors.

Space 94

Work within Sp.94 focused on the western end of the space which is dominated by platform F.7638 to the north and platform F.7637 to the south, divided by bench F.2164. The arrangement of two platforms divided by a bench is seen in the later phases of the building as well. Here a number of different plastering, leveling, and truncation events were excavated. The aim was to unify the space in terms of its phasing, as the eastern and northern areas of the space were stratigraphically earlier than the western end. By the end of the season, with the excavation of a number of plaster floors, the goal was reached.

Space 94 is a very large space, extending 4.8m east-west and 4.6m north-south. The north-eastern end has two platforms next to each other. Each contained a number of burials that were excavated in the previous years. Immediately to their south is an expansive floor, (21390), divided from the southern floor

(21393) with a ridge. This season, a few post-retrieval pits, associated with the first major remodeling of the house (as discussed above) were excavated. The evidence of post retrieval pits in the remodeling phase gives more credibility for the possibility that the roof was partially dismantled during renovation.

Space 255

Space 255 is located at the southeastern end of the building. The inner dimensions of the space are about 1.9m by 1.7m. When the building was first excavated, two centrally located basins were and left for display. This season, excavations recommenced in the space for the first time since 2008. Needless to say, the features defined in 2008 were very badly eroded. Once the eroded features were excavated an earlier phase of occupation within the space was revealed.

The earliest phase reached here may predate Sp.94, as floor (22260) seems to go under division wall F.2015 while floor (21293) actually lips up the same feature on the other side. Associated with the aforementioned dirty floor is a small rectangular platform at the southeast corner of the space, platform F.7763. A patchy floor (22298) covers this platform.

What is further interesting about this space is the number of different accesses that were created and blocked for the space to be accessed from Sp.94. The floor that is currently exposed is associated with access F.7761, which was cut into wall F.7774. Wall F.7774 was actually built within a truncation of wall F.2015 as a blocking wall.

Space 290

As in Sp.255, a number of features that were left *in situ* after excavations in 2008 were finally excavated this year. It has become apparent that Sp.90 had undergone a number of modifications, making it a complex space. This season's excavations revealed two separate floors. Further excavation is necessary to understand the development of the space and its relation to the spaces surrounding it.

Building 77

This excavation season B.77 was finally completely excavated. Building 77 was, in all likelihood, intentionally and possibly communally burnt down during its closure. Two horned pedestals flanked its northeastern platform, above which a small rams head was placed within the northern wall. At various points of the building's life history, its walls were painted with different designs. Of these, most striking were the handprints that ran across the northern and eastern walls. A large number of individuals were buried within its north eastern, northern and eastern platforms. As such, most of the work over the past two excavation seasons on B.77 had focused on the removal of the burials. Last season, all of the walls of the building were completely excavated while a small 'island' where the northeastern and northern platforms once were was left for further excavation. This season a total of 11 individuals from six burials were excavated from the island. Further, new light was shed on the construction of the building, in particular, the arrangement of its foundations.

Burials excavated in 2015

Burial F.7859 was a baby burial within a basket. Its cut was not located, and it was very deep within the leveling of B.77, by the northern wall within the earlier expression of the northern platform, F.3617. The flexed baby was preterm. It was buried with a shell and some non-plant organic material that may be from animal hide. Its location seems significant being immediately under another neonate burial that was in a basket (F.3642), excavated in 2012.

Burial F.7853 is a multiple burial that belongs to an older adult male (21657) and two infants (Sk(21656), Sk(21653)). The individuals were buried together and represent primary burials. The cranium and mandible of another adult (probably female) Sk(21663) and elements of another infant Sk(21662) were also recovered in the fill as secondary deposits. No artifacts were recovered from this burial feature. This burial was cut into the middle of the northern platform, F.3617, towards its southern edge.

Burial F.7857 belonged to an adult female Sk(21668) and a neonate Sk(21669) interred together. The cranium and mandible of the adult was removed before the burial and the neonate was placed immediately on top of her mid body. Unfortunately the skeletal elements of the burial were not in good condition. No finds were associated with the burial. The burial is located centrally within the northern platform, placed towards the northern wall. No direct stratigraphic link can be made between burial F.7857 and burial F.7853 as they were immediately next to each other.

Three more burials that each contained single individuals were excavated from what would have been the northeastern platform, F.6051. The earliest interment in this area is burial F.7865 which belongs to neonate Sk(21698), located at the northeastern corner of the platform. The incomplete skeleton was in very poor condition. It seems to have been literally 'tucked' into the corner of the platform as cut (21697) followed the edge of the building's walls. It is very likely that this was the first individual interred within the platform. Burial F.7860 belonged to a child, Sk(21681), placed at the eastern edge of the platform. The cut for the burial, (21683) followed the alignment of the eastern wall of B.77. A few beads were associated with the child that was loosely flexed. Burial F.7862 was above both burials and belonged to a flexed adult female Sk(21679) lying on her right side. A cut was not determined for this individual. A number of finds were associated with the skeleton: an obsidian point, yellow-green pigment, a bone pin, a greenstone blade and a shell.

Further notes on the construction of Building 77

This season's work within Sp.531 (see below, B.131) revealed that the abandonment of B.132 and the construction of B.77 included the construction two distinct foundation walls (F.7858 and F.7861) that were previously unrecognized. The abandonment of Sp.531 seems to have been incremental, with the area eventually being used as a 'burial ground'. Prior to its use as a burial ground the western and eastern walls of Sp.531 were severely truncated during the process. New constructional elements were set into the truncations to provide stability for the construction of B.77.

Foundation wall F.7858 was set into the truncation of the western wall of Sp.531. The wall comprised of three courses of mid-grey bricks (21673) joined by mid-orange mortar (21674). The bricks, in terms of their colour, texture and consistency were the same as the bricks used in B.132. It is this reason that in the previous season, this feature was thought to define the western end of B.132. However, the difference in the mortar, once revealed in section, clearly distinguished F.7858 apart from the other walls. Upon its excavation, it became clear that the wall was only three courses high. Interestingly, the continuation of the western wall of B.132 was not found beneath F.7858, eluding the exact layout of the building.

Foundation wall F.7861 (Fig. 2.5) was placed within a truncation that cut the northern wall of building 132 at its eastern end and the eastern wall at its northern end. The L-shaped mud-brick structure comprised of 8 courses of mid-grey bricks (21684), joined by mid-orange mortar (21686). It was constructed within cut (21699) which truncated the earlier mud brick walls to the north (F.7869) and to the east (F.7149, F.7866). The mortar used in its construction is the same as the mortar used in F.7858.

The circumstances that impacted on the decision to undertake construction activities in the northeast part of the B.132 before the erection of the walls of B.77 remain unclear. The execution of a ditch-like cut

(21699) may indicate that at that point the builders realized the possible instability of the earlier elements (F.7866 and F.7869) and eastern wall of B132 (F.7149). The alignment and position of the bricks constituting F.7861 suggest that the building material most plausibly was still wet or plastic during construction.

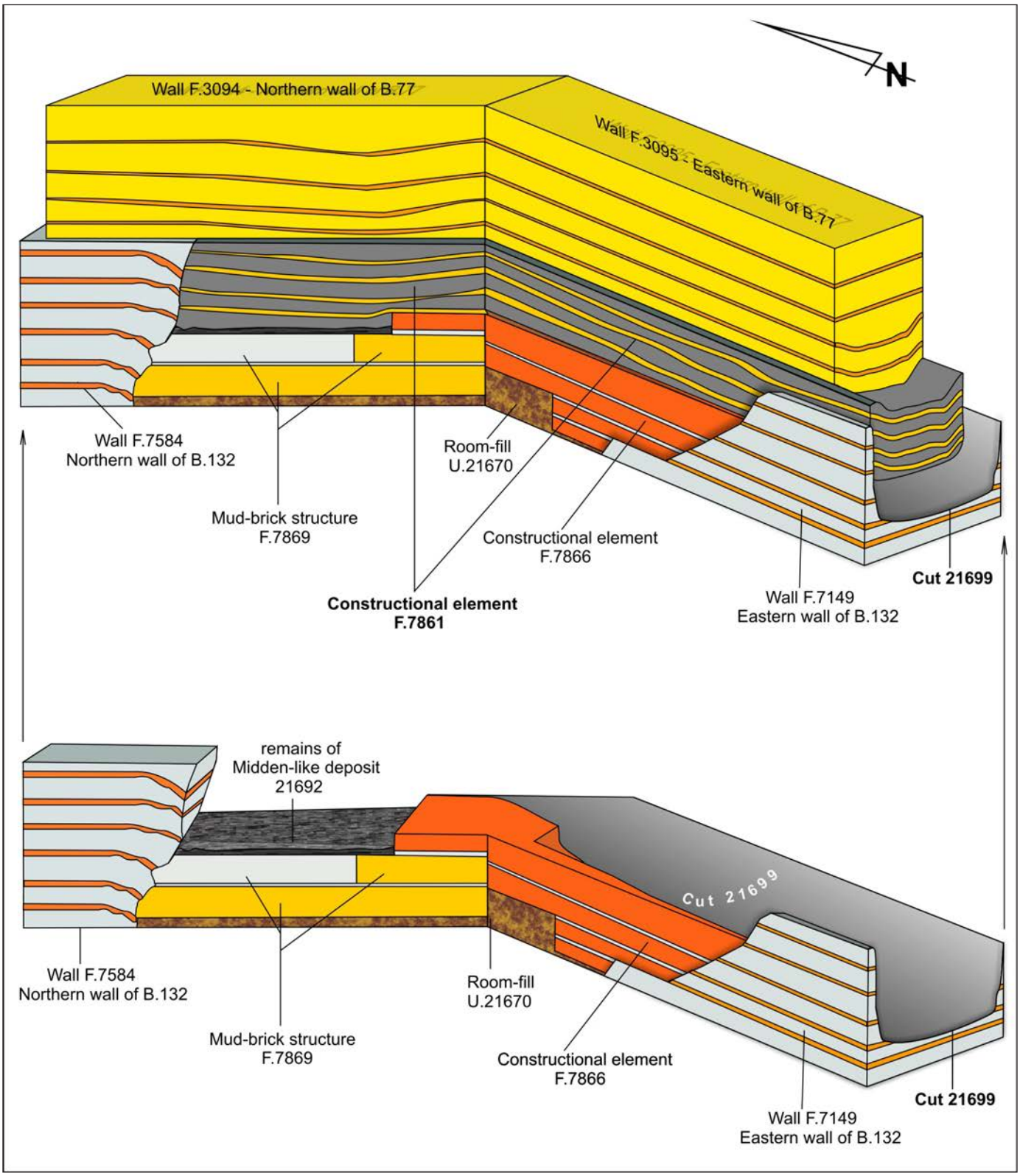


Figure 2.5. *Schema of the constructional elements that make up the northeastern corner of Space 531 (illustration: Arek Klimowicz).*

Building 114

Building 114 is comprised of Spaces 87 and 88. The main space of the building, Sp.87, measuring internally about 4.60m in length and 1.7m in width, has been under investigation since 2012. This season early occupational phases of Sp.87 were excavated, bringing more clarity to the spatial organization of the building. Unfortunately the building is not excavated in its entirety and will remain only partially understood in terms of its stratigraphic relationship to other buildings as this season marks the final excavations in the building.

Unlike other buildings, B.114 has a different configuration in its use of space with its fire installations set to the northern half of its main space: Last season it became evident that the western half of Sp.87 was divided into two distinct activity areas and that the northernwestern quadrant showed 'domestic' activity with the placement of two fire installations that were used in different phases of the building. It was posited that the sunken floors at the northwestern quadrant may have been placed within a wide and shallow cut, but it became apparent this season that this interpretation is most likely wrong. In fact, the southwestern quadrant seems to have been a thin platform, although its edge was truncated during the Neolithic, giving the impression that the plaster floors were cut.

This platform (feature number to be allocated) contained the burials of three individuals interred in two events (burials F.7614 and F.7615). Burial F.7614 belonged to a young female adult and was excavated the previous season. Burial F.7615, which was excavated this season, also belonged to an adult female, accompanied with an infant. The individual Sk(21571) was flexed, placed on its back, with its head towards the east. The infant Sk(30006) was placed on the chest of the adult. Both individuals were facing each other. No finds accompanied the burial.

Immediately across at the northwestern quadrant were a series of fire installations that were used in different phases of the building. It seems as though this area was instantiated as a place for cooking activities early on in the building's life history. The earliest evidence excavated on this comes from a scorched area excavated as (30000), immediately by the northern wall, underneath the later fire installations. This deposit contained an abundance of plant imprints (phytoliths) in random orientation, possibly fuel remains, as inferred from their grassy appearance. It shows a marked rubefaction gradient, and was sealed rapidly after its use.

Figure 2.6. *Plaster coat (30015), fire installation F.8101, Building 114 (north-facing view; photo: Aroa Garcia Suarez).*

This season, the remains of the earliest fire installation of the building, F.8101, was excavated (Fig. 2.6). Oven F.8101 was cut into the northern wall of B.114. Further post-excavation analysis is required to place cut (30033) into the sequence of floors observed in the area. There is a possibility for it to actually be the same as oven F.7345, which had initially been interpreted as a later oven. Part of the issues in this area have been the tremendous amount of post-depositional damage, particularly animal burrowing, that has eluded many of the stratigraphic links. The oven was heavily truncated in the Neolithic during later modifications, and is only retained within the cut. The cut was lined with a sandy clay medium brown sediment (30016) before its first floor (30014) was laid. This superstructure had no signs of rubification. The oven had three series of scorched floors and corresponding make-ups; (30014), (300013), and (30012) from earliest to latest.

(30012) was sealed at its western end by a massive orange clay packing, (30017). At this point the roof of the oven was plastered over with a fine layer of white plaster, (30015) that showed no evidence of burning.

Other work in the building this season focused on the eastern platform and the surrounding floors. Before the platform was constructed, a series of floor deposits excavated as (30029) extended until the plaster ridge that divides Sp.87 into two (western and eastern) areas (Fig. 2.7). These floors are two grey plaster floors and two white plaster floors (below the former), along with their respective make-ups. The second make-up layer from the top was actually a leveling unit, increasing in thickness from 0.5cm to 5cm towards the northwest limit of this unit. Overall, this unit was much thicker towards the north, where the layers underneath show a marked slope. These floors were cut by a small pit (30028) located immediately east of the building's post that did not contain any significant finds. This small pit was in turn sealed by another series of floors (30026) contained in the same area.

Figure 2.7. *Floors that cover the eastern end of Space 87 before the construction of the platform (photo: Aroa Garcia Suarez).*

At this point the platform F.638 was constructed. It was shaped by a light orange-brown silty clay sediment (30022), which was patched (30025) and shaped to a ridge (30023). The initial core seems to have been placed upon a more heterogenous leveling deposit that remains to be excavated. The orange geometric wall painting (Fig. 2.8) found on the southern wall by platform F.638 is likely associated with earlier phases of the platform.

Burial F.8100 the first burial placed within F.638. This was the burial of an adult male Sk(30007) and an infant Sk(30010) placed on the adult's left shoulder. By the right shoulder of the adult and close to its cranium was a complete marble 'mace head', 30008.x1. Cinnabar staining was found on the cervical vertebrae

and cranium of skeleton Sk(30007), and probably the skull of Sk(30010), although in this case pigmentation is more obscure. A sample was taken of the sediment in contact with the mace head, as it appeared to be rich in phytoliths. These have also been found concentrated towards the edge of the burial pit, and the possibility that the mace head moved from its original location (either due to human action or taphonomic agents), should not be discarded. The adult skeleton, although well articulated, has its lower left arm and pelvis missing. These were probably lifted in 2012, as a pelvis and other disarticulated bones were documented as part of the previous burial event. This means that the skeleton may have been slightly altered when the burial pit was re-opened for the following interments.

Figure 2.8. *Orange geometric paint by the southern wall (photo: Aroa Garcia Suarez).*

Building 129

with Allison Mickel

Building 129 is a highly eroded building located within the North Shelter between B.1 and B.77. Excavations in this building began last season, primarily to uncover its predecessor, B.131. Its main axis sits on an east-west alignment. The building is about 11m long and 5m wide. According to the plans drawn during the surface scrape in in the 1990s, B.129 comprised of Spaces 74, 75, 76 and 77. However, due to further erosion in the area, no clear divisions of space are apparent. Further, the doglegged area that was originally assigned as Sp.77 actually belongs to the building below B.129, B.131. Space 77 has been retained in our records to belong to B.129 and represents the eastern end of the main space, as a number of burials that were excavated in 2012 were assigned this space number. These were the burials in which two obsidian mirrors were retrieved (see 2012 Archive Report, Excavations in the North Area). In short, B.129 currently consists of two spaces, one large side room and a main space. Spaces 74 and 75, which make up the side room have been equated to each other, as have Spaces 76 and 77, which constitute the main room of the building.

Building 129 was built above the burnt remains of B.131. As discussed in the 2014 Archive Report and below, the infill of B.131, comprised of burnt building materials (presumably deriving from the burning of the building itself) that were processed into small chunks and evenly distributed across the building. A concentration of antler near the northwest corner of Sp.500 of B.131 and an identifiable, circular dark brown/black dump, (22628), in the southwest corner of the space has been identified to be associated with the foundation of B.129. It is noteworthy that last year's excavators working in Sp.504 identified a similar transition between the fill associated with the foundation of B.129 (21193) and that associated with the closure of B.131. It is likely that the final closure of B.131 and the foundation of B.129 are in fact inseparably linked to one another, showing that there was no temporal break between the two buildings.

All of the identified walls of B.129 were placed within a foundation trench (F.7563) that cut the preparation layer. The northern wall of the building was first defined in 1998. It has been discussed by Craig Cessford that '*it lies over a series of dump deposits which have built up against the southern wall of B1 so the construction of this building must be later than the construction of B.1*' (see Archive Report 1998). The same wall was excavated in 2014 as F.7558. The western wall was defined and excavated as F.7559 and the southern wall as F.7560. These walls contained only a few courses of brick and mortar. The eastern wall of the building could not be defined as it was completely eroded away. It is likely that it was sitting above the heavily burnt eastern wall of B.131.

The only occupational evidence that remained of the building were its burials. As mentioned above, a number of them were excavated in 2012. This season, two more individuals were recovered from this area, which would have been the western platform of the main space. Burial F.7714 contained the primary burial of Sk(22620), an adult buried tightly flexed with bracelets and anklets on both wrists and legs, as well as a copper ring that stained the phalanges green. On top of this individual, throughout the fill, were a large number of elements belonging to Sk(22655) — tibia and fibula, femur, radius and ulna, scapula, mandible, ribs, and many phalanges—which was either an earlier burial at a higher elevation that was disturbed and re-deposited when Sk(22620) was buried, or is alternatively, a secondary burial. Due to the lack of identifiable cuts through which single versus multiple cutting events can be posited, it is impossible to determine the original course of events. However, the burial is consistent with other burials that came from this are in that it contained a primary burial covered over with re-deposited skeletal elements from different individuals.

This season, other burials were excavated from locations consistent with platforms, presuming that B.129 followed a similar design to its predecessor, B.131. Burials F.7709 and F.7713 were both primary burials of subadults, located in what would have been the northern platform of the building. F.7713 was unfortunately highly disturbed by both bioturbation and the construction of the walkway above (see Chapter 5 for further discussion of these individuals). Skeleton (22618) in F.7713 was buried with a significant amount of shell bead jewelry, a finding consistent with juvenile burials elsewhere at Çatalhöyük. Finally, burial F.7715 would have been cut into the southwest platform of B.129 above, and contained a juvenile—though one a bit older than those contained in F.7709 and F.7713.

Building 131

with Allison Mickel

Last season, the infill within B.131's side room, Sp.504 was removed to reveal a very heavily burnt space. This season, after completing the excavation of B.129, the entire fill of B.131 was excavated. What was uncovered is a building that follows the general rules of spatial configuration typical to Çatalhöyük with its platforms, benches, fire installations and posts.

The configuration of B.131

Building 131 is a rectangular building comprised of side room Sp.504 and main room Sp.500, with a small space (Sp.556) extending to the north at the northeast corner of the building like a panhandle (Fig. 2.9). The east-west oriented building is defined by wall F.7705 to the south, wall F.7706 to the west, F.7707 to the north, and wall F.7712 to the east. Space 556 at the northeastern most tip is defined by the eastern wall of the building to the east, wall F.7711 to the north, wall F.7710 to the west and partition F.7967 to the south. The side room of the building, Sp.504 is divided from main Sp.500 by an internal partition wall, F.7708. This room, similar to the side room of B.5, as well as B.77, is located at the western end of the building.

Figure 2.9. *Overview of Building 131 (east-facing view; photo: Jason Quinlan).*

At the latest occupation phase of the building, the northwestern platform (F.7950) dominated the main space as the highest platform. Another platform, F.7952, was located by the eastern wall, immediately south of Sp.556. Bench F.7966, was placed upon this platform, forming a boundary with the building's entrance, which was at the southeastern corner. A burnt ladder (F.7969) abutted the southern wall and was incorporated into the southeastern platform F.7954. Oven F.7953 was carved into the southern wall. Corresponding hearth F.7957 was placed more centrally in the space, on platform F.7951. As such, the main space follows the typical clean/dirty area divisions observed at Çatalhöyük with clean floors observed on the platforms at its northern half and 'dirty' activity areas observed at its southern end.

The space was further divided by the placement of a number of structural posts. Engaged posts F.7971 (abutting the northern wall) and F.7972 (abutting the southern wall) were placed centrally with regards to the building, facing each other, and are structural features associated with its inception. Three posts (F.7959, F.7960, F.7971) have been located centrally in the space next to each other, placed on the north-

south axis of the engaged pillars. Post F.7975 was placed at the partition of Spaces 504 and 500, and aligns on a east-west axis with post F.7959 and bench F.7961. Two engaged pillars were placed abutting the eastern wall. Pillar F.7958 was located at the northeastern end of Sp.500, and became incorporated into the northeastern platform. Pillar F.7976, similarly, was incorporated with bench F.7966. The placement of this post aligns with post F.7959 (located in the middle of the space), which in turn aligns with post F.7975. The placement of the posts and engaged posts clearly divide the building in four quadrants and further enforce the division of space accentuated with by the placement of platforms. The northern wall F.7707 was painted red by the northwestern platform, as was the western wall, F.7710 of Sp.556.

Occupational deposits excavated in 2015

This season a number of small features and floors that correlate with the later occupation phase of the building were excavated.

Space 556

After removing an additional plaster floor in Sp.556 the outline of burial F.7962 became apparent in this small area. For the first 0.20m of the burial's infill contained only fingers, vertebrae, and teeth of juveniles. Below this fill was five separate crania of individuals all under 10 years of age. These crania were placed in the burial along with a myriad of other elements, including some metatarsals, tibia, femur, scapula, phalanges, and pelvis. There were also four wooden bowls placed in the burial, some of which appear to have actual had some skeletal elements inside of them (e.g. 22678.x2, which contained a piece of pelvis) (Fig. 2.10). Most of the juvenile bones, as well as the four wooden bowls (22678.x1, x2, x3, and x4) were lifted this seaon. Underneath these secondary burials was evidence for a primary burial of an adult that has been left *in situ* for future excavation.

Figure 2.10. *Detail view of the wooden bowls in burial F.7962, Building 131 (photo: Jason Quinlan).*

Northwestern platform F.7950

Platform F.7950 dominates the northwestern corner of Sp.500. It extends 1.5m north-south and 1.6m east-west In its final occupation, the platform was covered by a white plaster surface, (22639), which has been left *in situ* until excavations resume in 2015. This floor was truncated by burial and a possible retrieval pit. Both cuts were visible after the removal of the building's infill. As such, they may represent activities associated with the closure of the building. Retrieval pit F.7965 had a cut (22667) that was shallow and small (about 0.20m in diameter). Its fill contained no artifacts. Burial F.7956, on the other hand, contained an adult female skeleton Sk(22661) (Fig. 2.11). A number of organic materials within the burial were preserved very well due to the conditions of the building's fire. A great deal of linen textile and woven botanical fibers were found, binding the individual. The individual's arms and legs contained evidence of leather straps. Further, a material different than linen, possibly animal hide, was identified with the individual. A wooden bowl was left by its head. Further, bodily remains from the individual were also preserved: remains of brain, flesh, muscle tissue, and intestines containing fecal material. The fecal matter was examined by the archaeobotanical team who found hackberries, starches, and small animal bones inside. While the skeletal elements, organics, and textile samples were all fully lifted in 2015, fill (22641) remains partially excavated due to time restrictions.

Figure 2.11. *Burial F.7956 within northwestern platform F.7950 of Building 131 (north-facing view; orthophoto: Scott Haddow).*

Northeastern platform F.7952, bench F.7966 and entry platform F.7954

The northeastern platform of Sp.500 extends 2.1m north-south and 1.5m east-west. Due to the damage that occurred to its southwestern corner, a section of the platform itself is visible in the field. Here, it is clear that bench F.7966 was a later addition to the platform although further investigation is required to confirm this. This bench abutted engaged pillar F.7976. Immediately south of the bench is a smaller platform, F.7954, extending 1.3m north-south and 0.7m east-west that was used for the entry of the building. The bench had more remodeling done on it in this later phase of occupation in comparison to its neighboring platforms.

Figure 2.12. *Platform F.7954 in Building 131 (photo: Allison Mickel).*

The earliest construction excavated of the entryway is makeup (31700), which correlates with a (22694), a remodeling deposit for bench F.7966. A number of very patchy plastered surfaces that sat above makeup (31700) towards the eastern wall were incorporated into the unit for ease of excavation. Charcoal (22692), preserved in the southern end of platform F.7954 abutting the southern wall, has been interpreted as the remains of the bottom of the ladder post (Fig. 2.12). A small pit was discovered by the ladder (22666 cut, 22660 fill) that did not contain any finds. The ladder remains were removed and sampled in their entirety due to their delicate nature out of sequence for study during next field season by charcoal specialists.

Once bench F.7966 was remodeled it was plastered and painted red (22693). This painting event was in turn sealed by a white plaster, (22690), that covered only the eastern end of the bench. The bench, platform F.7952, as well the western wall and partition F.7967 were then covered by a plaster layer that was painted red (22684). Two burials post-date the application of the red paint, evidenced by their cuts. Burial F.7961 is located to the north and contains a large oval cut (22679) 0.82m long and 0.72m wide. While no skeleton has yet been located in the burial, fill (22675) did contain skeletal elements small in size including phalanges, ribs, and teeth. Cut (22681) for burial F.7963 is similar in size to the cut discussed above. Fill (22676) also contained some disarticulated human remains. At the end of the excavation season a cranium and tibia were located and left *in situ* for further investigation the following season.

Both burials were sealed by a number of white plaster floors excavated consecutively as (22870) and (22683). More layers of floors were preserved by the eastern wall as the western end of the platform seems to have been structurally damaged by the fire more. These floors covered by (22642), a plastering event marking the abandonment of the building (see below).

The southern activity area

Hearth F.7957 and oven F.7953 are predominant features in the southern activity area. Hearth F.7957 was cut into the southern platform. Its makeup has been left *in situ* for excavation the following year. Above this makeup were two main activity floors excavated separately. Earlier floor (22672) was a clean surface with no plant remains on it, unlike the second and final occupational floor of the hearth. This surface, (22668), contained a large mixture of plant materials, which was interpreted as evidence of dung burning. These remains may be evidence for the final occupational events within the building. Unlike the hearth, Oven F.7953 was completely scoured out before abandonment. While fill (22691) contained some pieces of oven superstructure within it, it was similar to the building's infill. This circular oven that was cut into the southern wall remains to be further excavated. It is important to note that the back of the oven was cut by the construction of B.77. It was further truncated by the foundation trench for the construction of the southern wall of B.129. A small scoop about 0.2m in diameter was located immediately northeast of the oven entrance. Its fill had an abundance of ash compared to the surrounding fills, further associating the feature with the cooking activity area.

The abandonment of Building 131

Before the burning of the building, which may have occurred in an extended time but in low temperatures (see below), almost the entirety of Spaces 500 and 556 were covered with a thick white massive plaster, (22642). Unit (22642) covered the main floor, the dirty floor in front of the oven, platform F.7954, platform F.7952, bench F.7966, the threshold F. 7967 between Spaces 500 and 556, and the floor of Sp.556. In Sp.556, a sub adult femur (22642.x1) was placed above this plaster floor by the northern wall. This was buried under four liters of burnt new type wheat (22656). This deposit was in turn sealed by (22638), a layer of nearly pure charcoal and ash, that covered the entirety of Sp.556. These deposits represent the only *in situ* objects left within the building for its abandonment.

The building seems to have been burnt down in a controlled manner. That the wheat was recovered hints to a low-temperature fire. The entire building was affected by the fire, although the southwest and northeast corners of the building seem to have been damaged the most. Multiple layers of thick plaster along the northern and eastern walls not only turned grey but also consolidated into a single block from the effects of the fire. The mud brick walls of the building lost much of their structure, crumbling at the touch. Once the fire ended, the remaining rubble was not simply left in place. It was processed and mixed together and compacted to form the foundation for B.129. This infill, excavated as (22635), was examined by specialist from all teams. The composition of the fill in was far higher in clay content, and far lower in artifact density in comparison to B.77, particularly in terms of the ground stone. Striking was the surprisingly high amount of human remains recovered from this fill. A number of horncores and larger animal remains were also recovered. Two figurines decorated with polka-dots found within the fill are remarkable, even if just a coincidence.

Two aspects of the buildings abandonment make it very different from the abandonment of B.77 and B.52: first is the lack of *in situ* objects found on the floors of B.131 except for the human femur sealed by a new type wheat deposit in Sp.556. Second, the building's rubble was processed into smaller pieces for the foundation of B.129. Both B.77 and B.52 had evidence of *in situ* collapse and large architectural fragments, none of which was recovered in B.131.

Excavations in the building will continue in the following season to uncover the earlier phases of the building.

A note on the structural timbers of Building 131

Aside from the ladder, seven separate posts were investigated in 2015. All of the posts were structural posts most likely associated with the construction of the building. Some of them were excavated stratigraphically out of sequence due to the condition of the charred wood remains.

Post F.7975, (22689) was excavated from near the partition wall F.7708 after an animal burrow collapsed and it became exposed. It was located to the east of the partition wall, about halfway between the north and southern walls of the space. It is likely that this post is one in a line of posts, running parallel to the line of posts approximately 2.0m to the east, on the other side of platform F.7950. This line of posts consists of: F.7971, timber (22697), an engaged post built into the north wall F.7707 of the building, F.7970, timber (22696), a freestanding post in the center of the space abutting F.7960, timber (22674) (another freestanding post in the center of the space), F.7959, timber (22673), a third freestanding post in the center of the space, and F.7972, timbers (22698), an engaged post containing two timbers built into the south wall F.7705. A large amount of these timbers were left in situ, on average they extended 30.5cm below the surface. F.7972 (Fig. 2.13) contained the most material, with charcoal preserved for the first 30cm in depth, at which point the timbers were no longer composed of charcoal but rather unburnt wood. The posts were held in place with some plaster and clay packed around them. Ordinarily, these posts would have been left *in situ* until they were the next unit in stratigraphic order, but to leave them in place during the winter would result in a great loss of information as they would almost certainly disintegrate. As such, they were collected according to the established protocols set by Eleni Asouti, and will be studied next year (see the archaeobotany archive report for a description of the preliminary assessments conducted on the posts).

Figure 2.13. *Engaged pillar F.7972 in Building 131 (photo: Allison Mickel).*

Building 132

with Arkadiusz Klimovicz

Building 132 was the predecessor of B.77. It was twice the size of B.77 with walls up to 0.60m thick, made from grey mud bricks. Excavations in the previous seasons have revealed that it comprises of at least two spaces, Sp.531 and side room Sp.511, covering a space that extends at least 7.2m east-west and 10m north-south, making it one of the largest buildings recovered at Çatalhöyük. This season's excavations focused on uncovering as much possible within Sp.531. The excavations revealed - in part - the final occupation phase of Sp.532. A passageway (F.7856) between Spaces 531 and 511 at southwestern corner of Sp.531 was uncovered. Unfortunately, due to time constraints, the entirety of the infill of the space was not removed to uncover all of the features at the time of B.132's abandonment. Figure 2.14 shows where the excavations ended at the end of the 2015 excavation season and the renewed understanding of the configuration of Sp.531.

Figure 2.14. *Overview of Space 531, Building 132 at the end of the 2015 excavation season (west-facing view; photo: Jason Quinlan).*

Space 531

This season's excavations revealed that the configuration of the main space of the building, Sp.531, is not as straight forward as assumed in the previous season (Fig. 2.15). It is clear that the walls defining Sp.531 underwent multiple modifications, defined by the building's currently exposed walls. The extent of the space was decreased at some point with the construction of support wall F.7876 that runs parallel to the main eastern wall, F.7149. Further smaller stubs by the eastern wall, F.7877 and F.7878, have been defined.

It is possible that all of these may belong to a single constructional element that was severely truncated due to the abandonment of B.132 and the construction of B.77, although more research is necessary to reveal the true nature of these modifications.

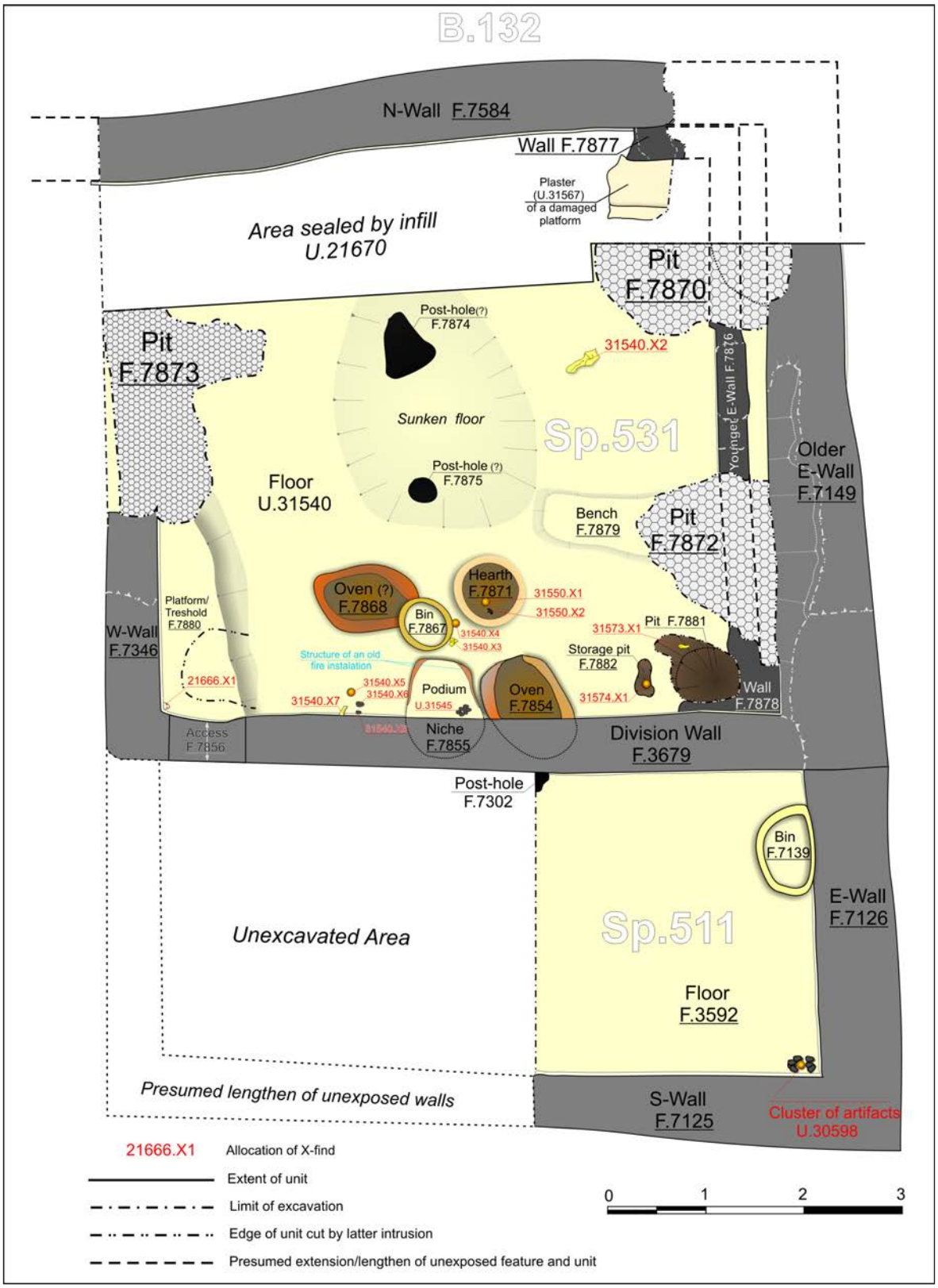


Figure 2.15. *Building 132 (plan: Arkadiusz Klimovicz).*

Excavations at the western end of the space revealed further surprises. The southern end of the western wall, F.7346 was exposed the previous year and assumed to join the northern wall of the building, F.7584. Excavations this season, after the removal of the room fill in this area revealed that the western wall extends about 2.5m towards the north. At this stage, one could speculate the existence of another room that belongs to B.132 west of wall F.7346. However, it seems more likely that the western wall was truncated by activities that relate to pit F.7873 as well as the construction of B.77 (see above). Again, further research is necessary to understand the western end of the space.

The internal arrangement of Space 531

Architecturally the most significant feature revealed in Sp.531 this season was the crawl-hole (F.7856) that curved into the southern wall (F.3679), connecting Spaces 511 and 531 (Fig. 2.16). The important role of this intramural passage in the southwest corner was somewhat emphasized by the placement of a sophisticated wall-installation, 21666.x1 (See Chapter 28 for an extensive discussion of the feature). The installation most likely represents a part of a bigger furnishing applied initially to the western wall (F.7346) at its junction with the southern wall (F.3679) (Fig. 2.17). Next to the northern face of the crawl-hole was a slightly raised north-south aligned rectangular protrusion resembling a platform (F.7880) that may have acted as a threshold. Unfortunately, the feature's patchy plaster surface and a truncation to its north make it difficult to define its full extent. The layout of the room – uncovered so far – shares general resemblance with hitherto recognized internal arrangements at site. Accordingly, the southern segment is dominated by fire installations (Fig. 2.18). The detailed stratigraphic sequence of the mentioned features cannot be presented here as they are not yet fully explored.

Figure 2.16. *Crawl hole F.7856, Building 132. Note the wall installation, 21666.x1 jutting out (south-facing view; photo: Jason Quinlan).*

Figure 2.17. *The southwest corner of Space 531 (west-facing view; photo: Jason Quinlan).*

Figure 2.18. *Fire installations in the southern half of Building 132 (photo: Jason Quinlan).*

Oven F.7854 was centrally cut into the southern wall of Sp.531. The oval oven had a relatively thick (5-8cm) silty-clay superstructure, (31569), demarcating outline of the feature. Immediately west of it is niche F.7855. Its base extended centrally like a podium, which actually seems to have been an earlier oven that was modified. A hearth, F.7871, corresponds with the oven. A shallow circular bin/basin-like feature was situated immediately southwest of the hearth, clearly sitting above the demolished remains of an earlier fire installation (F.7868).

The southeast corner of the space had two small irregular pits. The larger one, F.7881, about 0.9m in diameter, abutted the eastern and southern walls. Most likely a post-retrieval pit, the feature may also correspond with the entrance to the space form the outside. However its fill remains to be excavated. Immediately front of it was a smaller, shallow pit, F.7882 which comprised of an irregular elongated cut, (31575), aligned north-south. A distinctive dark greasy layer of plaster coated its sides. Within the pit there was one complete clay ball (31574.x1).

Located in the central-east end of the space was unique a bench-like feature, F.7879, in terms of its positioning and size. About 0.15m high and at least 1m long, the feature is rectangular in shape with rounded corners. Its eastern end was truncated during the abandonment of the building by pit F.7872, eluding its original form. The feature may have been attached to the wall, even incorporating a post, although its slight southeast-northwest tilt does not correspond with the alignment of the walls. The feature was clearly an important part of the space evidenced by the multiple coats of plaster that cover its entirety, seen through the truncation.

Another distinct element of the internal arrangement of the Sp.531 was a sunken floor uncovered partially in the central part of the room. It is a shallow oval depression of north-south alignment with concave edges. The nature of the depression remains ambiguous although it is clearly an intentionally created and maintained, feature. Within the sunken floor to the north and south, there were two pits (F.7874 and F.7875). The diameters and shapes of their cuts ((31556) and (31558) respectively) clearly differ. Nevertheless, their placement may imply original positions of wooden beams set vertically to support the roof.

The features at the northern end of the space are still covered by the infill of the building.

The abandonment of Building 132

Spaces 511 and 531 make B.132 show different abandonment processes in their closure. Please refer to the 2013 Archive Report for an extensive discussion on the processes that took place in Sp.511. In sum, the room seems to have been left open, most likely without its roof, and used as a midden. At one point the walls collapsed, and the area continued to be used as a midden for some time. Space 531, on the other hand, was more systematically abandoned. A number of truncation features denote the deliberate dismantlement of various features. The infill that filled the space was highly processed and homogenous. Excavations in the following season should reveal more information on what these features may actually be, as they were not entirely excavated. There is evidence of small-scale constructional activities within the northeastern corner of the space, showing that the abandonment took place in an extended timeframe. Once the room was succinctly closed, it was used a burial ground. It is important to note that the northern part of the initial infill still remains to be excavated, thus all interpretations provided below may therefore change in light of new data.

A number of *in situ* objects that can be associated with the abandonment of the building were sealed by a compound fill, (21670), which was made up of orangish brown make-up elements as well as plaster, and possibly roof remains. On the podium, immediately next to the oven was a cluster of stones (31545). Nine whole pieces and 10 fragments of unworked stones were in a pile. Many of the pieces were clearly

heat affected, showing that they were likely used for cooking or boiling purposes. A scapula, 31540.x7 leaned on the southern wall immediately west of the podium. Next to it was a clay ball, 31540.X5 and a ground stone, 31540.x6. Next to the bin was another clay ball, 31540.x4 and some large pieces of animal bone, 31540.x3. Within the heath was a clay ball, 31550.x1 and two obsidian flakes, 31550.x2.

A number of large irregular pits – F.7873 at the western, F.7872 at the southeastern and F.7870 at the northeastern end of the space – that have not yet been excavated are clearly associated with the abandonment of Sp.531. The walls of the space were severely truncated (see below). While it is not certain whether the execution of the pits preceded, followed or went concurrently with leveling of the walls, it is possible to assume that they were related to the removal of certain features and posts.

Except for the southern restriction of the room (F.3679) all others walls (F.7584 to the North, F.7346 to the west, F.7876 to the east) have signs of the truncations and leveling up to 50-60cm height. However, the most affected in that matter were the later eastern wall (F. 7876) and its fragmented northern and southern extensions (respectively F.7877, F.7878). All of them were radically leveled out to the height of 30-35cm. Their older counterpart set parallel to the east, F.7149, was demolished to stand about 50cm.

Infill (21670) extended within the entirety of the space, and is not fully excavated at its northern extent. It is a deposit that changed depth, between 0.2 to 0.18m. It may represent an accumulation process that took some time, as evidenced by its compound nature. (21670) was sealed at its northeastern end by a wall construction, F.7866. F.7866 was set into the gap of the truncated older eastern wall (F.7149) of B.132. It was eventually truncated by the construction of foundation wall F.7861 for B.77, excavated this season (see B.77). It is not clear why this small wall was built to the northeastern corner of the partially demolished space, but it definitely contains a number of infilling deposits ((26693), (21664), (21654), (21622)) as well as a peculiar re-deposited midden-like deposit (21692) constricted to the northeastern corner of Sp.531. The infill deposits were rather homogenous in nature, but also contained different types of building materials. The infill of the space was then cut by a number of burials.

The "burial ground"

Five distinct burials cut the room fill of Sp.531 (Fig. 2.19). It is possible that the burials were related to the foundation of B.77. It is in fact not quite possible to discuss these events as belonging to space 531, and a new space number will be allocated to the area in the following season. A similar phenomena, in terms of using a space in between buildings as a burial ground, was observed in the South Area in Space 144 where a group of six child burials occurred after the major levelling and prior to the construction of building 65. Within what used to be space 531, four adults and one infant were interred in five different burials (F.7632, F.7633, F.7634, F.7863, and F.7864). The burials are mostly contemporaneous with each other, having been cut into the same infill deposit. However, burial F.7633 was clearly an earlier burial than F.7632 as F.7632 cuts the former.

There are a number of traits that the burials carry with each other that make the assemblage unique. Each one of the burials have similarly sized and shaped cuts: The cuts are circular rather than the shape of the flexed body and they are all about 0.9m in diameter. In fact, in each burial the body is found in the middle of the burial pit, seemingly detached from the cut itself, unlike burials found in buildings where bodies are tightly placed in a cut, often times abutting the sides. The cuts were also extremely deep (0.50-0.55m) in relation to the width of the preserved bodies. All of the burials contained a single skeleton. All of the skeletons excavated were in bad condition, as if they were secondary interments. Some of the individuals were in partial articulation, some of the individuals had limbs in partial articulation. The craniums and ribs were usually crushed. As such, the human remains specialists believe that the individuals here represent a practice of 'delayed burial' where an individual would be left to decompose elsewhere before brought for

their final interment. This practice and evidence for different levels of 'decomposition' may suggest specific temporalities (i.e. seasonal) in the practice of burial.

Figure 2.19. *The 'burial ground' (orthophoto: Marta Perlinska and Arkadiusz Klimovicz).*

Burial F.7633 contained a flexed infant within a basket. While the bones were fragmented and flattened, the left arm showed a pathology that may have been caused by an infection. The baby was not buried with any burial goods, although there were remnants of organic material recorded on the upper limbs that may be indicative of a shroud. The burial cut, (21633), was 0.9m in diameter, making the burial unique, in that the cut is much larger than the space the body would have occupied.

Burial F.7632 belonged to young-adult, possibly male. The body was very tightly flexed and wrapped in an organic material (21630.s11). The bones were in very poor condition considering the depth of the grave and showed signs of being crushed. For example, the crushed and flattened cranium may represent the fact that the brain was well decomposed before burial took place, since crushed craniums is something

observed in burials that contain extra craniums. In all likelihood, this individual, alongside with the rest of the individuals buried in this area represents a 'delayed burial' where a body is left to decompose for some time before it is actually interred. A wide range of burial goods, 21630.x1-x7, were found in close vicinity to the bones. In fact the finds, that consisted of a bone fish hook, a bone harpoon, a bone pendant, two stone beads and an extraordinary flint dagger seem to have been wrapped in an organic container or matt.

Burial F.7863 represents a primary inhumation with the evidence of secondary treatment similar to F.7632. Individual Sk(21685), a female adult, revealed in cut (21687), was set in a very tightly flexed position and had the appearance of partial dislocation of elements and disarticulation. Again, organic material was noted around the bones suggesting the use of a shroud and/or wrapping. A number of stone beads (21688. x1-x7) were found in the vicinity of the neck and chest.

Burial F.7864 contained the remains of a subadult Sk(21691) that was placed within an immense oval cut (21689). The skeleton was tightly flexed and the bones seemed flattened and fragmented easily. No artifacts were buried with the individual.

Burial F.7634 contained an older female adult. As per the previous burials, this individual was also tightly flexed, her body contained within organic materials (21634.s4 and 21634.s6). The bones of this individual were also in bad condition, in terms of being fragmentary. Yellowish-green pigment was found on the femur (21672.s1). This burial was the richest burial in terms of the artifacts that were placed with the individual. Within the organic remains of what may have been a pouch were a number of chert flakes, all of which were a different colour, one obsidial bifacial projectile, one obsidian point, shell, and two bone points. Further, a basket that was placed immediately north of the skeleton was recorded as 21634.s8 and 21634.S20. Finally there were a number of animal bones, in articulation, within the cut recorded as 21634. x20.

Chapter 3

Excavations in the South Area

James Taylor, York University
with contributions by Renata Araujo, Frank Carpentier, Mateusz Dembowiak, Julius Lundin, Halle Payne, Kate Rose

Introduction

Excavations in the South Area, during the 2015 field season focussed upon five structures (Buildings 17, 160, 80, 89 and 96) and some of the spaces (Fig. 3.1), which surround them or seal them stratigraphically (including Mellaart's Houses 31 and 32 (Spaces 565 and 581 respectively). All of these interventions, bar the last two, were begun in previous seasons. In most cases the research questions driving the excavations were focussed upon understanding the occupation sequences of these buildings. However this season, being the penultimate excavation season for the project has meant that for B.89 and B.96, this was effectively the last opportunity to excavate in them. Most of the areas addressed in the South Area this year were approached with a view to preparing for a large deep sounding to be excavated in the 2016 field season, which would be centred upon B.17 and B.160. As such some areas were targeted to reduce overburden above the proposed deep sounding.

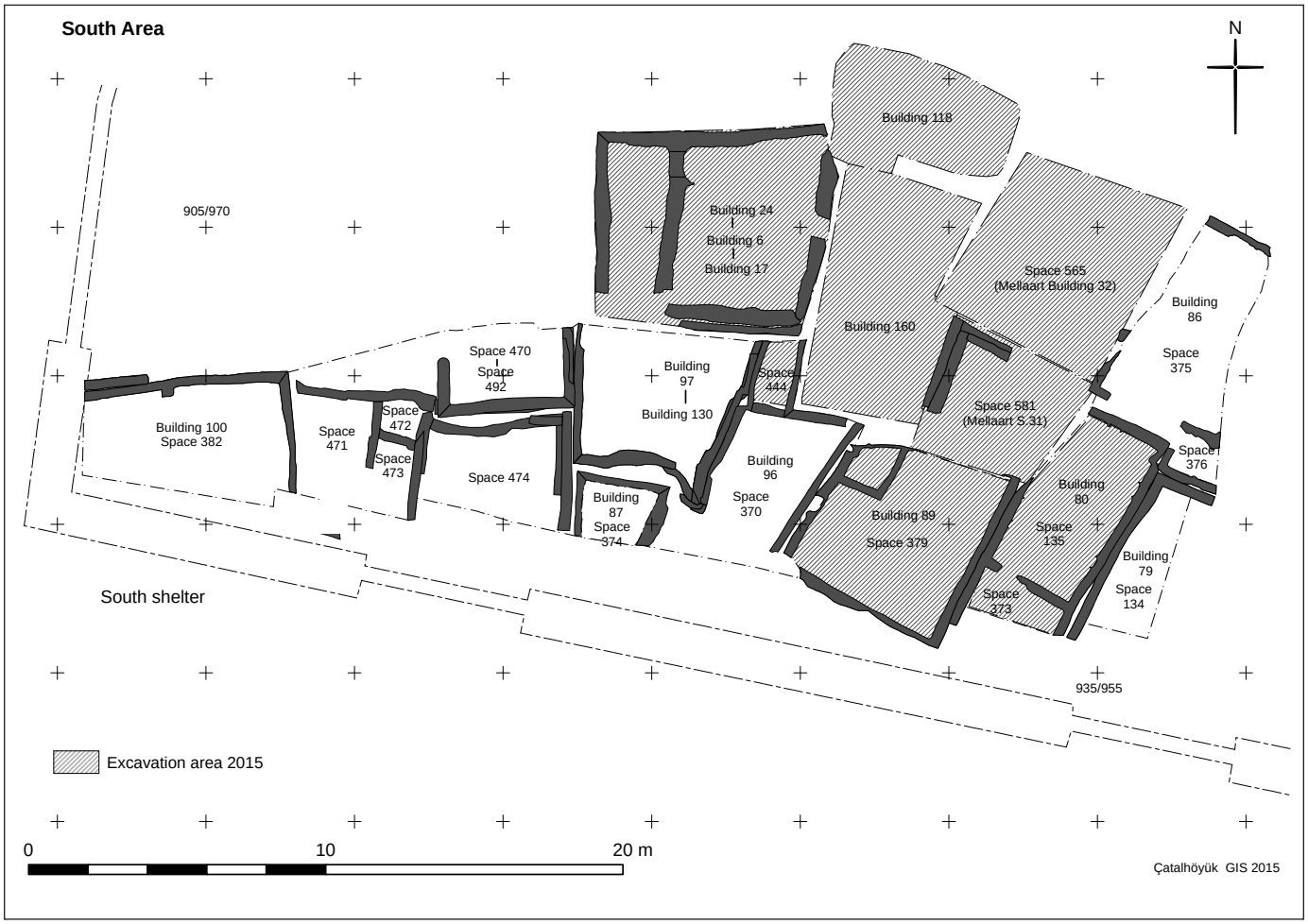


***Figure 3.1**. Plan of 2015 excavated areas in the South Area (plan: Camilla Mazzucato).*

Buildings 6, 24 and 17

Frank Carpentier and Julius Lundin

Introduction

Mellaart's "Shrine 10 sequence" comprised of at least three buildings: B.24, B.6, and B.17, with the former two only represented by extant walls at the beginning of the 2015 field season. All of the aforementioned structures were predominantly excavated in the late 1990's. This season (2015) involved interventions on each of these as part of preparatory work for the final fieldwork season in 2016. The overall objective for the team working in B.17 was to get into phase with the level reached in 1999 (i.e. Phase E), and subsequently continue further down.

***Figure 3.2**. Removal of the remaining walls of B.24 and B.6 (west-facing view; photo: Jason Quinlan).*

Building 24 and Building 6

Fieldwork started with the removal of the south wall of B.24 (F.511, (12071), (12072)), which had no bonding walls left (Fig. 3.2). This wall was constructed directly on top of the south wall of B6 (F.486, (17069), (12070)) that was bonded to the east wall of B.6 (F.485, (22501), (22503), (22505)). The latter wall was in turn constructed directly on top of the south wall of B.17. The removal of these walls had the practical effect of stabilising the southern section (inherited from the 1960's excavations) that lay above B.17, enabling further work in that lower structure.

***Figure 3.3.** Plaster bin/basin, F.8217, associated with previously unseen Sp.579 (northeast-facing view; photo: Julius Lundin).*

Space 579

Behind the east wall of B.6 (F.485) a plastered wall was uncovered. In the middle of this wall a bin, or basin-like feature was found (F.8217, (22404)) which later on was filled and kept in the construction of the wall (Fig. 3.3). This wall is shared with B.160 where it functions as the west wall and is plastered on both sides. This suggests that B.160 may have been associated with another space (Sp.579) towards the west. This space, constructed and abandoned before the construction of B.6, Sp.163, is only identifiable by the wall plaster and basin-like feature mentioned above. This finding suggests that buildings in this area, at this level, may share single walls without being connected via access holes.

Building 17

The removal of the south wall of B.6 enabled the removal of the remaining room fill ((22508), (22507)), which had been left unexcavated in 1999 on the south and east wall of B.17 in order to support the latter wall. The excavation of this room fill, which had previously deemed too unsafe to excavate, exposed a possible crawl hole or niche (F.8219) in the middle of the east wall. In close proximity and possibly associated

to this feature, there is a small cache (F.8220), containing a concentration of clay ball fragments and a large clay block with traces of red pigment. Neither of these features could be excavated this season due to time constraints.

If the larger feature is indeed a crawl hole, this has some ramifications for the interpretation of the buildings with interconnecting buildings/spaces forming a small "complex" of sorts including at least two large rooms and several small side rooms. One of the problems with the interpretation process of this area is that when the 1999 team excavated the remains of B.6 (except the east and south walls) and into B.17, they were unaware of the spatial/chronological relations between B.43 and B.160-B.17.

Beneath the aforementioned room fill ((2208), (22507)), several constructions belonging to the younger phases of B.17 could be attested (Fig. 3.4). In the westernmost part of the south wall the remains of a basin where found which appear to belong to a basin feature from Phase E known as F.586 (Hodder 2007: fig. 6.30). As it appeared to be integrated in the plaster wall and therefore part of the phase, these remains were left unexcavated. In the southeast corner, the remains of a fire installation (F.8202, (22509)) were discovered. The intensive use of this area for multiple fire installations in all phases (F.538, F.541, F.542, and F.545), it is hard to distinguish which phase it belongs to. The earlier phases featured hearths rather than ovens and no structural remnants could be attested during excavations, suggesting the fire installation was a hearth too. A large crack runs from the wall, through the hearth area towards the floor, but the hearth itself is not truncated by it, overlying the crack. It is unclear whether this is because the fissure was already there when the hearth formed or whether it formed post-depositionally and somehow did not affect the hearth itself. The removal of the fill also exposed the unexcavated bits of floors from all phases of B.17, which were excavated down to Phase E. Bits of floor surface from a posterior phase, however, were left unexcavated (under the possible niche in the middle of the east wall of B.17), also due to lack of time.

***Figure 3.4**. Overview of B.17 during excavation season (south-facing view; photo: Jason Quinlan).*

When the (Phase E) plaster floor of B.17 (5365) was first exposed in 1999, several unexcavated features/cuts were marked out in the report (Hodder 2007: 192) and the post excavation plan (Graphics Number: 99_882) as being potentially of importance for future field research. However, over the past 15 years the floor has been left uncovered and has since weathered severely. This impaired to some extent the recognition of erstwhile cuts and features. However, both reported features and a number of new features could be recognized in the course of cleaning and recording for 3D-modelling (see post-ex plan). As potentially integral parts of the Phase E building context, these cuts were a prime focus during field research. Four such pits (F.8203, F.8204, F.8205 and F.8206) were excavated with each of them containing a primary burial.

The first of these burial pits (F.8203) was located more or less centrally in the building and had been cut through by post-depositional cracking. The cut (22528) is more or less oval in shape oriented roughly east-west and has concave and undercut pit walls. It appears that the cut was made into a midden layer. The fill (consisting of upper fill (22510) and skeleton fill (22524)) contained a midden type fill, identical to the one that the feature was cut into and therefore possibly refill by the same material. It contained significant amounts of animal bone as well as charcoal, shell, plaster, obsidian, clay ball fragments, flint and a few disarticulated human bones. At the bottom of the cut, the articulated remains of an elderly female Sk(22522) were found to be in a loosely flexed position, with the head towards the west. The right upper limb and left pelvis had a relatively thick coating (3-5mm) of reddish brown ochre applied directly onto the bone whereas the skull had received a bright red coating of cinnabar (possibly mixed with red ochre). A lump of cinnabar was found at the skull while three complete halves of bivalve shells were found between the legs, at the pelvis and near the lower abdominal area. It is uncertain whether this concerns an intentional placement or whether this is a coincidental configuration within the fill. The application of ochre directly onto the bone suggests the body had been defleshed already, while the primary articulated position suggests that the tendons were still intact. Fragmentary, broadly linear concentrations of phytoliths were attested and may either be relict material of plant-based objects that once formed part of the burial or were present in the midden.

West of this burial, a second pit burial (F.8204) was found to contain the remains of two individuals. The irregularly shaped but roughly circular cut (22527) seriously undercuts towards the east but has a more straight profile towards the west. At the bottom of the pit, the badly preserved remains of an adult individual Sk(22525) were found in primary, relatively loosely flexed position. It appears that the pit dug to inter this individual was dug into midden, with the same (or similar) material being used to refill the burial (consisting of upper fill (22512) and skeleton fill (22526)). However, apart from the animal bone, clay balls, flint, obsidian, charcoal, plaster and shell material, the fill also contained a large number of disarticulated human bones, seemingly all part of the same juvenile individual (22523). The cranium of the latter was found upside down on the feet of the primary buried adult with a concentration of obsidian flakes in the palate in what seems to be an intentional placement. It is suggested that the inhumation of the adult individual disturbed the skeletal remains of an earlier burial. A small cut ((22529), fill (22511)) into the fill of burial is located more or less where the skull is present might even suggest later re-deposition of the skull. The identical properties and composition of the soil and post-depositional compaction, however, make the identification of cut interfaces very difficult and therefore any such interpretation remains tentative. In any case, the cut feature was undercut far enough to extend into burial pit F.8203 (supra) with the redeposited juvenile skull mere centimetres away from the cranium of the elderly individual buried there. Towards the base of the pit, more clayey material was encountered.

A third burial (F.8205) is located south of F.8204 in a small, D-shaped pit. The cut (22519), which has slightly concave, undercutting walls contained the primary remains of a neonate Sk(22518) individual in a loosely flexed position, the legs stretched straight forward and the head towards the west. A large piece

of horn was found in the south part of the pit, but appears to continue considerably into the pit wall and it would appear that this horn was encountered unintentionally while digging the burial pit. The pit was dug into and infilled (upper fill (22513), skeleton fill (22521)) with midden material, containing obsidian, animal bone, flint, shell and plaster. The position of the body and particularly the stretched legs provides an interesting parallel with other neonate burials (F.442 and F.487) in successor building B.6 (Hodder 2007: 270, 273-4).

The final pit burial (F.8206) was one of two burials that had been considered as such in 1999, when it was registered as F.582 (Hodder 2007: 186, 192) and it is, in fact, quite clearly distinguishable on a photograph in the published report (*ibid*. fig. 6.37). Moreover, the location of the oval cut is in relatively close proximity to two intrusive burial pits from the Phase D(IV) (i.e. F.564 and F.576; Hodder 2007: 202-4). The cut (22520) is oval with concave, undercut walls. As elsewhere in B.17, the burial fill (upper fill (22515), skeleton fill (22517)) consisted of the same sort of midden which the burial cut into with animal bone, shell, (painted) plaster, shell and a large number of obsidian flakes (debitage waste?). At the flat base of the cut, the articulated remains of a subadult (preliminary estimate: *c*.10 years old) were found Sk(22516). The individual was in a loosely flexed position on its left side with its head facing west. A piece of cinnabar was found on the cranium and a large rectangular feature consisting of articulated phytoliths was found alongside the back of the individual (Fig. 3.5). Preliminary analysis of the phytolith remains reports that deciduous wood leaves were prevalent near the cranium, perhaps indicating some sort of pillow; reeds and further leaves could be found along most of it and deciduous wood dominates the edges, suggesting that some sort of wood board onto which the reeds and leaves were laid out. At the sternum, a small patch of phytoliths with cross-weaving was attested, which might be a textile relic. The large phytolith structure again provides an interesting correlation with B6(VIII) burial F.492 which also featured a large wood board (Hodder 2007: 274-5). At the base of the cut, sequences of fine clay surfaces had been partially truncated by the burial. These may be short-lived floor surfaces installed on the midden (I. Hodder, pers. comm.).

Figure 3.5. *Detail of burial F.8206, showing wooden phytolith remains associated with skeleton (22516) (north-facing view; photo: Jason Quinlan).*

Concluding thoughts

While only four of the burials have been excavated so far, a number of preliminary observations can be made. A first important point that needs to be made, especially when considering future excavations, is the presence of a large number of similar pit burial features as the ones recognised and excavated in 2015. While it is by no means certain that each of these will be a burial, the situation in B.6 (Hodder 2007: fig. 7.26) may help to warrant caution when excavations in B.17 do resume. Another interesting characteristic is the loosely flexed position in which all the burials are placed, which again finds some correlates in the burials of B.6. Finally, it should be noticed that all of the excavated burials appear roughly oriented on an east-west axis with the head towards the west.

An issue that was repeatedly raised during excavation, was how to interpret the occurrence of these burial cuts, and more specifically whether or not their presence precedes or succeeds the installation of the plaster floor. Support for an "anteriority" thesis, hinges on a number of idiosyncratic characteristics in the burials, notably their presence in midden material, their location in the middle of the building, the occur-

rence of animal bone with the human bones and the lack of clearly defined pit walls. From this perspective, the burials were already present in the midden when the building was constructed. The features identified at the floor surface would then either be cognitive constructs created by tracing cracks into make-believe features or the result of cracking by the floor around former pits in the midden.

Given that so far each of the identified burials materialised into a primary burial context within the identified pit constraints, the erroneous identification of pit features can be dispelled. If on the other hand, these features formed post-depositionally due to a difference in compaction between unaltered parts of the subfloor stratum and infilled pits, one would expect the plaster floors to gradually sag into the slowly compacting pits rather than crack along the edges. In fact, there have been instances where such slumping was remedied by re-levelling with plaster (S. Haddow, pers. comm.). But no such increase or convex plaster levelling features could be identified in B.17. As for the occurrence of burials in the middle of B.17, it would be interesting to refer to B.6, successor to B.17, where this appears to be the rule rather than the exception. When modelling the eighteen burials so far attested in B.6 and B.17 combined, eight (or almost half) are found to be in or near the central area. It should be noted as well here, that in the case of F.8204, the brown layer associated to fire installation there, was cut through as well. This layer is located below the plastered surface and is therefore not part of the midden.

In addition, all identified burials fall (well) within the limits of B.17, which suggests the building was there prior to the burials. The occurrence of burials in the midden may indeed be uncommon, but perhaps less so considering that B.17 finds itself on top of a midden. Burials below the floor would then invariably end up in midden contexts, explaining the occurrence of animal bone in the burials. The lack of clearly defined pit interfaces can be explained by the strong similarity between the fill and cut, as the material that is dug into, is also used to infill. Finally, one might ask where the dead of B.17 were buried, if not under the floor?

Building 89

Introduction

This season saw the continuation of the excavation of the occupation sequence in Building 89, Space 379 (work has been ongoing since 2011). The building is being excavated by a team from Duke University (formerly UC Merced, California), who continue to experiment with various techniques of digital data capture and recording, focusing upon 3D and tablet technology in the field (as part of the 3D(D)igging Project). This was the last scheduled season of excavation in B.89; the structure remains incompletely excavated at the end of the season.

Building 89 (Fig. 3.6) is situated in sequence directly under B.76 is likely to belong to Level South P. It is a large square structure, the exposed limits of which are approximately 5.80m north-south by 5.20m east-west, with platforms (and burial sequences) situated along the northern and eastern walls, hearths and dirty floors in the southern half of the central space, a possible partitioned storage zone on the western side of the structure, and a number of post scars and retrieval pits. The southernmost end of structure (including key features such as the oven sequence, ladder scar and southeastern platform and any storage structures that might be situated against the southern wall, as seen elsewhere on the site) extends below the southern limit of excavation in the shelter in order to meet health and safety requirements.

Figure 3.6. *Overview of B.89 (north-facing view; photo: Jason Quinlan).*

Figure 3.7. *Detail of bucrania (21968) during excavation (west-facing view; photo: U.C. Duke Team).*

Space 379 (the platform sequence and central floors)

At the end of excavation the occupation sequence of B.89 remains incompletely excavated. The earliest excavated unit in the structure this season was a bucranium (21968), which was found to be embedded at the eastern limits of the main floor sequence of the central space of building. The decision was made to block lift the bucrania slightly out of phased and a sondage was cut through the floors (21971) and (21999) to enable this. For the most part these floors remain *in situ* and unexcavated. These central floors were sealed upon their eastern side by a 5mm thick compound layer of light grey silty-clay make up and white clay plaster floor surface (21986) and (21965), which extended all across the east central platform of the space (*c*.2.36m north-south by *c.*1.47m east-west, at a height of between 1006.21-1006.36mASL). This represented the earliest exposed surface on this platform (Fig. 3.7).

This was in turn sealed by a further central floor, (21986) and (21965), which also comprised of grey clay silt make up and white plaster surface to a thickness of 5mm across the central floor, at a height of between 1006.17-1006.32mASL. This uniform surface was sealed on its northern side by a long thing linear (east-west orientated) pisé-like structure (21979), which appeared to define the southern limit of the north-central platform, F.7401, against which several of the subsequent surfaces abutted or sealed. The structure itself was 5mm high and 0.19m wide, running the length of the platform (1.9m). Apparently cut at the same level as this structure was founded was a burial pit (21985) containing a skeleton (21981) and filled by a homogenous grey silty clay (21980). This cut was truncated on its northern side by a later post retrieval pit. At the same level there was a thin and patchy layer of brown sandy clay make-up (21976), which may have been associated with a highly eroded surface that formed another thin (0.13m wide) border between the north-central and north-east platform (*c*.1.4m long and 9mm thick). All of these units were sealed by a further, more uniform layer of thick and compact make up and associated floor (21974), described as a light grey and brown clay; the makeup was 0.14m thick and the surface itself up to 10mm, forming the first significant modification/construction event in this platform.

The sequence in the north-central platform continued with the construction of a bin in its northwest corner (21951), which may have abutted the partition of the space that may have run the length of the room's western side. This bin was severely truncated by later modification of the platform, and as such only stood to a height of 30mm. Constructed of white clay with a grey make-up the bin structure was square (approximately 0.38m across) and the base stood at a height of around 1006.32mASL. The bins infill (21946), also heavily truncated, was a dark brown sandy clay. The bin was stratigraphically overlain by an associated light grey clay floor surface (21947), which sealed the whole platform at a height of *c*.1006.39mASL (1.77m east-west by 1.26m north-south). This marked the first in a short sequence of white plaster floors, and grey clay make-up deposits that were removed from the top of this platform, beginning with (21942), which was cut by two shallow pits of unclear function (21938, filled by 21937) and (21936 filled by 21933 and 21932), averaging 0.41m in diameter. The fills of these pits were similar to the platform core, making it hard to tell whether the base was reached. They were immediately sealed by a grey- and yellowish-brown sandy clay surface (21929), which covered the whole platform. This was in turn finally sealed by a friable grey-brown silty make-up layer, (21920), *c*.40mm thick, which, as the first deposit to be removed this season in this sequence, was probably associated with the a deposit removed in the 2014 excavation season. The final height of the platform at this point was 1006.42mASL.

Sealing the border, or boundary layer between the two northern platforms, see (21976) above, was a composite layer of white clay plaster and its associated dark grey clay-silt makeup (21989). This surface and makeup was 0.10m thick and covered the entire northeast platform, F.3473, at a height of *c*.1006.49mASL and extended south below the sequence for the east-central platform. This was sealed by another 0.10m thick layer of dark brown silty-clay makeup (21988) on the northeast platform, which marks the first significant height different between it and the adjacent platforms to the west and south. This was associated with 0.14m wide a light grey clay silt linear structure (21978) demarcating the southern limit of the platform and possibly forming a reinforcement component or a modification of the platform. This apparently retained a by a further compound layer of makeup and white plaster on the northeast platform, (21987) bringing the height of the platform to a level of *c*.1006.54mASL. This phase of the platform was apparently finally sealed by a final floor surface, (21934), which not only lipped up the side of this northeastern platform, but also the side of the adjacent north-central one and across the surface of the east-central one to the south, F.3476 and F.3477, at a level of *c*.1006.22mASL. Being almost level with the central floor in this phase, this surface formed the foundation of all the later incarnations of the raised eastern platform in particular.

The first significant elevation of the east central platform is the laying down of a thick make-up deposit (*c*.60mm) of homogenous grey clay (21919), which defined the surface of the east-central platform. This had on its surface thin patches of remnant mortar (21922), and whitish plaster (21921), at a height of 1006.32mASL. The basal interface of this deposit contained fossilized botanical remains resembling straw, which may have acted as some form of temper for the material. This was in turn sealed by another layer of make-up, (21917), which directly corresponded with (or indeed was the same modification event as) a similar deposit on the northeastern platform, (21984). This 100mm thick layer of mid-grey clay silt (with charcoal and plaster inclusions was sealed by a white plaster surface on the sides of the southern bench that extended from the eastern wall F.3474, (21915) and (21916), which ultimately were capped with a further large and uniform white plaster surface, (21910) that sealed both the bench, the east-central and northeastern platforms (F.3473, F.3476 and F.3477). This unit *c*.4.0m north-south by 1.5m east-west, represented the latest unit to be removed this season, and lipped down to cover elements of the central floor sequence and the southern 'dirty floors'.

The southern area

The earliest units identified in the southern part of the space, remain unexcavated at the end of the 2015 excavation season and include two dirty floors, (21997) and (21998), and an associated plaster structure of unclear function (21996) and an infill of the extant remains of the hearth structure at this level (21995). The earliest of these dirty floors was cut by a burial, the cut of which was not bottomed as it extended below the southern section across the building. The skeleton Sk(21977) itself was not a primary interment, having apparently been scattered around the very shallow cut, and was sealed by a homogenous brown silty-clay deposit (21975), which apparently spread across the area (0.51m north-south by 0.23m east-west) to form a dirty floor surface. This in turn was cut by an elongated cut, 0.50m long by 0.20m wide and 70mm deep. The cut, which may be associated in some way with the burial below it, was apparently empty and filled with a loose mid-grey sandy-silt with some charcoal inclusions.

Figure 3.8. *The hearth sequence and 'working platform' to the south of the building (south-facing view; photo: U.C. Duke Team).*

The earliest hearth infill noted above, (21995), was sealed by a hearth remodeling event, F.3497, which manifested with the construction of a rim structure (21972). This only survived as a remnant of the complete structure and most of the remains of this light grey silty-clay moulded rim were on the south side of the hearth, partially extending below the limit of excavation (Fig. 3.8). One hearth infill was associated with this phase of hearth activity (21969), along with on compact yellow and black mottled dirty floor containing ash and charcoal inclusions, (21973), which extended east from the hearth into the southeastern corner (0.92m by 0.86m across and 70mm thick at about 1006.21mASL). The northern portion of this floor was sealed by a very thin and patchy plaster surface that appeared to respect the southern limit of the eastern bench and platform (and may therefore have been associated with its initial construction see above). All of these units were finally sealed by another dirty floor, which extended across the southern corner (21987), in almost exactly the same footprint as its earlier predecessor (21973) above at a height of *c*.1006.50mASL.

This floor was cut by three small circular cuts, (21961), (21963) and (21966), averaging approximately 0.17m in diameter and 0.11m deep, all had rounded sides and a concave base and were filled with a dark grey silty-clay, (21960), (21962) and (21964) respectively, and were of unclear function; although it remains possible that they may have been associated with a temporary structure over, or adjacent to the hearth, as has been noted higher in the sequence (in previous excavation seasons). As if to emphasise this relationship, the last of these fills was partially sealed by another hearth infill (21972). These were all sealed by another friable yellowish-brown clay-silt dirty floor (21967), again concentrated in the southwest corner (and extended below the southern limit of excavation) at a height of *c*.1006.28mASL. This particular dirty floor was associated with a bright orange fire-spot *c*.0.45m across (21923), before being locked into an interleaving sequence of clean central floors and dirty floors to the south. The first of these central floors (21995), was a light grey compact clay-silt, with small charcoal fragments and ash that was approximately 2.13m wide by 2.30m long at a height of 1006.30mASL. The remnants of a small amount of compound plaster floor and makeup (21944) were identified as sealing this along its northwestern edge. To the south of this floor surface a large dirty floor extended across most of the southern extents of the space (21954), except for the southeastern corner. This was a yellow brown clay-silt surface that was 80mm deep, extending 1.63m across and 1.00m out from the southern limit of excavation at a height of between 1006.17-1006.25mASL.

This surface formed the basis for a southern 'working' platform structure in the space than mainly extended into the southern limit of excavation. This feature (unnumbered at the time of writing) was clearly associated with the hearth sequence (which was immediately adjacent to it on its eastern side) and directly sealed the burial noted above. The first element of its construction was whitish/light-grey clay L-shaped plaster structure, which may have acted as a retaining structure for the platform, certainly it defined the sharp southern and eastern edges, and had a more irregular surface on its southern (inward side). The east-west leg was *c*.1.08m long and the north-south return was *c*.1.01m long (before extending into the southern limit of excavation) overall it stood 70mm high with a surface height at 1006.45mASL. The depression formed on the southern side of this more formal edge was filled by a 100m thick dirty floor (light grey-brown silty-clay) approximately 0.90m across (21952), which sloped a little to the south. This may have been associated with another patch of dirty floor that extended beneath the southern limit of excavation (21950) at a height of 1006.32mASL. The top of the platform was then immediately sealed by a sequence of three 'working' surfaces. The first of these (21948) was a firm yellow brown sandy-clay 50mm thick, the western half of which was sealed by a 50mm thick dark-brown clay, (21945), before the whole platform was again capped with a further 60mm thick dark-brown clay surface (21943).

On the direct top of this platform the sequence links in at this point to material that was excavated in the 2014 excavation season, however this surface was also stratigraphically sealed by another floor in the central floor sequence (21935). This was described as being a firm grey sandy clay with charcoal, ash and plaster inclusions and as such may have been a make-up layer, with a surface height ranging between 1006.22-1006.31mASL. Also stratigraphically linked to the 'working' platform, is the continuation of the hearth sequence, adjacent to the immediate east. Filling the last incarnation of the hearth is an infill, (21941), which is immediately sealed by another modification of the hearth structure. This was a molded pisé-like structure, (21930), constructed from sterile light brown sandy clay that abutted the eastern face of the platform, and formed a square rim demarcating an area around the round hearth centered perfectly in the middle. This was probably associated with a re-plastering of the rim of the circular hearth itself, (21927). This incarnation of the hearth contained two discrete bright orange infill deposits (21926) and (21925). The north side of the hearth was then repaired with a soft grey clay layer (21924), which represented the latest activity associated with this structure hearth this season. This deposit lipped over the rim of the hearth and was sealed on its western side, at a height of 1006.30mASL by a patchy of yellowish silty-clay surface (21904), excavated in 2014. However the rim repair also tied back into the central floor sequence, being

overlain by another large patch of soft grey make up layer that covered most of the southeast quadrant of the central area, (21918). This deposit was 60mm thick and was 2.00m north-south by 1.48m east-west at a height of between 1006.26-1006.37mASL.

Both the southern side of this make-up and the fire-spot ((21923) – mentioned above) were both sealed at this point by a further dirty floor in the southeast corner of the space, (21914). Much like the other earlier ones in this sequence it was a soft, dark brown clay-silt at a height of 1006.28mASL. This was finally sealed (this season at least) by a final central floor which covered most of this area, ((21912)/(21913)), which was a 50mm thick mid-yellow brown clay-silt at around 1006.30mASL. This also sat under the latest make-up/surface of the east-central platform sequence ((21910) – mentioned above).

Concluding notes

At this point in the project's life-cycle it seems very likely that this season's excavation will be the last for Building 89. Although not ideal, as a considerable amount of the occupation sequence remains *in situ* for this structure, every care has been made to bring the building into phase so that should it be excavated in the future it would be easy to pick up.

Building 96

Introduction

Excavation of Building 96 began in 2010, under the supervision of Lisa Yeomans; in 2012, 2013 and 2014, work continued under the supervision of Agata Czeszewska, Johanna Bergqvist and Alison Mickel respectively, focusing on the occupation sequence in Sp.370. This space, situated to the south, represents the building's main living area the southern portion of this space remains under the stepped limit of excavation of the South Shelter. This year excavation focused only upon the northern room, Sp.444, which probably served as a storage space for the building. This area was prioritized since it needed to be physically reduced in preparation for the 2016 season excavations, as it stands very high in relation to the proposed location of the new deep sounding. As such this season the only work to be conducted in the southern Sp.370 was the reduction in height of the previously recorded northern wall of the space, F.3505. This will be the last season of excavation associated directly with the B.96 sequence.

Space 563

This space essentially represents the western annex or space of B.43, first identified during the 2014 field season with the discovery and excavation of a crawl-hole/niche in the southwest corner of the building. This year the removal of Sp.444 (B.96), which directly overlay the remnants of this space gave some insight into its layout, although it should be noted that the space remains only partially excavated.

The earliest identified feature, which remains unexcavated and *in situ*, was a north-south oriented mudbrick wall, F.8807 ((31619) plaster on east face; (31620) brick; (31621) mortar). Very little can be said of this wall (Fig. 3.9) as it was only seen predominantly in plan, with only 0.20m of the surrounding fill (20897) being removed on the eastern side to help define it. The fill of the room itself was very homogenous light grey silty clay. That extended throughout the room. The distance from the wall in plan to the crawl-hole to the east was not more than 0.6m, which suggest that the wall was a later addition to the space as the actual space defined between them would be very impractical and hardly warrants a large crawl-hole such as that which linked them.

Space 558

Founded directly upon this wall and the fill of Sp.563 was a curious structure that was allocated to its own space. The structure consisted of two mudbrick boxes constructed from four discrete walls, two north-south oriented long walls on the east and west side of the structure F.8003 and F.8006 respectively. These were sealed at the northern end by an east-west cross-wall, F.8004 – to form a rectangular box *c*.1.80m north-south by 0.75m east-west. A further east-west oriented cross wall, F.8005, divided the structure into two square boxes. Projecting from the north face of B.96, the eastern side of this box structure clearly abutted the west wall of B.43. Both 'chambers' were filled with a dense homogenous, almost sterile, dark brown silty clay. The infill material sealed the top of the chambers, obscuring the walls, acting as a foundation for the occupation sequence of Sp.444. However more curiously it was very similar to the material that lay under the main southern space of B.96 (Sp.370), suggesting that it may have been constructed at the same time.

Figure 3.9. *Wall F.8807,* in situ*, below remaining room fill of Sp.563 (north-facing view; photo: Maciej Chylenski).*

This has led to speculation that the structure may be a casement-style foundation for Sp.444, perhaps inserted to raise the level to that at which the main body of B.96 was being constructed. This has led to further speculation that perhaps the physical topographic levels were significantly variable at the time of construction, perhaps as a result of terracing; although presently it is almost impossible to define the actually position of such a hypothetical terrace.

Space 444

Previous excavation excavations in Sp.444 have been quite limited to date the 2014 archive report notes that:

> *"...excavation began with a layer of ash (20856) that appears to signify the closing of this room. Since 2010, it has been noted that Sp.444 was clearly burnt, and this unit seems to represent that event. In the place where the ash was deepest and darkest, where the fire would have burnt the hottest, there was a groundstone tool (20856. x1). Furthermore, below (20856) we uncovered a cluster of complete faunal bones (20863) including two* Bos *scapulae, one equid scapula, one sheep scapula, one* Bos *astragalus, a* Bos *basicranium from a young animal, and a crane ulna—a bone which has been suggested to have symbolic associations and potentially important in ritual events (Russell and McGowan 2003). Underneath this cluster, there was a 10cm-thick layer of compact clay fill with extremely few finds, underscoring the evidence for the intentional deposition of cluster (20863) and burning of Sp.444."* Alison Mickel – Archive Report 2014

This season saw the continuation of this sequence yielding a fuller picture of this small room to the north of B.96. In general the occupation sequence in here was fairly simple and appears to reflect the status

of this space as side room for storage. The earliest part of the sequence was the construction of the east wall, F.3514 ((20881) – brick, (20882) – mortar). The internal west face of this wall was coated (or repaired) with a large patch of grey silty-clay (20883), before finally being plastered with a light grey/white clay plaster (20880). The space had a single 'formal' floor or surface, (20885), which covered the whole space (1.90m north-south by 1.00m east-west) and consisted of two laminated layers of yellowish-white plaster with grey make-up (*c*.3mm thick, at a height of between 1006.37-100.642mASL). This surface was probably in fact two discrete surfaces as they were split apart by a small and empty ovoid pit, cut into the lower lamination, (20889), which was 0.30m by 0.24m in diameter and 100mm deep, and filled with a homogenous dark grey sandy-clay, with white mineral flecks, (20889).

Sealing the northern end of the floor were two square white molded plaster bin structures, F.8000 and F.8001 (Fig. 3.10), constructed from a grey white plaster material (20886) and (20887). The binds were poorly preserved surviving to a height of only 30mm, both measuring 0.35m long and being truncated to a width of only 0.07m. These were then finally sealed by a final layer of clay packing across the space, (20884). This was a firm and sterile light grey brown silty-clay, which was partially excavated and recorded as (20864) in the 2014 field season, and effectively supported the cluster (20863) mentioned in the opening quotation from that archive report above.

Figure 3.10. *Space 444 with remnant bins (F.8000 and F.8001) at visible at north end (east-facing view; photo: Maciej Chylenski).*

Building 43

Introduction

Work continued this season in Building 43 from where it was left last season. Originally it was James Mellaart who excavated the building in the 1960's. He named it E.VIII.27. Not until the season of 2004 was the building focus for excavation again, but the main work has been carried out over the last four years. Between 2012 and 20134 the building was completely removed and the underlying structure exposed. This year only residual burials were excavated that actually relate to B.43. Stratigraphically they appeared to be situated in the room fill of the building below (B.160), but it is quite possible (and indeed more likely) that they were associated with the platforms that would have been in the north end of the southern space of B.43 (Sp.236). However, any evidence of this relationship is unclear due to the poor state of preservation of the occupation deposits, due to erosion and weathering since the buildings initial exposure in the 1960s

Building 118, Space 510

The deposits filling the south side of Sp.510 were left *in situ* as they were stratigraphically locked under the middens and spaces to the north of B.43 (see below). This season they were exposed and excavations we begun to finish emptying B.118. The earliest of these deposits, a compact grey-brown silty clay (22338), was interpreted by the excavators as collapsed material on the basis that it contained lots of mudbrick and plaster fragments. However, it could also have been (and was more likely) a fill of a foundation cut for the north wall of Sp.552, although further excavation is required to prove this. If this proves to be the case then the overlaying deposits may be more rightly associated with the construction of B.160, and the spaces associated with that. This deposit was sealed by another layer (22336), which was a layer of dark grey brown clay (*c*.60mm thick).

Space 559 – north of Building 43

All of the deposits situated in this space amounted to a slither of archaeological material approximately 1.20m wide (i.e. north-south) that would have abutted the north side of the north wall of B.43 (F.1854), which had been excavated at the end of the 2014 excavation season, leaving the deposits out of phase. The northern side of this sliver was truncated by Mellaart's attempted (and aborted) excavation of a second deep sounding during his 1960s campaigns. As such the deposits have very little spatial information to offer. However they remain of interest because they correlate with a number of 'courtyard' or eternal midden areas which Mellaart saw and excavated.

Figure 3.11. *South-facing section of deposits left* in situ *after the excavation of B.43, plaster floor (22326) is clearly visible about a third of the way up, which would have abutted the north side of the northern wall of B.43 (photo: Onur Yüksel).*

The earliest deposit in this sequence was the remnants of a thin white plaster floor (22326) which would have abutted that same northern face of the now removed F.1854, the north wall of B.43, at a height of between 1005.31-1005.53mASL (Fig. 3.11). This floor survived with dimensions of 1.03m wide (north-south) and 3.49m long (east-west), and was no more than 10mm thick for the most part, consisting of pale grey clay, with an orange brown make-up layer. There was little else to note of interest about the floor, except for the fact the clear abuttal with B.43's north wall. Since the floor clearly represented a (presumably internal) space in its own right, and given that there was no evidence of any access between this space (numbered Sp.559) and the northern space of B.43 (Sp.235), the only logical conclusion was that this must have been part of a difference Building or complex of rooms, with uncommon situation of sharing a single wall (as opposed to the more usual double wall).

A shallow circular pit (22327) then cut the plaster surface, which was 0.55m in diameter and 0.13cm deep. This pit was of unknown function and was filled with homogenous dark grey and orange brown fill, containing some charcoal (22325). The remnant Sp.559 was then filled with a compact material, very similar in composition to the pit fill, but containing pale pink and white plaster and brick fragments (22322). This deposit was also about 3.53m long and 0.36m wide, and filled what was left of the space to a depth of only 90mm, and as such probably only represented a primary period of collapse or demolition.

Space 583 – north of Building 43

Two further thick midden layers sealed this earlier collapse or demolition, the lower being (22320), and the upper being (22314). It was impossible to say to what degree these deposits represent an abandonment of Sp.559, or a total remodeling and reuse of the area; this was the rationale for attributing them to their own new space (Sp.583). The earliest midden layer was approximately 0.43m thick, comprising of firm dark grey and light mottled grey sandy clay midden material, with some burning at the eastern side. This was sealed by a further 0.64m of midden deposit, to a height of 1006.68m ASL, distinguished by the presence of more orange brown and black in the mottling. This was the highest deposit excavated in this sequence, essentially laying under material that Mellaart exposed and excavated in the 1960s.

Building 43, Space 236

To the south of this area B.43 was almost complete excavated by the end of the 2014 field season. As such no structural elements or occupation material appeared to remain at the beginning of the 2015 excavation. However, as excavation was begun on the infill of the clear outline of the walls of the underlying B.160 (see below), three burials were found in this material that almost certainly belong higher up in the B.43 sequence.

Burial F.7800 contained one skeleton Sk(22303), burial F.7802 contained the skeletons of two individuals, Sk(22335) and Sk(22309) respectively, and finally burial F.7803 contained one further skeleton Sk(22311). The cuts for all of these burial events, (22304), (22308) and (22312) respectively, were indistinguishable from both their fills (22302), (22305) and (22310), and from the room fill of Sp.551 (22300) into which they were cut.

Building 160, Space 551

Space 551 was the number attributed to the main southernmost space of B.160 (Fig, 3.12), in which excavation began this season, having had the tops of its walls exposed in the 2014 season. This southern space also had the dogleg along its eastern side that was reflected in the later B.43. This demonstrates that Mellaart's Shrine 31 sequence was already in place stratigraphically when B.160 was first established. The

space was *c*.5.24m north-south and was *c*.4.19m east-west at its widest. As noted already, the building had the same layout as B.43 above it, There was evidence for two post scars on the exposed face of the western wall in the space. There was also a clear niche in the situated in the northern wall of the space, which appeared to mirror a similar niche in the southern wall of the adjacent northern Sp.552, suggesting that it may once have served as a crawl hole (see also discussion below). Furthermore to the east of this (although obscured by the remaining fill along the eastern wall of this space) was some evidence of a doorway or crawl hole (again similar to that found in the overlying B.43).

Figure 3.12. *Overview of B.160 (west-facing view; photo: Jason Quinlan).*

As such the earliest exposed deposit in this southern space was the pale whitish plaster floor (22333) at an elevation of approximately 1004.05mASL. In fact only the northwestern area of this floor surface was cleared this season, as strips of room fill needed to remain *in situ* for the purposes of health and safety requirements (stepping in of the limit of excavation). As such the area adjacent to the southern wall of the space was not visible this year, which is conventionally associated with the 'functional' 'dirty area' of buildings at Çatalhöyük. Even so, the building displayed a couple of unusual spatial components, such as the presence of an (as yet unexcavated) pyrotechnic installation in the north-western corner of the space (22324).

At the end of its use life the floor was sealed by a very compact room fill (22324) and (22300), similar to those seen in the majority of house closures at Çatalhöyük. The stratigraphically lower of these deposits, (22324) was effectively an arbitrary division, allocated to the lowest 100mm of the room fill, on order to separate the primary demolition from the main body of the room fill, thus allowing any artefacts or assemblages that may be present on the floors at the time of abandonment/demolition to be closely associated spatiotemporally. As it happens this deposit was largely sterile, and both fills consisted of densely compact light orange brown silty-clay, together filling the surviving space to a depth of approximately 0.95m. Both deposits contained very few artefacts but significant plaster, crushed brick and fragments of moulded clay inclusions, consistent with demolition debris. Although in plan the deposits look largely homogenized,

there was clear evidence of tip-lines throughout, and a higher density of plaster demolition in the southern north facing section.

Space 552

In plan Sp.552 appeared to be a pre-cursor for the layout of the northern space of B.43 (Sp.235), which overlay it, however its relationship to the layout of B.160 was far more ambiguous. Although the niche on the southern wall (see also discussion above) would suggest that (if it had once served as a crawl-hole) the spaces were linked, and later on again by the crawl hole in the southeastern corner (which may have also been blocked at some point) these features remain ill-understood at the end of season 2015 and will need to be closely addressed in future excavations.

Suffice it to say that two dense and compact room fills (22337) and (22301) were removed from this space this year (again representing a more or less arbitrary split just above where the floors were anticipated to occur). Both were essentially compact grey/orange-brown silty-clay, this time containing occasional animal bone fragments and charcoal fragments. These deposits were excavated to a total depth of depth of approximately 0.90m. However at this point, when below the floor level of the adjacent southern space (*c.*1004.05mASL) and still no floors or obvious surfaces had been found throughout the space, the excavation team began to question whether this space was in fact associated with Sp.151 at all, but rather might be a southern space of B.118 partially excavated in the 2012 field season. To test this hypothesis the team extended the excavation of the western third of the lower fill deposit (22337) into a sondage, to test for the presence and elevation of floors. After approximately a further meter of excavation, just below the level of adjacent floors in B.118 to the north, still no floors were found. The northernmost and side (east and west) appeared to continue to this depth, although deposits appeared to extend below the partition wall between Sp.551 and Sp.552. Confusing matters further. The complexities of this spaces association with B.160 or B.118 will not be ironed out without further excavation next season.

Building 80 (Spaces 135 and 373)

Kate Rose, Mateusz Dembowiak, Renata Araujo, Halle Payne

Introduction

In the 2015 field season, excavation continued in B.80 (Fig. 3.13). As in the 2014 field season, the main aim was to continue the removal of the structure in order to create a complete timeline for its occupation and construction phases. Further aims included revealing the burial sequences of the main platforms, phasing the painting above the main platform, identifying the oven and hearth phases of the southern activity area, and better understanding the patterns of architectural remodeling of the main features. Throughout the building removal process the walls were to be left in place. As in 2014, along the walls we have continued to preserve a small section of stratigraphy to aid later building reconstruction.

Building 80 is located to the west of B.79 and the east of B.89, and is oriented on a roughly north to south axis. It consists of two rooms with the main room, Sp.135, to the north and a smaller storage room, Space 373 to the south. The excavation of B.80 began in 2009 and the latest occupation floors were revealed in 2010 (2009, 2010 Archive Reports). Excavations resumed in 2013 (2013 Archive Report). Although partially truncated by Mellaart's 1960's excavations along its northwestern edge, B.80 displays remarkable preservation due to burning and most notably contains a geometric wall painting located on the lower center panel of the building's eastern wall, F.5014, first discovered in 2011 (2014 Archive Report).

Figure 3.13. *West facing overview of B.80, post-excavation (photo: Mateusz Dembowiak).*

Space 135

Space 135 represents the northern room of B.80, containing the northern and main platforms, bench, and main floor area. The overall aim of excavation in this space this season was to remove as many features as possible and develop a timeline for the construction of these features, and to better understand the techniques behind their assembly. Furthermore, the relationship between the building and oven phases is of great interest. The identification of the main platform burial sequence as well as the stratigraphic phasing of the geometric wall painting suggested by the removal of the bench are discussed in detail below. It seems the currently exposed phase of occupation is associated with a phase that includes an earlier oven, does not contain a bench, aligns with the initial formation of the main platform, and corresponds to a more connected floor sequence in the southern activity area preceding the construction of many features.

Main floor

We began excavating in this area of the building at the beginning of the season in order to remove the occupation floor sequence that was stratigraphically locking the plaster floors of the main platform. The earliest exposed floor in the main area is a patch of dirty floors southwest of the main floor in the area between hearth F.7402 and wall F.5036 under the location of the platform with fine spot. Sealing this patch is a thick compound layer of main floor make up events (21767). It consists of about five micro-layers. It was decided to lump all these layers together in order to proceed with excavations of the main platform. The layers are a thicker (>5cm) homogenous orange clay make up, a thin ashy and charcoal rich gray layer, a whitish brown plaster floor, a grayish brown layer with lots of phytoliths (could be chaff material that was deliberately placed at regular patterns as a kind of floor matting), and a grayish orange make up layer right

above the now exposed (but unexcavated) main plaster floor. Also set into this layer is a large, albeit broken groundstone with a triangular base. The groundstone was first identified surfacing through later floor layers in 2013, suggesting that it was used throughout the maintenance of the main floors.

Sealing this make up is an eroded, patchy, plaster floor (21759), which is then sealed by a series of patchy, overlapping, thin plaster flooring events (21763). The units are distinguishable despite the extremely thin and patchy nature of the floors due to distinct make up layers that can be traced across the entire main floor area. Each floor layer was excavated in a composite manner. Sealing the previous floor was another event of plastering traceable across the entire main floor area (21762), which was then sealed by a slightly better preserved plaster floor (21758). These consecutive layers of plaster flooring events demonstrate the continued maintenance and use of the main floor area throughout the lifetime of the building.

Sealing the plaster floor sequence of the main floor is a thick, homogenous layer of ashy, sandy clay packing, located in the south west corner of the main floor (21761). It is packed into a square shape, thus forming the foundation of a small platform just west of the hearth F.7402. Sealing this packing is another make up layer of the small platform (21760) consisting of less homogenous, mixed orange clay. These construction packing layers are sealed by a layer of *in situ* burning (21752), thus forming a fire spot on the platform. A sequence of micro gray clay make up layers (21751) seals the *in situ* burning. Sealing the make-up layers is a thin remnant plaster floor (21740). These layers determine that this small platform is not a hearth, but a feature dedicated to a fire spot, perhaps used in conjunction with the existing hearth F.7402.

Also sealing the micro gray clay make up layers on the fire spot platform (21751) is a compound layer of plaster and make up floors across the main floor space (21744). Sealing this is a relatively thick layer of plaster, only preserved around the northern edge of the hearth (21741), but that could have extended across the entire area of the main floor. A deposit (21735) of fine, friable clay make-up, light brown in color, measuring 1.04m x 0.7m and 0.01m in thickness, seals the plaster. It extends in a west to east orientation from the northern border of the hearth F.7402 to the southern edge of the main floor of Sp.135.

Figure 3.14. *Overview of the central platform area F.3440 before excavation burial sequence (west-facing view; photo: Mateusz Dembowiak).*

Main platform

The main platform is located directly beneath the geometric wall painting on the central lower panel of the eastern wall, F.5014. The platform measures 1.84m x 1.38m and is oriented on the north-south axis on the building. This season's excavations revealed the construction of the main platform in two distinct phases, corresponding to F.3440 and F.7411 (Fig. 3.14). The earlier feature phase of the platform was identified due to the presence of a burial horizon and architectural remodeling. We finished removing the later phase of the platform, F.3440, and excavated the burial sequence and nearly all of the stratigraphy of the earlier platform phase, F.7411.

Feature 7411

The earliest layer identified of the platform is a thick, smooth, and pristine plaster floor (21774), measuring 1.84m x 1.38m with a height of .05 m from the main floor. It appears to be the first substantial plaster-flooring event following earlier platform makeup layers (not excavated). A brick and mortar extension to the

western extent of the platform that ran north to south sealed this layer. The bricks, six in total (22416), are composed of sandy clay and are set in a layer of grayish-yellow mortar (22417). The bricks extend north towards platform F. 3441 past small platform F.7410, and south towards bench F. 3439. Therefore the extension connects the bench, main platform, and F. 7410 and represents a significant architectural remodeling event. The brick and mortar extension was sealed by a layer of eroded plaster (21775). This plaster appears to serve the purpose of leveling the extension and abutting the plaster floor of the platform (21774) to create a cohesive, flat surface of plaster.

Figure 3.15. *Burial sequence in the central platform of B.80 – from left: F.7407, F.7408 and F.7409 (east-facing view; photo: Mateusz Dembowiak).*

The well-preserved plaster floor (21774) also represents the burial horizon of the main platform, and is cut by three later burials F.7407, F.7408, F.7409 (located from north to south respectively) (Fig. 3.15).

Feature 7407 is the northernmost burial located on the main platform. The cut (21769) is oriented northwest to southeast, mostly ovular in shape, but is slight circular shape in the southeast corner of the cut. The burial is a primary inhumation of two individuals that appear to have buried at the same time. In the northwest portion of the cut, a skeleton Sk(21779) of a neonate was identified in a very poor state of preservation. It was located 0.23cm from the top of the cut and was facing south. In the southeast portion of the cut, a juvenile individual Sk(21776) was identified in a flexed position at approximately the same level as the neonate. The burial fill (21768) was a sterile deposit of silty-clay with charcoal and plaster aggregates.

Feature 7408 is a single primary burial located just south of F.7407, north of F.7409. All three main platform burials are contemporaneous. The cut (21771) is regular and ovular in shape, and oriented east to west. The skeleton Sk(21777) is a juvenile in a flexed position, facing eastward towards the geometric painting on wall F.5014. The burial fill (21770) is very similar to the fills of F.7407 and F.7409, and consists of silty gray clay with charcoal and plaster inclusions.

Located south of F.7408 and approximately 0.2m north of the bench, is F.7409. This burial is extremely similar to F.7408 in that the cut (21773) is extremely regular and ovular in shape, as well as oriented east to west. The skeleton Sk(21778) is a juvenile, although due to the size of the individual may be slightly older than the juvenile from burial F.7408 (see Human Remains Report for more information). The individual is in a nearly identical flexed position as the individual in F.7408, on the right side facing east towards the geometric wall painting. The burial fill (21772) is gray silty clay with charcoal and plaster inclusions.

Feature 3440

The coeval burials (F.7407, F.7408 and F.7409) were sealed by a sequence of thin plaster and gray make-up layers (21765). They consisted of five micro layers and were excavated in a composite manner. This layer also represents the earliest plastering event of the second phase of the main platform (F.3440). This layer was sealed by another series of micro plaster floor and make up layers (21764), which was then sealed by another deposit of plaster floor and gray clay make up (21738). These layers were excavated and assigned unit number arbitrarily due to the very thin and eroded nature of the plaster floors. In keeping with the floor sequences previously excavated in the building, these layers were generally sterile apart from some fragments of bone, shell, and obsidian.

Feature 7410

Located just north of the main platform is a small platform construction, F.7410. The earliest exposed floor on this platform, which is also earlier than the floor and makeup sequence of F.7411 (Fig. 3.16), is an eroded plaster layer (21789). This layer is significant in that it contains highly eroded traces of red paint. On the top of the platform there are traces of red handprints of different sized and orientations (Fig. 3.17). Along the south-facing edge of the platform there is eroded red paint in a "checkerboard" pattern (Fig. 3.18), extending below the main platform layers. Abutting the painted platform floor along the western edge of the feature is a layer of eroded plaster platform (21784), which covered the portion of brick and mortar extension ((22416), (22417)) that bordered F.7410. Both the eroded plaster (21784) and the painted layer of plaster floor (21789) were sealed by a composite layer of plaster floor and gray make up (21737). This floor sequence, like that of the main platform, was also generally very sterile in terms of finds.

Figure 3.16. *Earlier incarnation of the central platform (F.7411) of B.80 (east-facing view; photo: Mateusz Dembowiak).*

Figure 3.17. *One of the new hand prints found next to the central platform of B.80 (north-facing view; photo: Mateusz Dembowiak).*

Figure 3.18. *'Checkerboard' red painting discovered on the minor central platform edge (north-facing view; photo: Mateusz Dembowiak).*

Feature 3441

This feature consists of B.80's northeastern platform, measuring at 1.54m x 1.50m and a height of 0.14m. Excavation did not resume on the platform in the 2015 season as it continued to be stratigraphically sealed by F.7410. In 2014, following the removal of burial F.7404, the remains of an individual associated with an earlier burial resurfaced, although the cut remains sealed by platform floor layers. Further excavation seasons will aim to uncover the remaining burial and floor sequences of this platform.

Feature 3442

Feature 3442 is B.80's northwestern platform and was truncated by Mellaart along its northwestern edge, measuring at 1.8m x 1.44m and a height of 0.07m. The earliest exposed deposit is a heavily eroded, homogenous orange clay make up layer (21786). Sealing this is an uneven and also heavily eroded plaster floor (21783). The floor was in a poor state of preservation and due not extend across the entire platform. Sealing this plaster was a different, less refined layer of plaster (21782) that appears to serve as a preparation layer for the clay partition. The clay partition (21781) runs west to east along the southern edge of the platform, separating the platform from the main floor. It is composed of sandy orange clay. Further excavation of this platform in the coming seasons will aim to continue to remove the floor sequences and reveal the earlier burial sequences.

Bench

This bench is narrow with a raised eastern end containing remnants of cattle bucranium attached to it (Fig. 3.19). It measures 1.39m x 0.29m with a height of 0.25m on the lower, western end and a height of 0.35m on the eastern end. It has been burnt along its southern edge, but not along its northern side. We succeeded in removing the entirety of the bench this season, as well as identifying two construction phases of the feature (F.3439 and F.7415).

Figure 3.19. *Bucranium installation from bench F.7415 (northeast-facing view; photo: Mateusz Dembowiak).*

Feature 7415

The earliest deposits of the bench are 27 gray clay bricks (22436) set into thick plaster mortar (22437) that compose the foundation and original shape of the feature. The bricks are organized in three courses oriented east to west. There is a fourth course at the very top that forms the step of the bench on top, which also directly abuts wall F.5014. Therefore, the original shape of the bench was created throughout the placement of these bricks, and maintained throughout the architectural remodeling and renovation of the bench. The bricks are slightly staggered in the courses, with smaller bricks located at the western edge as well as at the top. The brick and mortar is sealed by a massive block of smooth, thick plaster located on the top step part of the bench (22432). This layer was sealed by a thick layer of chunky, eroded plaster (22431) in which the bucranium was set. The bucranium was extremely well preserved consisting of a complete bos skull of a juvenile. Located just to the south of the bench, also abutting wall F.5014, is a small feature (F.7416), constructed out of five small sandy clay bricks (22434) and gray clay mortar (22435). Sealing the brick and mortar foundation of this feature is a thin, eroded plastering event over the surface of the feature (22433). This feature appears to be a small pedestal perhaps built as a support feature for the bench and bucranium. Sealing both the plaster over F.7416 and the plaster over the bucranium is a compound layer of plaster covering the entire surface of the bench (22430). When we removed this layer of plaster, specifically the portion where the bench plaster lapped up onto wall F.5014, we uncovered red paint which appears to be a continuation of the geometric wall painting. Therefore we hypothesize that the wall painting is earlier than this initial construction phase of the bench. Thus the painting may not be a late addition to the building, as it was thought from the 2014 excavations of "paint spill" on late floor sequences from the main platform.

Feature 3439

Sealing the plaster layer (22430) and representing the earliest layers of the later construction phase of the bench (F.3439) is a brick and mortar extension to the bench. The bricks are fine, smooth, orange silty-clay (22428) set into gray clay mortar (22429) that extend the bench to the west by approximately 0.15cm. Sealing the extension is a layer of eroded plaster (22426). The plaster extension is sealed by a composite layer of plaster covering the entire surface of the bench (22427). The plaster layer sealing this plaster (22427) is a surface that contains traces of a red geometric painting along its northern side (21798) displaying the same shapes and motifs as the wall painting on the lower panel of the build¬ing's eastern wall F.5014. This plaster surface represents the surface exposed at the end of the 2014 season.

Southern activity area

Feature 7402

The hearth was extensively excavated during the 2014 season, and some work resumed removing mostly construction packing layers around the edge of the feature. It is an earlier incarnation of the later hearth F.3436 (which was first identi¬fied and excavated in 2013 and completed in 2014). Feature 7402 is a raised, molded, circular fire installation. Dirty floors to the east, a raised platform like area to the south, a patch of make-up layers to the west, and the main sunken floor to the north bound it.

The earliest deposit of the hearth is a series of laminated, silty clay hearth floors (22402), heavily eroded due to burning. Sealing this layer is a micro plaster floor layer located in an extremely degraded state around the western, eastern, and northern edges of hearth F.7402. It appears to be a lipped edge construction like (20078) excavated in 2014. However this layer is located clearly within the hearth not outside on the edges. This suggest this floor was added perhaps as a cosmetic construction, perhaps during a period of time when the hearth was not as much in use. It is strange that F.7402 should contain so many clean plaster floors which all do not seem to continue onto the southern edge, and appear to be some kind of intentional

border to parts of the hearth. It is clear this hearth was reused and remodeled many times throughout the phases of B.80. Sealing this plaster ledge construction is another series of laminated hearth floors (21749), which are in turn sealed by a dumping event of degraded clay material located inside of the hearth (21787). Similar to the hearth floors excavated in 2014, these layers were generally very sterile.

Southern floors and Feature 7401

The southern activity area, beyond the hearth, consists of a series of sunken dirty floors, a small platform (F.7401) located to the south of the bench and east of the sunken area, a raised area to the south of the hearth, a patch of floors north of wall F.5038 containing an oven sequence, and the ladder platform (F.3437). Excavation in this area this season revealed the construction packing layers connecting the sunken floor area and the platform features.

The earliest deposit in the area of the sunken floor is a very ashy clay make up layer (22425). Sealing this is a continuous, smooth orange clay surface connecting the southern activity area and extending across the sunken floor area, the small platform area, and the area under the ladder platform. This demonstrates the connectivity of the southern activity area before the construction of separate features and platforms. Above this surface is a small deposit of clay molding in the area below the ladder platform, perhaps serving as the foundation of the ladder base (22422). Sealing this molding is another continuous construction packing event (22420), connecting the southern activity area and extending across the sunken floor area, the small platform area, and the area under the ladder platform. This layer is composed of extremely sandy, friable, clay. Sealing this layer in the sunken floor area is the sequence of plaster, make up, and dirty floors that composed the later sunken floor addition to the southern activity area. The earliest sunken floor layer is a gray make up (22405), sealed by a very thin remnant plaster floor (22403). Sealing the plaster floor is another grey make up layer (21794), followed by a dirty floor (21790). A compound layer of micro plaster and make up floors (21780) seals the dirty floor. Following the compound layers is a patchy, but easily traceable plaster floor extending across the sunken floor area (21766). This floor is sealed by another compound, patchy, and heavily eroded series of plaster and make up floors (21748).

Sealing the latest construction packing event connecting the later features of the southern activity area (22420) in the area of platform F.7401, is a plaster floor (22419). This floor represents the earliest flooring event of the small platform. Sealing this is a makeup layer (22415), followed by another distinct make up layer (21799). Sealing the makeup layer is both the plaster floor extending over the bench containing the geometric red paint motifs (21798), and another compound make up floor sequence (21796). Excavation in this area was successful in identifying the stratigraphic relationships between the southern platform and floor areas and the neighboring features of the northern portion of Sp.135.

Ladder platform Feature 3437

This feature is a ladder platform located in the southeast corner of Sp.135, measuring 0.91m x 0.55m, with a height of 0.16m. This season we removed the feature in its entirety. The earliest deposit of this feature is a heavily burnt, massive deposit of mixed construction packing, forming the foundation of the platform (22407). This make-up was cut by two posts, forming the ladder itself (F.7413 and F.7414). The cut located just north of wall F.5038 (22413) is small and circular in shape, associated with a clay lining inside the cut (22410) and remnants of a burnt timber post (22409), and corresponds to timber post F.7414. The small shape of the cut and timber and its location right next to the wall post suggests that it might be some kind of extension, ramp, or rail associated with the larger timber post (F.7413) located just north of this feature. The second timber post feature (F.7413) consists of a rectangular cut (22412), a clay lining (22408), and a rectangular remnant post (18963), initially identified in 2010 that seems to represent the base of the main ladder. Sealing these two post features is a sequence of highly burned and homogenized plaster and make up floor layers (21746). This layer consisted of well-preserved impressions of varied organic inclusions,

mainly plant remains visible as highly burned seeds, stems and charcoal fragments. This suggests the deliberate inclusion of chaff and other plant remains into the floor layers, or the deposition of plant remains repeatedly in the area.

Oven floors

At the conclusion of the 2014 season we identified a phase in the building without an oven. However excavation this season in the area containing the floors underneath the base of oven F.5041 revealed the base of an earlier oven (Fig. 3.20), thus introducing an earlier phase of oven use. The earliest deposit in this area is a heavily eroded, clay ozen base (22418), forming an earlier incarnation of an oven, F.7418. Sealing this base is a layer of construction clay make up (22400) perhaps used to close the oven and prepare for later flooring events. Sealing this packing layer is a less homogenous, ashy make up layer (21797) preceding plaster floors identified in 2014.

Figure 3.20. *Southern area of Sp.135, showing the oven base (F.5041) and associated ladder platform, with charred* in situ *wood remains (east-facing view; photo: Mateusz Dembowiak).*

Southwestern raised floors

Located to the south of hearth F.7402 is a raised sequence of eroded plaster floors and make up, forming a small platform-like construction. The earliest deposit in this area is an unexcavated orange clay make up layer (22424), sealed then by a gray construction make up layer (22401). Further excavation in coming seasons will aim to elucidate the earlier floor sequences and purpose of this raised area.

Space 373

Space 373 consists of the southern side room or "storage" room of B.80. Due to safety concerns the original extent of the space of the building remains unknown. The earliest exposed deposit of this room is a layer of homogenous orange clay room fill (22414). Sealing this layer is a firm deposit of mixed gray make up with many charcoal inclusions (22411). A compound deposit of plaster, make up, and thin ash lenses follows (22406), also containing an extremely high density of phytoliths. The nature of this unit, including many micro layers of different colors and associated purposes (plaster floors, makeup, and thin ash lenses) suggests a series of occupation events, indicative of the intensive use of this storage space. Sealing this is a deposit of thick chunks of white plaster located in the northwest section of the storage room (22404). This deposit may represent *in situ* collapsed wall plaster. Sealing this is a mixed dirty floor with a low density of shell and bone fragments (21754). Following the dirty floor is a well preserved thick plaster flooring event, extending across the entire side room (21753). Sealing the plaster floor is a deposit of burned organic material with a high density of charcoal and plaster inclusions (21757), located underneath an *in situ* fired orange clay brick (21742), first uncovered in 2014. The brick measures 0.36m x 0.20m and is oriented on an east to west axis. The brick does not abut any walls and therefore its purpose remains unclear. Sealing the brick is a layer of compound dirty floors (21739), covering the full extent of the storage space. Unlike the floor layers of Sp.135, the floor sequence of the side room is relatively rich in artifacts such as fragments of obsidian, bone, shell, and pottery, as well as organic remains such as charcoal and phytoliths. This leads to the interpretation of this room as an area associated with processing or dumping activities.

Conclusion

Despite being unable to remove the building in its entirety, this season we accomplished the removal of a number of features, such as the bench, the ladder platform, and the small platform F.7401. Furthermore, we identified the intricacies of a number of floor sequences in the main floor area, sunken dirty floor area, as well as uncovered the burial sequence of the main platform. It is important to note that so far the vast majority of burials in this building consist of juveniles and neonates. The excavation of the earliest burial sequence associated with platforms F.3441 and F.3442 in the coming seasons will provide further information regarding the nature of burials in the building.

We identified further stratigraphic relationships linking the construction of the main features, as well as providing evidence for the geometric wall painting on wall F.5014 belonging to an earlier phase of construction of the building than previously thought. We identified an earlier phase of the building containing perhaps the first oven, preceding a phase without an oven (identified in 2014). The pattern of phases without and with ovens throughout the lifetime of the building could have significant implications for communal practices between houses as well as the importance of hearth and fire spots for food processing activities.

This season demonstrated the challenge of identifying specific relationships between feature and floor sequences, despite the excellent preservation of the building, due to the homogeneity of plastering events and multiple phases of architectural remodeling of features. Nevertheless, excavation revealed more crucial stratigraphic relationships and patterns of construction and maintenance throughout the building. This information, in conjunction with further excavation and analysis as the building removal continues, will serve to elucidate the complex practices associated with the occupation of B.80.

Spaces 565, 580 and 581

Introduction

During the course of this season, the 1990's and 1960's backfill was removed from Mellaart's Shrine 31 and House 32 (labelled Space 565 and 581 respectively). These two structures were essentially exposed in order that they may be excavated and reduced slightly to reduce the overburden above those digging in B.160 to the west. Excavations were essentially begun in Sp.565 this season, in order to physically reduce the amount of material that overhung B.160 and the probable location of the deep sounding planned for the 2016 field season. As such the structure, identified by James Mellaart when he exposed it during his 1960s excavations as House 32 was reduced, with the removal of the latest floors, and the reduction of the walls, to foundation level.

Space 580

Almost nothing is known about this space at the time of writing, as all the units identified as part of it remain *in situ* at the end of the 2015 excavation seasons. The space is defined by a wall, F.8012 ((31617) – brick, (31618) – mortar, (31616) – internal plaster) which predates, and directly underlies the northern wall of Sp.565 above it (see below). This appears to be filled with a dense room fill deposit, (31616), which largely remains *in situ* also (the top 0.20m were removed to define the space).

Space 565

Bearing in mind that eastern and southern limits of this space lay under the limit of excavation to allow a safety step in and continued access and egress to B.89 to the south (Fig. 3.21). As such the excavated extents of this space were 2.54m north-south by 1.43m east-west. The earliest features to be recorded in this space were the western and northern walls, F.8010 ((31606) – brick, (31607) – mortar) and F.8011 ((31609) – brick, (31610) – mortar). These were both clearly founded upon a firm clay foundation bedding layer (31622) and (31623) respectively. The full with of the walls was a little unclear, since both were very badly eroded on their external faces, as they had been exposed since the 1960s, but was probably around 0.35m. Discrete 'between-wall' fills were noted against the outside of both of these walls, (31612) was situated low down against the northern wall and (31611) in a band against the west side of the west wall. The latter was 0.44m deep and was visible beyond the southern limit of excavation to a length of 3.17m (being 0.38m wide). Both fills were a silty clay matrix supporting a mix of white plaster, grey mortar and yellow brick debris. The southern between wall fill would have linked Sp.565 with Sp.581, whilst the western would have tied in to B.43. This latter deposit contained a cluster of eight pieces of bone and stone (31613).

The walls were sealed with a thin white plaster on both internal faces (31605/31608), that itself was associated with a compound floor sequence, comprising three white plaster surfaces and associated brown make up layers. The preservation of these surfaces made it impossible to remove them separately so they were grouped as (31603), the uppermost being at approximately 1006.50mASL. This floor sequence was cut by a single burial (F.8008), which remains *in situ* at the end of season 2015, although the cut, skeleton and fill are all numbered, (31501), Sk(31615) and (31602) respectively; as such little can be set about this individual at this time. The burial was apparently sealed by another thin (30mm thick) compound sequence of surfaces (again three white plaster layers and two associated dark brown clay make-up deposits), (31600). This unit extended throughout the exposed limits of the room at a height of approximately 1006.53mASL. This in turn was cut by a shallow scoop, (20898), towards the southern end of the exposed area. The cut was approximately 0.30m in diameter and 60mm deep. Interestingly, the base and sides of the scoop were plastered with a 20mm thick white clay, (31604) which could not clearly be associated with any of the floors in the space, suggesting that it may have served as a basin or storage utility. The scoop was finally filled with

a compact dark greyish brown silty clay, with small charcoal flecks, (20899). The rest of the occupation sequence was excavated and recorded by James Mellaart in his 1960s campaign; his backfill was assigned the unit number (22321) (Fig. 3.22).

Figure 3.21. *Space 565 pre-excavation 2015 (west-facing view; photo: Maciej Chylenski).*

Figure 3.22. *Space 565 post-excavation 2015 (west-facing view; photo: Maciej Chylenski).*

Space 581

Space 581 was situated on the northeast side of the doglegged kink on the east side of B.43. This space has not yet been allocated a building number as the extents of the building associated with it are not fully understood, by the current excavation team. However the space is in fact the same as Mellaart's Shrine 31. Very little was done in this space this season, for the most part modern fill (dating both to the 1960s and 1990s) was removed from the southwest corner of the space, and the top of the western wall was partially removed, along with a small section of its southern return, F.7807 and F.7806 respectively. This was mainly done for health and safety purposes, in order that excavations might focus upon B.160 situated immediately below it and to the west. A very degraded oven (which had been planned by Mellaart) was noted on the western wall, but was not numbered, as it was situated below the line at which excavations of the wall stopped.

References

Hodder, I. (ed).

2007. *Excavating Çatalhöyük: South, North and KOPAL Area Reports from the 1995-99 Seasons* (Çatalhöyük Research Project Volume 3). Cambridge: McDonald Institute for Archaeological Research; London: British Institute at Ankara.

Chapter 4

Excavations in the TPC Area

Arkadiusz Marciniak, Patrycja Filipowicz, Jędrzej Hordecki, Paul Eklöv Pettersson

Introduction

The works in TPC Area commenced in the 2012 excavations season and three excavations seasons have been carried out to date. They have been carried out in four new trenches. Trench 1 is 5 x 5m is located directly to the South of the Mellaart Area A. Trench 2 is placed directly South of Trench 1 and its overall dimension is 5 x 6m. Trench 3 is located in southern part of TPC Area. It is quadrilateral in shape with southern and eastern edges being 10m long and the northern edge measuring 6m in length. Trench 4, measuring *c*.8 x 6m and is located in between these two sections of the TPC Area. This year field work in the TPC Area was concentrated in Trench 4 and to a lesser extent in Trench 3. Work began on June 24 and continued until August 25.

An overall goal of the excavation of TPC Area is to link the stratigraphy of the TP sequence, excavated between 2001 and 2008, with that of the South Area. A further aim is to recognise architecture, burial practice, pottery and obsidian manufacture and use, subsistence, landscape use, etc. in the period between the end of the South sequence (Building 10 in Level South T) and the beginning of the TP sequence (Building 81 in Level TP M) (see more Marciniak *at al.* 2012).

The excavations carried out in the past three seasons made it possible to reveal a sequence of Neolithic buildings and features in three excavated Trenches: 1, 2 and 3. Altogether, the remains of four buildings (B.121, B.110, B.115, B.109) in Trenches 1 and 2 and two (B.122, Sp.520) in Trench 3 have been unearthed. The works in Trench 4 conducted to date were concentrated upon post-Neolithic occupation and only yet unspecified remains of the Neolithic architecture had been revealed.

Building 121 is located at the bottom of the Neolithic sequence in Trench 1 and 2 and is dated to the period of *c*.6400-6250 calBC, which appears to be contemporaneous with B.81 (Level TP M) from the TP Area. The following Neolithic structure in this part of the TPC Area is B.110. As indicated by the character of walls and elements of constructional practices, the building was probably contemporary to B.74 from the TP Area, which means it can be dated to Level TP N (Marciniak *et al*. 2012, 2013). Following the abandonment of B.110, the area went out of use for some time and was transformed into a midden ((20232) and (20215)). This makes the sequence identical to that in the TP Area where temporarily occupied B.72 of a light construction and the following open space (B.73) emerged after the abandonment of a solid B.74. This further supports the claim that B.110 and B.74 may have been contemporaneous (see Marciniak *et. al* 2012, 2013). Remains of an *in situ* occupational activities were found directly above the open space and superimposed midden. Despite the fact that it was badly destroyed, but considering its character, it is right to attribute them to a separate B.115 (Sp.491). This construction is almost identical to the floor of B.61 in the TP Area, the latest in that sequence. The latest dwelling structure in this part of the TPC Area was B.109. This Building is possibly contemporaneous with the latest B.61 from the TP Area and can be tentatively dated to Level TP R (see a detailed discussion of relations between TP and TPC Areas in Marciniak 2015).

The Neolithic occupation

This year excavations brought about the discovery of at least four phases of Late Neolithic occupation. However, the detailed relationship between this sequence and that of Trench 1 and 2 is yet to be established.

Figure 4.1. *Neolithic midden (21038), Space 598, Trench 4.*

Figure 4.2. *Space 595, a large platform (F.8289) with two benches (F.8298 & F.8299), Trench 4.*

The earliest structure in the Neolithic sequence in Trenches 4 and 3, partly exposed but not yet excavated, is B.150 (Sp.586), located in southern part of Trench 4. This is a large building with a double mudbrick western wall (F.8267) and a single mudbrick northern wall (F.8288). Both walls were plastered and most likely painted. The remaining two walls have not yet been recognized. B.150 has been tentatively dated back to Level South S and it is most likely contemporary with B.44 from the South Area (Regan 2005). The building has been badly destroyed by numerous post-Neolithic pits, in particularly a large pit (F.7378) placed between its western and northern walls (see below; see also Filipowicz, Harabasz & Hordecki 2014).

A wide range of occupational activities in the Neolithic has been revealed following the demise of this large dwelling structure. Hence, B.150 serves as point of reference for grasping and conceptualizing stratigraphic sequence in Trench 4 and to some extent also in Trench 3. Altogether, five distinct stratigraphic strands postdating B.150 have been revealed in different parts of both trenches. These are as follows (as seen from the north):

1. A sequence of homogenous and deep middens placed directly north of northern wall of B.150 (F.8288). Two phases of midden accumulation have been revealed: (i) an earlier phase at the bottom (Sp.598), composed of midden layers (21038) (Fig. 4.1) and (31850); it has been deposited against this wall, and most likely during the building's occupation; (ii) a sequence of later middens recorded as Sp.596 ((31854), (31832) and (31848)). It postdates the occupation of B.150, as their part has been placed on top of its northern wall.

2. A sequence of dwelling structures post-dating the use of B.150 in northern part of Trench 4. After B.150 went out of use, the space it had occupied has been intensively used. The northern part of B.150 has been reused and served as an element of a distinct dwelling structure (Sp.595). Two walls of this structure have been revealed: (i) northern (F.8267) that reused northern wall of B.150) and (ii) southern, composed of both grey and orange mudbricks (F.8257 and F.8258). A solid floor (F.8285) with a largely destroyed fire installation (F.8290) has been placed between the walls. From the east, a large platform (F.8289) with two benches (F.8298 and F.8299) has been found, but not yet excavated (Fig. 4.2). After abandonment, the house interior has been deliberately backfilled with heterogeneous deposits of a significant depth and rich in archaeological material, mostly animal bones. The souteast part of earlier B.150 has been then turned into two small rooms (Sp.578) sitting in-between two grey and orange mudbrick walls of north-south alignment (F.8259 in the west and F.8260 in the east). The southern wall of the building is beyond the perimeter of the trench. Its eastern room was very small and devoid of any in-built structures. A floor (F.8275) between the walls was found but as it may have belonged to the earlier room(s); it was recorded as Sp.594. A large oven (F.8278) was found in the southern part of its western room next to the platform (F.8279). It was square in plan and had a solid mudbrick superstructure of which the western and northern walls are preserved. The stratigraphic relations between Sp.595 and Sp.578 remain to be clarified in the next excavation season.

Figure 4.3. *Space 585: Y-shaped structure F.8271, cluster of stones and bird wing (31825), Trench 4.*

3. A sequence of dwelling structures post-dating the use of B.150 in southern part of Trench 3. The earliest reconstruction of B.150 in this part of the trench comprised a small special purpose room (Sp.585). Its main element was a Y-shaped plastered structure in its central part (F.8271, Fig. 4.3). A cluster (31825) of worked stones, worked bones, horn core, obsidian and flint objects as well as two wings of a wild progenitor of domestic goose (identified by Teresa Tomek) have been deposited from its eastern side. Two largely unspecified fire installations (F.8282, F.8283) were found in the room fill. Worth mentioning is a large stone headless female figurine (31852.x3, see Fig. 4.4) that was found in the room fill. The following reconstruction (Sp.564) involved erecting the walls on top of the preceding room and their subsequent plastering and painting. Remains of fire installation were found on the well preserved floor (31321). A number of worked stones and large fragments of animal bones, indicative of post-abandonment activities, were found on the floor (31317). They represent all elements in the production cycle of worked stones – from the preparation of raw material, through different stages of their production to use, breakage and deposition.

Figure 4.4. *Stone headless female figurine (31852.x3) in the room fill (Space 585), Trench 4.*

Figure 4.5. *Space 493- storage room with bins, Trench 3.*

4. A sequence of special purpose buildings in the northern part of Trench 3. The earliest structure discovered to date in this sequence is Sp.493, identified and partly excavated in 2012 as well as in 2013 (see Marciniak *et al.* 2012: 73; Marciniak *et al*. 2013: 86-88; Fig. 4.5). The room is most likely a part of B.122 and is located in its northeast corner. This was a storage room of *c*.3m^2 and full of a large amount of barley and wheat grain. It consisted of five rectangular bins: F.3933, F.7182, F.7198, F.7196, F.7197 and F.7497. The former was revealed in the 2012 excavation season (Marciniak *et al.* 2012: 73), while the remaining four in the following year (Marciniak *et al*. 2013). The infills of two bins F.7182 and F.7198 were removed that year while the remaining two: F.7196 and F.7197 were left unexcavated. This year we exposed the entire northern part of the room revealing a new bin F.7497. The infills of all the bins from Sp.493 have been taken away.

The fill of bin F.7197 fill (22713) consisted mostly of rubble from the collapse of the building but also some few inclusions of grain, both barley and wheat. These few inclusions may represent the original content of the bin, which most likely must have been emptied before abandonment. The bin F.7497 contained only rubble infill (22748) with the exception of one polishing tool (22748.x2), one cutting tool for plant material (22748.x1) as well as a thick layer of phytoliths at the bottom. The bin F.7196 has been backfilled with a large amount of burnt rubble infill ((31310), (30831)). However, two grinding tools (x1 and x2), one unworked ground stone, as well as several large cattle bones have been found, which most likely formed a some kind of special deposit.

The stratigraphic analysis of Sp.493 made it possible to establish the order of construction of all of the features in the room. The earliest two bins have been placed against its northern wall (F.8255) – F.7196 in the northeast corner and F.7497 in the northwest corner. Two bins (F.7182 and F.7197) have been added later from the south. A small bin F.7198 in the southwest corner has most likely been constructed later.

Space 493 is in bad condition due to heavy burning that damaged the structure. It might have happened as a result of deliberate fire, which happened after the room went out of use. It is indicated by the fact that both bins and the room infill (30868) had marks of fire. The fire was so intense that the infill (31384), directly underneath the room's southern wall, was affected. Signs of fire on later structures in close proximity to the storage room also prove that the burning event happened after the room's construction and use.

The walls of Sp.493 (F.8255) and the southern wall of Sp.564 (F.7499) from Trench 4 (see above) were clearly contemporary, at least for some time, as they have both been affected by the same deliberate fire event that led to the destruction and ultimate abandonment of Sp.493. The fill (22762) between the walls of these two structures was partly excavated in order to get a high quality datable material from this stratigraphically locked event.

The storage room Sp.493 was completely excavated in the 2015 season. A few earlier layers were revealed directly underneath the occupational surface of the room and belong to earlier construction of unspecified character. Space 493 can be dated back to the period of *c*.6400-6250 calBC (Marciniak *et al*. 2013: 87).

Space 493 is most likely an element of a large structure stretching further to the east. Its tiny fragment (Sp.577) was reveled between its eastern wall and the eastern edge of Trench 3. A fill (31355) of *c*.30cm wide in the western part of the space was excavated. The top edges of bins, most likely similar to that from the neighboring Sp.493, were revealed.

Sometime after the construction of Sp.493, a special purpose room was built directly to the west (Sp.562). It was 5.13m long and 3.74m wide (see Fig. 4.6). The western part of the room is located outside the trench. The walls have been plastered and painted with black and white geometric design in the form of vertical and transverse sets of parallel lines (Fig. 4.7), very similar to the decoration of B.121 from Trench 2 (see Marciniak *et al*. 2013: 77). Numerous features were revealed inside the room: platforms in its northern and eastern part (F.8262, F.8294, F.8296), ovens (F. 8295, F. 8297), benches (F. 8291, F.8293) and a bucranium (F.8292). Of extraordinary character are two small painted pillars (F.7291, F.7292), which were painted over with geometric design, and placed on a bench (F.8293), itself located against the northern wall of the room. Northern part of the room was of a ceremonial character while the southern one seemed to serve domestic purposes. At least two distinct phases of its occupation were distinguished, as indicated by a sequence of superimposed floors ((31843), (31846), (31847) and (31859)). The uppermost floor (31843) covered the entire surface of the room. The following two floors (31846 and 31847) were exposed directly underneath, but in only in the southern part of space. The floor directly underneath (31859) covered its

entire surface. Directly underneath, an as yet unspecified floor was revealed in the southern part of the room while a fragment of infill was found in its northern part. The work in Sp.562 will continue in the 2016 excavation season with the main aim of reaching the earliest floor of the building.

Figure 4.6. *Space 562- an overview of the room, Trench 3.*

Figure 4.7. *Space 562- geometric wall painting on the wall, Trench 3.*

The top part of the fill (22797) of Sp.562 was made of neatly placed bricks held together with mortar forming a stable foundation, possibly for a floor layer. There was no clear evidence of the floor, however a distinct, white layer (22765) was recognized at the bottom of the Hellenistic pit. It is not clear whether this is a part of the pit bottom or is a fragment of the Neolithic floor. This surface continued also into the niche to the north and east, which has been shaped by the cut of the late pit F.7272.

Sometime after the special purpose room Sp.562 went out of use, yet another dwelling structure has been constructed directly on top of it. Building 133 was composed of a number of small rooms, most likely surrounding some kind of large room. It extends to the north where one of the rooms has been placed directly above Sp.564 (see above). Three rooms of these structure have been identified. The most southern room (Sp.517) was excavated in the 2013 and was identified by a floor that was radiocarbon dated. The preliminary attribution of this room to B.122 needs to be reconsidered (see Marciniak *et al*. 2013). The second room (Sp.557) is placed directly North of Sp.517. The room seems to have a rather indistinct floor (22762). These parts of. B.133 were badly destroyed by the Hellenistic pit F.7272. As the building has been placed directly underneath the surface and due to considerable destruction by post-Neolithic occupation, it is only preserved in small fragments making its reconstruction difficult. Building 133 is most likely the latest Neolithic building in this part of TPC Area. It was completely excavated in the 2015 excavation season.

Figure 4.8. *Neolithic mudbrick walls (F. 7481, F. 7482), Trench 3.*

A sequence of walls in Trench 3, indicative of four superimposed buildings, was uncovered in 2015. The earliest of them (Sp.575) was only partly exposed. The next building (Sp.574) had three walls: F.7488 (south), F.7487 (east) and F.7484 (west). A small buttress was found on its western wall. The following struc-

ture (Sp.520) was made of four walls: F.7172 (west), F.7486 (north), F.7252 (east), and F.7253 (south). The walls had the following dimensions: F.7172: 2.04x1.12m, F.7486: 6.35x1.17m, F.7252: 1.21x0.94m, F.7253: 3.02x0.78m. The fill of this space was removed in 2013. Similarly to B.74 from the TP Area and B.110 from Trench 2 in the TPC Area, the building did not have a floor (Marciniak *et al*. 2013) The latest building in this sequence (Sp.573) was only preserved in its western and northern parts. Both its northern (F.7481) and western (F.7482) walls were excavated (Fig. 4.8). The four superimposed walls seem to represent a continuously reconstructed room of some as yet unspecified larger structure.

Not a single Neolithic burial was unearthed in the TPC Area, which seems to corroborate an earlier conclusion about a lack of intramural burials in the last three hundred years of the Neolithic settlement occupation (e.g. Marciniak 2015).

The post-Neolithic sequence

The 2015 excavation season in TPC Area brought about the discovery of a wide range of features indicative of the post-Neolithic occupation. Altogether, three distinct phases of late occupation have been reveled: (a) post-Chalcolithic, (b) Hellenistic and (c) early Islamic.

Post-Chalcolithic occupation

One burial (F.7287), preliminary dated back to the Bronze Age, was excavated this year. Its chronology was established on stratigraphic ground as it truncated the latest Neolithic deposits (Fig. 4.9). Three individuals ((22740), (22746), and (22759)) were interred inside one oval burial cut (22752). All of the human remains were in bad condition, which is understandable considering they were placed directly underneath the mound surface. The first two skeletons Sk(22740) and Sk(22746) were preserved in the form of disarticulated body parts in a non-anatomical order. Individual Sk(22740) was originally a flexed inhumation with probably upper limbs flexed to the left side. No cranium was recovered while mandible was found but not *in situ*. No feet were recovered but the hands or at least elements of both were revealed. Individual Sk(22746) was only some cranium and feet fragments. The individual Sk(22759) belong to a baby and was the best preserved as the entire skeleton (apart feet) was recovered. Some loose human bones were also recorded within the burial infill (21046). Thereby, this is the third Bronze Age burial found in the TPC Area. It resembles burials F.3931, F.3961 both in the shape, the localization close to the ground surface and the presence of remains of multiple individuals (Marciniak *et al.* 2012).

Figure 4.9. *Burial F.7287, probably Bronze Age, Trench 4.*

In the northeast corner of Trench 4, a post-Chalcolithic building was unearthed. It is preserved by a fragment of sunken floor and fragment of wall (Sp.589). It extends beyond the eastern and northern edge of Trench 4, therefore it is hard to establish its chronological position and its relation to surrounding deposits (e.g. Sp.584).

In the northern part of Trench 4, a sequence of largely eroded and truncated deposits (Sp.584), most likely post-Neolithic in date (as they are sitting directly on the Neolithic middens designated as Sp.596) were lifted up.

Another feature that can be tentatively dated to the post-Neolithic period is B.134 (Sp.569), located in the southeast part of Trench 4, consisting of very scant and poorly preserved small, isolated fragments of floor (22725) measuring 0.84 x 0.52 x 0.02m; (22727) - 2.64x 0.53 x 0.05m and (22730) - 0.37 x0.30 x 0.02m; and walls (F.7384, F. 7280). In the beginning it was thought to be Neolithic in date, but it turned out that some Hellenistic pit were located underneath.

Finally, in the central part of Trench 4, a sequence of infills, designated as Sp.544, was revealed. It is a relatively large (*c*.4.2 x 2.9m) and deep sequence of infills: (22717), (31326), (22735), (31327), (31329), (31328), (31335). It is definitively pre-Hellenistic in date, as some Hellenistic pits were cut into the infills of this big truncation.

Hellenistic occupation

During this year excavation, a number of features from the Hellenistic phase of the mound occupation was found, including 14 pits and four fire installations.

Figure 4.10. *Bell-shaped Hellenistic pit F.7261 truncating Neolithic structures visible in the W section of Trench 4.*

The chronology of pits was established upon stratigraphic relations between features and chronological attribution of archaeological material. They were grouped into already existing spaces that were established in previous years. The following Hellenistic pits from Trench 3 belong to Sp.484: F.7273, F.7276,

and F.7288. Pits in Trench 4 belonged to the Early Hellenistic (Sp.495) and Late Hellenistic (Sp.496) periods. Altogether, 10 Early Hellenistic pits were excavated this year: F.7261, F.7264, F.7265, F.7267, F.7268, F.7272 (previously recorded as 7356), F.7275, F.7285, F.7290, F.8256 and only one dated to the Late Hellenistic (F.7262).

Some of the pits excavated this year have interesting characteristics. Pit F.7261 (Fig. 4.10) from the western section of a large pit F.7378, excavated in 2014, is distinctively bell-shaped in section with a significantly larger diameter at the bottom as compared with the upper part. Along with similar pits in the SUMMIT Area (Kotsakis 1996, 1997), and other parts of Trench 4 in the TPC Area (Filipowicz *et al*. 2014), the bell-shaped pits form an interesting cluster, arguably of some functional significance, in this very part of the Hellenistic settlement. Another interesting pit is F.7371. It was partially excavated last season (Filipowicz *et al*. 2014) and the works were completed this year. Well-preserved Hellenistic pots and articulated bones of a horse in its fill were discovered. The large pit F.7272 partially destroyed both the walls of Sp.562 and a later wall (F.7277) further to the south. A smaller pit F.7276 was cut into its infill. It contained a pot and human remains.

Other features connected with post-Neolithic occupation comprised two ovens F.7263, F.7159 and two fire installations F.7266, F.7278. All of them were clustered in Sp.495, dated back to Ethe arly Hellenistic period. Oven F.7263 was constructed in the cut truncating the earlier Neolithic walls; it was oval in shape and had a solid superstructure. It was not completely preserved due to post-depositional processes and later truncations..

The second oven F.7159 was placed in the southwest corner of Trench 3. It truncated earlier Neolithic walls F.7159, which later served as some kind of its superstructure, but it was cut through construction elements of Hellenistic B.120. A number of distinctively Hellenistic pottery fragments were found in its infill.

The fire installation F.7266 was located in northern part of Trench 4, west of oven F.7263. The shape of both features was distinctively similar. Two occupational layers of burnt matter, charcoal and ash were found around it. Both of them belong to Sp.495. The second fire installation F.7278 was an oval feature placed in central-eastern part of Trench 4. No pottery was found but instead a large number of animal bones, both charred and unburnt, were discovered. Additionally, a cattle horn core was also found.

Figure 4.11. Early Islamic child burial F.7298, Trench 4.

Early Islamic burial ground

During this year season altogether three burials F.7298, F.7358 and F.7377, located in Trench 4, were excavated. Similarly to burials excavated in previous years, they were dated back to Early Islamic period (Filipowicz *et al.* 2014). All of them were niche grave type burials. Every single burial was placed on the northeast-southwest axis with the head facing southwest. This type of grave, according to Moore and Jackson's typology (Moore & Jackson 2014), consists of an upper pit, grave markers and lower pit. The upper cut is rectangular in shape with rounded corners. The niche is oval in shape and is localized in southern part of grave below the grave markers lying next to the southern part of upper cut. The body was put in the niche. Each of the burials excavated this year have all of these elements.

Burial F.7298 was a child burial located in the southwest corner of Trench 4 (Fig. 4.11). Its upper part was mistakenly identified and excavated as a pit in 2014 (recorded as F.7354). A mudbrick marker was also registered in the cut, but because of high levels of erosion, it was not

recognized as a burial marker. This year excavation led to discovery of a niche cut (22777), the infill (22779) and deposited in it a child skeleton Sk(22778).

The second excavated burial was F.7358, located in the southern part of Trench 4, recognized and partially excavated (upper infill and grave marker) in 2014. This season the niche cut (21040), its infill (21041) with the skeleton of an adult Sk(21042) was excavated.

The third burial was F.7377 is located in the eastern section of Trench 4. It was partially excavated in 2014 (the infills of upper cut as well as a grave niche). Only a cranium was left in place and lifted in 2015. The rest of the skeleton was left unexcavated as it is outside the limit of the excavation area.

During 2014 and 2015 seasons, a total of nine early Islamic burials were identified. Altogether since the beginning of excavation in the TPC Area, 21 early Islamic burials were excavated. They are part of a larger burial ground identified on the top of the East Mound, used at least for 300 years (Kwiatkowska 2009).

Final remarks

The future works will concentrate on the clarifying Neolithic strata in all five stratigraphic strands in Trenches 3 and 4. The excavations in Trench 3 shall involve reaching Neolithic levels below Sp.484 while further investigating the Neolithic features within Sp.493. The works will also be continued in B.111, placed directly north of Trench 1. The ultimate goal of the incoming works would be to connect the TPC Area with the complex of B.10 from Level South T, and hence an area directly south of B.10 in the very southeast corner of the South shelter will be investigated. These works, along with the results of works from the TP Area, will make it possible to reach broader goals of the project in this part of the mound and contribute to an in-depth understanding of different facets of this major threshold in the development of the Çatalhöyük community.

Acknowledgments

We would like to thank Jana Rogasch for her important contribution to this year works in the TPC Area. Special thanks go also to Katarzyna Harabasz and Mateusz Dembowiak for their valuable support and dedication in the final weeks of the season. We would also like to acknowledge an important contribution of students from Australia, Poland, Turkey, the United Kingdom, and the United States to the success of TPC excavations.

References

Filipowicz, P., K. Harabasz & J. Hordecki

2014. Excavations in the TPC Area. In *Çatalhöyük Archive Report 2014*, http: //www.catalhoyuk.com/downloads/Archive_Report_2014.pdf

Kotsakis K.

1996. The Summit Area. In *Çatalhöyük Archive Report 1996*, http: //www.catalhoyuk.com/archive_reports/1996/index.html

1997. The Summit Area. In *Çatalhöyük Archive Report 1997*, http: //www.catalhoyuk.com/archive_reports/1997/index.html

Kwiatkowska, M.

2009. Byzantine and Muslim cemeteries at Çatalhöyük. An outline. In *Archaeology of the Countryside in Medieval Anatolia (*Pihans 113), eds. T. Vorderstrasse and J. Roodenberg. Leiden: Netherlands Institute for the Near East, 129-138.

Marciniak, A.
2015. A new perspective on the Central Anatolian Late Neolithic: the TPC Area Excavations at Çatalhöyük East. In *The Archaeology of Anatolia: Recent Discoveries*, eds. S.R. Steadman and G. McMahon. Newcastle: Cambridge Scholars Publishing, 6-25.

Marciniak, A., P. Filipowicz & A. Mickel
2012. The excavations of the TPC Area in the 2012 season. In *Çatalhöyük Archive Report 2012*, http: //www.catalhoyuk.com/downloads/Archive_Report_2012.pdf

Marciniak, A., P. Filipowicz, E. Johansson & A. Mickel
2013. The excavations of the TPC Area in the 2013 season. In *Çatalhöyük Archive Report 2013*, http: //www.catalhoyuk.com/downloads/Archive_Report_2013.pdf

Moore, S. & M. Jackson
2014. Late burials from the 4040 Area of the East Mound. In *Çatalhöyük Excavations: the 2000-2008 Seasons* (Çatalhöyük Research Project Volume 7), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 603-620.

Regan, R.
2005. Buildings 44 & 56. In *Çatalhöyük Archive Report 2005*, http: //www.catalhoyuk.com/downloads/Archive_Report_2005.pdf

Cultural and Environmental Materials

Chapter 5

Human Remains

Scott D. Haddow[1], Christopher J. Knüsel[2], Belinda Tibbetts[3], Marco Milella[4] and Barbara Betz[5]

[1]Çatalhöyük Research Project, [2]Université de Bordeaux, [3]Exeter University, [4]University of Zurich, [5]Ohio State University

Introduction

The Human Remains Team for 2015 comprised Clark Spencer Larsen (Ohio State University), Scott Haddow (Çatalhöyük Research Project, Stanford Archaeology Center), Christopher Knüsel (Université de Bordeaux), Marco Milella (University of Zurich), Eline Schotsmans (Université de Bordeaux), Barbara Betz (Ohio State University), Belinda Tibbetts (University of Exeter), Bonnie Glencross (Wilfrid Laurier University), Marin Pilloud (University of Nevada-Reno), Alexandra Barmettler (University of Zurich), Bright Zhou (Stanford University), and Michelle Gamble (Independent Scholar).

Christopher Knüsel chaired the Theme Priority Meetings again this year that took place on Saturday evenings, and he and Christina Tsoraki of the Groundstone Laboratory organised the Priority Tours of the site on Saturday, Monday and Wednesday mornings of each week. This year this group also agreed the priority units for the final writing-up season in 2017.

By the close of the 2015 excavation season a total of 31 primary or primary disturbed Neolithic burials (representing 47 individuals) were recovered: 19 from the North Area and 12 from the South Area. Four Post-Chalcolithic burial features (representing six individuals) were also excavated in the TPC Area. These are described by excavation area below.

North Area burials

Figure 5.1. *Building 77 burial F.7853 with primary adult male Sk(21657) and disarticulated cranium and mandible Sk(21663).*

Building 77

F.7853, Sk(21653; 21656; 21657; 21662; 21663), Cut (21650), Fill (21655)

Feature 7853 contained the primary remains of three individuals: an old adult probable male Sk(21657), a child Sk(21656) and a neonate Sk(21653). The secondarily deposited remains of at least two additional individuals, an adult female Sk(21663) and an infant Sk(21662), were recovered from the grave fill. The primary adult Sk(21657) was placed in a tightly flexed position on its right side with the head to the southwest and the feet to the northeast (Fig. 5.1). The primary child Sk(21656), aged 2 years +/- 8 months at death, was placed on top of the adult in the same orientation (flexed on right side, head to the west), with its head above the adult's left shoulder. The primary neonate Sk(21653) was found above the left os coxa of the adult. The neonate was only partially complete and its orientation was unclear.

In addition to these three primary individuals, the cranium and mandible of an adult female Sk(21663) and a cranial vault frag from a neonate was recovered from the grave fill (21655) of F.7853. The adult cranium and mandible appears to have been deposited in a reed basket, as traces of phytolith in a woven circular pattern were found below these elements. It is highly likely that the adult cranium and mandible derives from an earlier burial F.7857 (see below) that was partially truncated by the grave cut (21650) for F.7853, as the adult individual Sk(21668) from that burial is missing its cephalic extremity. No grave goods were found associated with this burial feature.

Figure 5.2. *Building 77 burial F.7857 with primary disturbed adult female Sk(21668) and neonate Sk(21669) above chest and knees.*

F.7857, Sk(21668; 21669), Cut (21671), Fill (21667)

Feature 7857 represents the poorly preserved primary burial of an adult female Sk(21668) lacking the cephalic elements (Fig. 5.2). The adult was placed on its left side in a tightly flexed position with the head to the south and the feet to the north. The region of the cephalic extremity has been truncated by the later grave cut (21650) for F.7853, and it is likely that the loose cranium and mandible Sk(21663) found in the grave fill of F.7853 belongs to Sk(21668). Directly associated with the adult female Sk(21668) was Sk(21669), lying on top of the thoracic area of the adult. Sk(21669) is the primary undisturbed burial of a neonate lying on its left side, with the head oriented towards the east.

F.7859, Sk(21678), Fill (21677)

Feature 7859 represents the primary undisturbed burial of a pre-term baby Sk(21678). The body was tightly flexed to the extent that it was practically rolled up upon itself, lying on its right side with the head to the southwest (facing northeast) and the feet to the south. The baby was approximately 28 to 30 weeks gestation at the time of death. It was placed in a basket with a shell. There is evidence of non-plant organic material within the fill of the basket. The basket itself was very well preserved with clear textile patterning and layering. A small object of the same textile as the basket was found just to the west of the basket and may have been a lid or portion of the basket that had broken away. Samples of both the basket and a layer of orange organic material within the basket fill were taken for analysis.

F.7860, Sk(21681), Cut (21683), Fill (21682)

Feature 7860 is represented by the poorly preserved primary undisturbed burial of a child Sk(21681) (aged between 3 and 12 years at death). The body was placed in a loosely flexed position on its left side with the head to the north and the feet to the south. Various beads were associated with the skeleton.

F.7862, Sk(21679), Cut (NO CUT), Fill (21680)

Feature 7862 is all that remains of primary disturbed burial Sk(21679); it consists of an articulated adult right forearm and left and right hands. These were found in the area of the northeast platform of Building 77 and may belong to Sk(30549) from F.7137, which was excavated in 2013 and located directly above F.7862.

F.7865, Sk(21698), Cut (21697), Fill (21696)

F.7865 represents the incomplete and highly fragmented remains of a neonate/young infant Sk(21698) recovered from the northeast corner of B.77. Given its poor state of preservation, the orientation of this individual could not be determined and a more precise age estimate could not be achieved.

Building 114

F.7615, Sk(21571; 30006), Cut (21528), Fill (21527)

Two individuals, Sk(21571), the flexed supine burial of a middle adult female, 35-50 years of age at death, oriented east to west, with the cephalic extremity to the east (Fig. 5.3), and Sk(30006), a child of two months to three years of age at death, were found in the same feature, with the adult facing the infant. Sk(30006), the infant, was in seated position with a flexed torso. This infant was thus lying face down in a prone position, cephalic extremity to the eastern side of the pit and feet to the western side. It was so tightly flexed that its knees were touching the chest. The infant was positioned in the abdominal area of the adult that lay beneath it, with the two individuals almost touching one another. The adult was in tightly flexed supine position- so tightly that the left upper limb that extended along the left side of the body was intertwined with the lower limbs to such an extent that the left hand appeared from beneath the left tibia and fibula. The cephalic extremity was in an erect position, with the neck flexed and supported against the east wall of the pit (a 'wall effect'). A lump of clay-like material was positioned posterior to the occipital and supported the cranium in this position. The lower limbs were drawn up to the left side of the vertebral axis of the skeleton. Curiously, the feet of this individual were 'crossed', the right deviated to the left and the left deviated to the right. The positions of the segments of the body suggest constraint, perhaps by binding and placement in a sack. A mollusc shell was directly associated with and slightly beneath the right humerus.

Figure 5.3. *Building 114 burial F.7615 with adult female Sk(21571); child Sk(30006) has already been removed (Photo: Jason Quinlan).*

F.8100, Sk(30007; 30010), Cut (30009), Fill (30008)

F.8100 represents the primary disturbed remains of a young adult male Sk(30007) and a neonate Sk(30010). This burial is the last in a sequence of interments within the southeast platform of B.114. The adult was placed in a flexed position on its right side with its head to the east (facing west) and the feet to the west Fig. 5.4). Its left forearm, left femur, left os coxa and sacrum have been removed during the interment of later burial F.3629. In 2012 these skeletal elements were recovered from the grave fill of F.3629 alongside the primary skeleton Sk(8598). Sk(30010) is a partially complete skeleton of a neonate which was place in a flexed position above the left shoulder of Sk(30007). The placement of the head of Sk(8598) in later burial F.3629 has displaced the cranium of Sk(30007) to the right and has disturbed much of the infracranial skeleton of Sk(30010). A large polished white marble mace head (30008.x1) was found above the right shoulder of the adult Sk(30070). Traces of phytolith underneath the mace head indicate that it was in a container of some sort.

Figure 5.4. *Building 114 burial F.8100, with primary disturbed adult male Sk(30007) and neonate Sk(30010) above left shoulder. Marble mace head (30008.x1) is next to cranium of the adult male (Photo: Jason Quinlan).*

Building 129

F.7709, Sk(22615), Cut (22625), Fill (22616)

Sk(22615) is represented by the remains of a child Sk 22615) lying on its right side and aged 3 – 12 years at death. The head was oriented to the east, slightly flexed anteriorly, and the lower limbs tightly flexed toward the thoracic area. The remains are poorly preserved as a result of their proximity to the modern surface of the mound. This burial was likely interred below a platform along the north wall of B.129, but this platform, along with the other floor surfaces of B.129, have all eroded away.

F.7713, Sk(22618), Cut (22622), Fill (22619)

F.7713 represents the primary disturbed burial of an infant Sk(22618) found to the east of F.7709. The body was oriented with the head to the southeast facing northwest, with the feet to the northeast. It is likely that the body was flexed although the extent of flexion is unclear as a result of the significant post-depositional disturbance. The individual was aged at approximately 18 months at time of death. A metal stake from the access bridge (removed mid-season) and a nail went through the burial, damaging several skeletal elements. Wasps had burrowed extensively through the burial fill and cranium. Two shell bead bracelets (one around each wrist) (22618.x1 and 22618.x2) were recovered. There were also many loose beads in the fill around the cranial region. One grave inclusion was a shell that was within the fill of the burial.

Figure 5.5. *Building 129 burial F.7714, adult of indeterminate sex Sk(22620).*

F.7714, Sk(22620; 22655), Cut (22626), Fill (22623)

F.7714 was recovered from Space 77 in the northeast corner of B.129. It contained the primary disturbed remains of an adult Sk(22620) of indeterminate sex (Fig. 5.5) along with a deposit of either secondary or primary disturbed disarticulated bones from at least one additional adult individual Sk(22655) located in the fill directly above and to the north of the abdominal and pelvic area of Sk(22620). It appears that the primary burial Sk(22620) and Sk(22655) were both placed in the grave cut (22626) in the same deposition event, since elements of disarticulated Sk(22655) rest directly on elements of Sk(22620). Due to the extremely friable and poorly preserved state of the bones, a more precise age estimate could not be obtained for either individual. Although the right innominate bone of Sk(22620) was also in poor condition, preliminary examination of the sciatic notch in the field indicated that the individual may possibly have been female.

Sk(22620) was lying in a prone, tightly flexed position with the abdomen resting directly over its tightly flexed lower limbs. Nearly all of the skeletal elements of Sk(22620) were present, except for some elements of the right arm and the left forearm, which may have been disturbed by F.3630, a later burial located immediately to the west of F.7714 excavated in 2012. The cervical vertebrae were completely absent, suggesting that the skull had perhaps been intentionally placed in a position approximating anatomical articulation rather than actually being articulated upon deposition. A corroded piece of beaten native copper believed to be a ring found under the right fingers had stained all nearby bones green. Strings of beads were found around both wrists and both ankles, and a few were found in the neck region.

F.7715, Sk(22621), Cut (22627), Fill (22624)

F.7715, located along the southern wall of B.129, is represented by the primary undisturbed burial of a child Sk(22621) approximately 4 years of age at death. The body was placed on its left side in a flexed position, with the head to the west and the feet to the east. The bones are in poor condition as a result of the proximity of this burial to the modern surface.

Building 131

F.7956, Sk(22661), Cut (22662), Fill (22640; 22641)

F.7956 was found under the north central platform of B.131. It contained the primary interment of a young adult female Sk(22661), aged 20-30 years old, placed in a tightly flexed position on its left side with the head to the west and the feet to the east (Fig. 5.6). An extraordinary amount of associated organic material was recovered from this burial feature. This material was preserved by a burning event in B.131, soon after the individual was buried. The bones of this individual were effectively "baked" a dark black color by the fire in the surrounding house. Additionally, vitrified flesh and other organic material wrapped around the remains prior to burning seem to have left a shiny black residue on many bone surfaces.

Figure 5.6. *Building 131 burial F.7956, adult female Sk(22661).*

Preliminary analysis of organic samples under a microscope by D. Fuller revealed that Sk(22661) appears to have been tightly wrapped in a combination of spun flax yarn (linen) and animal hide. Coarser woven cords made of a different plant fiber that had not been spun were also tied around the body, radiating out from a knot tied under the left upper arm near the individual's spinal column toward her flexed arms and legs. A small wooden bowl was found between the individual's chin and right knee. The individual’s

right forearm and wrist were resting directly on top of the southernmost portion of the bowl. A great deal of hide, cord, and textile were found around and behind the right foot against the wall of the cut, suggesting that excess material may have been wrapped there. A large black bead (22641.x2) was found near elements of the right hand, tucked near the left side of the mandible. It may have been associated with the wrapping of the body, since a great deal of textile was found around and under the face. Alternatively, the bead may instead have been some element of personal adornment.

In addition, a large amount of vitrified soft tissue from the deceased was preserved, especially around the neck, legs, and feet. In the pelvic area, a considerable amount of fecal matter was preserved within the colon itself, while the gluteus maximus muscle also may have been preserved *in situ*. Both were photographed and sampled for further examination.

Within the burial, the cephalic extremity and pelvis of Sk(22661) were positioned relatively high relative to her knees and mid-spine, suggesting that the individual was placed in a bowl-shaped cut, or perhaps a cut that was not quite long enough for her to lie flat. A strange white, gravelly, chalky deposit about 10cm wide surrounded the wrapped body, running most of the way around the skeleton from behind the right scapula to in front of the mandible. Unfortunately, rodent burrows disrupted parts of the burial, resulting in the loss of the entire left foot and ankle, as well as most of the left hand and wrist.

F.7962, Sk(22685; 22686; 31704; 31705; 31706; 31707), Cut (22680), Fill (22678)

Figure 5.7. *Building 131 burial F.7962 with disarticulated subadult remains.*

Feature 7962 represents a burial deposit that consists of a primary disturbed burial (31705) and several other subadults Sk(22685), Sk(22686), Sk(31704), Sk(31706), and Sk(31707). The burial was uncovered in the granary store at the north extremity of Building 131 (Fig. 5.7). The additional subadults and the burial inclusions were deposited at the same time as the primary burial, but may represent partial secondary burials. Skeletal units were given to each cranial vault deposit. The skeletal remains of Sk(31704) and Sk(31706) may prove to be the same individual once the excavation is completed during the 2016 season. The burial fill that was exposed at the end of the 2015 season includes four wooden bowls and a shell.

All of the skeletal remains in the burial are of subadults. The skeletal remains are inter-mingled with the grave goods and inclusions (shells, fragments of clay objects, chipped stone (obsidian and chert), and shell beads). The disarticulated remains were distributed throughout the fill above the main deposit and included skeletal elements from all regions and from individuals aged from infant (under 2 years) to adolescent (approx. 15 years). The skeletal remains of the disarticulated individuals were placed over the oldest individual (Sk(31705), approx. 15 years of age at death) but were clearly within the same deposit layer with the wooden bowls and the primary burial.

Sk(22685) is the youngest in the burial (approx. 1 yr +/- 3 months). This skeleton was the highest in the burial. The cranium of Sk(22686) was placed at the southern end of the cut with Sk(22685). The cranium was against the western edge of the cut. It is likely that other long bones and skeletal elements in the fill will be associated with this individual following completion of excavation in 2016. Infant Sk(31704) is represented by a cranium and it is anticipated that some of the disarticulated remains will belong to this individual. This cranium was placed between the wooden bowls on the eastern side of the cut. Individual Sk(31705) is anticipated to be the primary burial in this feature. The articulated lower limb and foot at the southern end of cut will be re-associated with cranium following further excavation of the burial in 2016. Individual Sk(31705) was aged approximately 15 years at death (estimated from skeletal development and dentition). Individual Sk(31706) is represented by a cranium and is likely to be of another infant. It was left *in situ* at the close of the 2015 season. In appearance it is very similar in age to Sk(31704). Individual Sk(31707) is represented by the frontal portion of a child's cranium was positioned above a small wooden bowl (22678. x4). This partial cranial vault may be re-associated with other cranial portions once the remainder of the cut is opened in 2016.

Building 132

F.7632, Sk(21636), Cut (21631), Fill (21630)

F.7632 contained the primary undisturbed remains of a young adult male Sk(21636). The body was placed in a very tightly flexed position on its left side with the head to the northwest (facing east) and the feet to the southeast (Fig. 5.8). The skeleton was very loosely articulated and the cranium crushed flat, with numerous elements out of place including many of the ribs, as well as the sacrum. Most noticeable, however, was the left forearm and hand, which was disarticulated from the left humerus and tucked under the right arm. Given the state of the skeleton and its extremely tight flexion, it is clear that this individual must have been largely skeletonized and kept tightly bound in a container of some fashion before its eventual interment. Traces of phytoliths on the skeleton in the form of cord wrapping appear to confirm this. Several grave good were associated with this individual, including a finely worked chert dagger (21630.x5) and several worked bone items including a harpoon (21630.x3), a hook (21630.x1) and a pendant (21630. x2). These were found together just below the region of the neck and may have been kept in a hide pouch. Two stone beads (21630.x6, x7) were also recovered from the grave fill.

Figure 5.8. *Building 132 burial F.7632, adult male Sk(21636).*

F.7633, Sk(21676), Cut (21633), Fill (21632)

F.7633 represents the primary undisturbed burial of an infant Sk(21676) in a basket. The body was flexed and lying on its left side with the head to the southeast (facing northwest) and the feet to the north. The

infant was flexed within a basket, the remains of which were very well preserved to the extent that texture was clearly visible. The cranium was compressed and highly fragmented, as was the upper body. The lower limbs and vertebral column were well preserved. The infant was aged at approximately 4 months old at time of death and had extensive skeletal pathology to the left forearm and hand indicating serious infection that impacted the bone in this region. No other skeletal pathology was noted and development was normal. There was clear evidence of organic material that resembled a form of lining, seen elsewhere in the burials at Çatalhöyük, overlying the upper limb (samples were taken). No grave goods were found in association with this burial.

F.7634, Sk(21672), Cut (21635), Fill (21634)

F.7634 represents the poorly preserved primary burial of an old adult female Sk(21672). The body was tightly flexed and lying on its right side with the head oriented to the east (facing northwest) and the feet to the west (Fig. 5.9). The bones of this individual were extremely friable and despite the fact the skeleton was largely articulated, the extremely tight flexion of the body suggests that this individual was partially skeletonized at the time of its interment, with only the ligaments holding the body together. Traces of phytolith composed of finely woven fibres were found above the pelvis and other parts of the body indicating that this individual was wrapped in a reed matt or other container. This burial is notable for the amount of artifacts found in association with the skeleton. These include a concentration of items located between the thorax and the left femur, including several reworked chert scrapers, an obsidian bifacial projectile point, a bivalve shell, two worked sheep metapodials and a powdery greenish-yellow pigment. Traces of organic material surrounding this concentration of items suggest they were placed in a hide pouch. Traces of the same pigment were found on the right fibula and left humerus. A second concentration of worked sheep metapodials and chert tools were found near the cranium. Lastly, phytoliths traces of a circular woven reed basket were found directly to the north of Sk(21672).

Figure 5.9. *Poorly preserved burial F.7634, adult female Sk(21672). Photographed midway through excavation in Building 132.*

F.7863, Sk(21685), Cut (21687), Fill (21688)

This was a flexed primary inhumation of an old adult female Sk(21685) on her right side (Fig. 5.10), oriented east to west, with the cephalic extremity to the west, with secondary treatment (i.e. this is the first and likely only burial location of this individual, but burial was delayed for a period). Evidence for this comes in the form of dislocated elements. A lower thoracic vertebra was rotated such that the superior surface was uppermost in the burial. Other elements were partially dislocated with paradoxical disarticulation (see Maureille and Sellier 1996; Sellier and Bendezu-Sarmiento 2013); the right knee, a persistent joint, is dislocated, but the feet that contain labile joints were in perfect articulation. Both patellae were missing from the skeletal. This may suggest loss upon movement of the body. White fragments, which were especially prominent dorsally, surrounded the burial. They appear to be remnants of a bag or covering. The platform was opened just enough to place this individual tightly within it. Again, this suggests that this individual may have spent enough time above ground to permit desiccation (but in a protected place not prone to rodent activity) before interment. This individual was found with multiple stone beads in the vicinity of the neck and chest (three with the cervical and eight with the thoracic vertebrae, with two burnt beads posterior to the cervical vertebrae). A mollusc shell was found beneath the torso. The remains of a basket were found anteriorly to the right lower limb (region of the tibia and fibula).

Figure 5.10. *Building 132 burial F.7863 (Photo: Jason Quinlan).*

Figure 5.11. *Building 132 burial F.7864.*

F.7864, Sk(21691), Cut (21689), Fill (21690)

F.7864 contained the poorly preserved remains of an adolescent Sk(21691) whose sex could not be determined (Fig. 5.11). The body was placed in a very tightly flexed position on its right side with the head to the west (facing south) and the feet to the east. Given its loosely articulated state and missing elements, it is likely that this individual was at least partially skeletonized when it was interred. No grave good were found in association with this burial.

Figure 5.12. *Building 17 burial F.8203 adult female Sk(22523).*

Building 17

F.8203, Sk(22523), Cut (22528), Fill (22510; 22524)

F.8203 is the primary undisturbed burial of a middle adult female placed in a loosely flexed position on her right side with the head to the west (facing southeast) and the feet to the east (Fig. 5.12). The right arm was extended alongside the body, while the left arm was loosely flexed across the abdomen. Much of the skeleton was stained dark red with ochre, with especially thick deposits located under the right side of the skeleton (right arm and hand, right os coxa). The frontal bone and parts of the viscerocranium (i.e. face) bore traces of a brighter red pigment, likely cinnabar. No grave good were found in association with this burial.

F.8204, Sk(22525; 22523), Cut (22527; 22529), Fill (22511; 22512; 22526)

Feature 8204 represents the primary undisturbed deposition of a young adult Sk(22525). The body was placed in a flexed position on its left side with the head oriented to the southwest and the feet to the northeast. The extremely poor preservation of the bones precludes an assessment of sex.

Sk(22523) consists of the disarticulated skeletal elements of a child (3-12 years). Bones of this individual were found at different levels in the burial fill of Sk(22525). The cranium was placed lying on the vault, oriented toward north and facing south. Four pieces of obsidian were found on the palate, and one ceramic sherd and one stone were placed near the cranial region. Sk(22523) may represent the disturbed remains of an earlier burial dislodged by the later interment of Sk(22525), or a secondary deposition brought from elsewhere to accompant the primary burial.

F.8205, Sk(22518), Cut (22519), Fill (22513; 22521)

F.8205 is the primary deposition of an infant (2 months – 3 years of age at death). The body was placed on its right side with the head oriented towards the west. The lower limbs were hyperflexed at the level of the hip and extended at the level of the knee.

F.8206, Sk(22516), Cut (22312), Fill (22515; 22517)

F.8206 is the poorly preserved primary undisturbed burial of a child aged 9 years +/- 3 years at death. The body was placed in a loosely flexed position on its left side with the head to the northwest (facing down) and the feet to the southeast. The thorax was in a prone position. Some skeletal elements were out of articulation, including the left forearm and hand, as well as many of the foot bones. A thick, well-defined patch of phytoliths in the shape of a plank or matt was revealed underneath the skeleton, running from the

base of the cranium to the ischial tuberosities of the os coxae (Fig. 5.13). No grave good were found in association with this burial.

Figure 5.13. *Building 17 burial F.8206, child Sk(22516).*

Figure 5.14*. Building 43 burial F.7802, neonate Sk(22309) above child Sk(22335).*

Building 43

F.7800, Sk(22303), Cut (22304), Fill (22302)

F.7800 represents the primary undisturbed burial of a neonate Sk(22303) with the head oriented to the northeast. The subject was lyıng supine, with the head flexed and the thorax at a higher level than the abdomen. The lower limbs were flexed and the feet were at a higher level than the lower limbs (same level of the head).

F.7802, Sk(22309; 22335), Cut (22520), Fill (22310)

F.7802 contained the skeletal remains of two subadults (Fig. 5.14) placed within the same grave cut (22520). Sk(22309) is the primary undisturbed burial of a neonate located directly above Sk(22335). Sk(22309) was placed in a flexed position with the head oriented to the east and the feet to the west. Red pigment was present at the level of the thoracic region. Sk(22335) is represented by the remains of a child (age between 3 and 12 years old) buried in a tightly flexed position with the head oriented to the east and the feet to the west. The skeletal remains of both individuals are overall well preserved.

F.7803, Sk(22311), Cut (22520), Fill (22310)

F.7803 represents the primary undisturbed burial of a neonate in Sp.236. The body was flexed on its left side and had rolled into a partially prone position following deposition. The head was to the west (facing east) and the feet to the northeast. The individual was either slightly pre-term or a small full-term with the skeletal ages providing an estimate of 34-36 weeks gestation at time of death. No grave goods were found in association with this burial.

Building 80

Four individuals in three separate grave cuts were recovered from the eastern platform of Building 80.

Figure 5.15. *Building 80 burials F.7409 child Sk(21778) (left), F.7408 child Sk(21777) (center); F.7407 child Sk(21776) and neonate Sk(21779) (right).*

F.7407, Sk(21776; 21779), Cut (21769), Fill (21768)

F.7407 contained two individuals within a single grave cut located in the northern third of the eastern platform (Fig. 5.15). Sk(21776) is a primary undisturbed burial of a child (between 3 and 12 years of age at death), placed on its left side in a flexed position with the head to the west and feet to the east. The preservation of the skeletal remains was poor. Sk(21779) is represented by the poorly preserved primary undisturbed burial of a neonate buried in a flexed position on its left side with the head oriented to the east and feet to the west. No grave goods were found with either individual.

F.7408, Sk(21777), Cut (21771), Fill (21770)

F.7408 was located in the center of the eastern platform of B.80 (Fig. 5.15). It contained the primary undisturbed skeleton of a child (3-12 years of age at death) placed in a tightly flexed position on its right side with the head to the west (facing south) and the feet to the east. No grave goods were found in association with this individual.

F.7409, Sk(21778), Cut (21773), Fill (21772)

F.7409 was located in the southern third of the eastern platform. It contained the primary undisturbed inhumation of a child, approximately 9 years of age at death (Fig. 5.15). It was in a tightly flexed position on its right side, oriented with the head to the southwest (facing southeast) and the feet to the east. The

knees were in contact with the facial orbits and the feet were in contact with the pelvic bones. The dental development is normal but the skeletal development is delayed in comparison. There is clear evidence of binding/strapping on the lower left limb (pelvis, femur, and ankle). The left side of the body was uppermost in the burial, which may have aided in preservation of these marks. The cranium was upright and the endocranium remained clear of burial fill, resulting in exceptional preservation of the fine internal cranial elements. No grave goods were found associated with Sk(21778).

Building 89

F.8152, Sk(21977), Cut (???), Fills (21975)

F.8152 is represented by the scattered bones of a neonate Sk(21977). The head is oriented to the south. The lack of most skeletal elements suggests a deliberate dispersal rather than taphonomic agents (e.g. animals). The interpretation could therefore be of a tertiary (but intentional) or secondary (but outside of a burial context) deposition.

F.8153, Sk(21981), Cut (21985), Fills (21980)

F.8153 is represented by the remains of an infant Sk(21981) lying flexed on its left side (Fig. 5.16). The lower part of the skeleton was truncated during the production of a post retrieval pit. The body was in a flexed position on its left side and the head oriented to the south. The tight flexion of the skeleton suggests some form of wrapping, possibly confirmed by the presence of phytoliths in the region of the hands.

Figure 5.16. *Building 89 truncated burial F.8153 infant Sk(21981) (Photo: Jason Quinlan).*

TPC Area burials

Four Post-Chalcolithic burial features were excavated in the TPC Area in 2015. Most were heavily disturbed by later activity, both animal and human related.

F.7287, Sk(22740, 22746, 22759), Cut (22752), Fill (21046)

This was very disturbed burial located in the south part of Trench 4. It was located very close to the topsoil and destroyed by numerous animal burrowings. Three skeleton numbers were given but probably remains of more individuals will be identified in the lab. All individuals were incomplete and disarticulated. One belonged to a neonate Sk(22759). Some loose bones were also found within the infill.

F.7298, Sk(22778), Cut (30446), Fill (30447)

Feature 7298 is a niche burial of a child located in the southwest corner of Trench 4 (Fig. 5.17). It likely dates to the medieval Islamic period. The skeleton was oriented east-west with the head to the west. In 2014 the upper part of the grave cut was excavated and recorded as a pit by mistake. This was clarified in 2015 when the skeleton was found within the niche cut.

Figure 5.17. *Burial F.7298 child Sk(22778) (Photo: Patrycja Filipowicz).*

F.7358, Sk(21042), Cut (21040), Fill (21042)

Feature 7358 is the heavily disturbed extended supine primary burial of a young adult male. Many skeletal elements were missing or disturbed as a result of rodent burrowing.

F.7377, Sk. (21036), Cut (21034), Fill (21016)

Feature 7377 comprised only a partial skeleton with the remainder remaining *in situ* in the western section of Trench 4 in the TPC Area. Only the cranium, mandible, cervical, and uppermost thoracic vertebrae and the left clavicle were recovered. These belonged to a small female, an adult 20+ years of age at death. This supine burial was oriented east to west, with the cephalic extremity to the west. Upon careful removal of

the cranium and mandible, the atlas was found rotated on the axis such that the individual faced to the southeast. We have recognised that this orientation of the cephalic extremity appears to identify this individual as a medieval Islamic burial, possibly dating to the Seljuk period.

Related research

In addition to excavating/lifting, cleaning and inventorying skeletal remains from the site, the Human Remains Team also completed or continued a number of research projects during the 2015 season. These included student thesis projects. As part of the Laboratory's work on the state of the skeleton prior to interment, Alexandra Barmettler (University of Zurich) completed data collection for her Master's thesis on cutmark evidence at the site, supervised by Marco Milella. Barbara Betz (Ohio State University), supervised by Clark Spencer Larsen, collected data for her doctoral thesis on enamel hypoplastic dental defects in children. Barbara's research will contribute greatly to understanding demographic aspects and well-being of the buried population sample recovered from the site. In a nicely complementary project on mother and infant health, Belinda Tibbetts (University of Exeter), supervised by Christopher Knüsel (Université de Bordeaux) continued her demographic and palaeopathological analyses to more accurately assess the demography of in utero, term, and immediately post-term individuals to address the important issues of fertility, fecundity, and health status at the site. Barbara and Belinda also contributed extensively to the excavation and retrieval of human remains this year. Bright Zhou (Stanford University) collected data for his undergraduate final-year thesis on cranial porosities, both porotic hyperostosis and cribra orbitalia

The Team took advantage of being on site at the same time to complete several publication submissions. With Scott Haddow and Christopher Knüsel, Marco Milella finished and submitted "A Neolithic Irregular Burial in a Midden at Çatalhöyük (Turkey)" to the International Journal of Palaeopathology. In addition to continuing her analysis of dental non-metric traits for biodistance studies, Marin Pilloud with co-authors Scott Haddow, Christopher Knüsel, and Clark Spencer Larsen completed and submitted "A Bioarchaeological and Forensic Re-Assessment of Vulture Defleshing and Mortuary Practices at Neolithic Çatalhöyük" to the Journal of Archaeological Science Reports for an edited volume edited by Christopher Knüsel and John Robb (University of Cambridge) on funerary taphonomy. The KOPAL trench study of 2013 that involved collaboration between the Faunal and Human Remains Laboratories, and which has featured in previous archive reports, will form another submission to the same volume. Scott Haddow and Christopher Knüsel completed the write-up and submission of "Manipulation of Elements of the Cephalic Extremity: The Space 77 Skull (Cranium and Mandible) Retrieval Pit at Çatalhöyük", Turkey to Antiquity. Scott Haddow, Josh Sadvari, Christopher Knüsel and Rémi Hadad also submitted "A Tale of Two Platforms: Commingled Remains and the Life-Course of Houses at Neolithic Çatalhöyük" for an edited volume entitled *Theoretical Approaches to Analysis and Interpretation of Commingled Human Remains* due to be published in late 2015. Finally, Dorian Fuller and members of the field and Human Remains Team, completed and submitted a manuscript on the flax linen discovered under the burnt Building 52 northeast platform.

These publications derive from an on-going concern of the Human Remains Laboratory to obtain a better understanding of the state of the corpse upon burial. This has considerable importance for understanding the funerary behaviour as well as the social structural and organisational complexity of the once residents of the site. Eline Schotmans' first two-week field season at the site concentrated on sampling burial fills in order to better appreciate the burial environment after the deposition of the corpse. Eline previously identified the white substance found on the bones of the deceased as gypsum, a finding that echoes previous work done on the walls and burial platform re-decoration and maintenance. A pertinent question now is to try to determine if this is a geo-chemical product of the interaction of the corpse with the burial environment or rather relates to a form of corpse preparation. In an extension of this work, Bon-

nie Glencross and Christopher Knüsel continued collecting data on cranial blunt force trauma in the human population. They have been asked to contribute to The Handbook of Mimetic Theory and Religion on the origins and context of early conflict in the Neolithic to be published by Palgrave and edited by James Allison and Wolfgang Palaver of the IMITATIO group. In a collaboration between and the Human Remains Laboratory, Dorian Fuller, Head of the Palaeobotany Laboratory has started to analyse burial fills for botanical remains, targeting burnt building burials in the first instance. This work addresses the origin of these soils, their botanical constituents, and change through time in their composition, a socio-economic indicator. Lastly, Michelle Gamble continued her osteological and palaeopathological analysis of the post-Chalcolithic burials from the West Mound excavations.

References

Maureille, B. and P. Sellier

1996. Dislocation en ordre paradoxal, momification et décomposition: observations et hypothèses, *Bulletin et Mémoires de la Société d'Anthropologie de Paris* n.s., 8(3-4): 313-327.

Sellier, P. and J. Bendezu-Sarmiento

2013. Différer la décomposition: le temps suspendu? Les signes d'une momification préalable: une archéologie des temps funéraires- hommage à Jean Leclerc. *Les Nouvelles de l'Archéologie,* 132: 30-36.

Chapter 6

Faunal Remains

Jacqui Mulville[1], Jesse Wolfhagen[2], Julie Daujat[3], David Orton[4] and Katheryn C. Twiss[2]

[1]Cardiff University, [2]Stony Brook University, [3]UMR 7209 (MNHN/CNRS/InEE) Paris/University of Aberdeen, [4]University College London/University of York

This report summarizes zooarchaeological work undertaken during 2015 by members of the core Çatalhöyük Research Project (CHRP) team (Wolfhagen, Mulville, Twiss, and Hayley Foster), the TPC team (Daujat), and the West Mound team (Orton and Romy McIntosh). Each team's work is discussed separately below. Updates on material exported for analysis are also presented.

Strategizing the end of the East Mound Çatalhöyük Faunal Project

As the seasons of excavation and analysis at Çatalhöyük's East Mound near their close, it is important to have a clear idea of the core CHRP Faunal team's desired outcomes and remaining tasks in order to best strategize our remaining analyses. While our primary goal is full analysis of the team-wide priority units, we believe it important to consider faunal-specific research interests as well. During the 2015 season we discussed faunal "blindspots" created by our primary reliance on priority units and revisited the need for assessment to speed up analysis.

After discussion it was agreed that the primary goals of the 2015 field season would be a) to record midden deposits linked to the South Area's chronological spine, and b) to ensure that as the CHRP heads into its final years the faunal lab does not find its analytic opportunities limited by the need to record substantial backlogs of osteological remains. We thus dedicated significant lab time and labor to recording units retroactively identified as priority units (e.g. burial fills), to entering macrofaunal data for our worked bone and bead backlogs, and to preparing bird bone, fish bone, and tooth samples for export to the US and the UK for specialist identification and stable isotopic analyses that at present are impossible to conduct in Turkey. Additionally the worked bone image archive was reviewed and discrepancies between the physical archive, the database and the images identified for future resolution.

In addition to these strategic efforts, in 2015 we analyzed several special finds, including aurochs scapulae, a dramatically large collection (*n*=199) of caprine astragali from the GDN Area, a collection of metapodia (North Area grave finds), and most of a bear paw from a South Area midden. We recorded all worked bone recovered during the 2015 excavations. We advised excavators on site about effective conservation and recovery of faunal remains, including a partially collapsed bucranium in the GDN Area and another bucranium in the South Area (Building 80), and we took field measurements of special faunal finds including Building 89's bucranium. Finally, we inventoried the material from the 2015 excavation season for secure storage in the depot.

The Midden Spine

With interpretive limitations of our analytic focus on priority units in mind, the main East Mound faunal team chose to start the 2015 season focusing on a chronological series of midden spaces in the South Area that were expected to be radiocarbon-dated (a series dubbed "the Midden Spine": see Table 6.1). There are

603 units overall in these spaces; our initial aim was to analyze this material fully via a series of steps: first analyzing material under the 2014 Protocol to provide a rough estimate of the material across these middens, then fully analyzing them under the Tier 1 protocol to have a more complete set of chronologically-distinct, fully-analyzed faunal material to form the basis of diachronic arguments about dietary patterns and changes (Archive Report 2012, 2014).

Space	Hodder Level	Studied Units	Assessed Units	Unstudied Units	Total Units
181	South G	44	3	23	70
199	South H	7	0	1	8
198	South I	6	0	1	7
115	South ?L	22	27	82	131
105	South ?M	11	1	16	28
132	South P	11	23	25	59
329	South P	11	23	23	57
344	South P	12	6	32	50
369	South P	2	0	20	22
372	South P	3	2	7	12
257	South Q	2	7	31	40
260	South Q	2	4	0	6
261	South Q	0	5	2	7
299	South Q	8	11	5	24
259	South R	3	4	0	7
339	South R	9	8	0	17
129	South S	7	4	0	11
119	South T	3	4	1	8
126	South T	4	6	12	22
459		3	9	5	17

Table 6.1. *The 'Midden Spine'.*

Figure 6.1 shows the faunal team's progress on the Midden Spine, scaled by the volume of the deposits. Unfortunately, the Midden Spine only includes Spaces excavated through 2011. 43% of the units, by volume, have been studied fully (at Tier 1 or Long-form) and 26% of the units, by volume, were assessed (A2-A5 or 2014 Protocol). Note that "total deposit volume" is only a rough approximation of expected volume of faunal material; while most of the units in these Spaces are classified simply as "midden," there are other unit types (e.g. "collapse" or "levelling") that are not expected to have similar densities of faunal material. Also note that the "Unstudied" category includes units which have been only scanned for ^{14}C samples, thus this underestimates the progress on dating the Midden Spine.

From Figure 6.1, it is first noteworthy that Spaces 118 and 115 (Hodder Levels South G and South ?L, respectively) are much larger than the other external spaces excavated in the South Area, though the combined volume of Spaces 132, 329, 344, 369, and 372 (Level South P) exceed those volumes; likewise, the combined volume of Spaces 257, 260, 261, 299, 259, 339, 129, 119, and 126 (Levels South Q, South R, South S, and South T) are roughly equivalent with the volumes of Spaces 118 and 115. This may suggest a reorganization of midden space from the earlier levels to the later occupation, a difference in the types of middens excavated in different levels of the site, or a change in the excavation strategy regarding the delineation of different spaces as the project expanded. There are currently no midden/external spaces defined for Hodder Levels South N or South O, which makes it difficult to directly compare these different hypotheses.

In terms of continued faunal strategy to characterize midden material across the South Area occupation, emphasis should be placed on fully-studying assessed units from Spaces 119, 260, 261, and 299 (Levels South Q and South T), as the South Q-South T set of middens has a lower proportion of fully-studied material compared to the South P, South G-South I, and South ?L/South ?M midden sets. As both Spaces 119 and 299 are in the Bayesian Dating Project's "spine" these should be a higher priority than the other South Q units, which are in the supplemental "Midden B" sequence and thus will not be given as precise an age. Focusing on space-by-space coverage, Spaces 344, 369, and 372 (Level South P) are a current gap in coverage, having been largely unstudied or partially screened for ^{14}C samples.

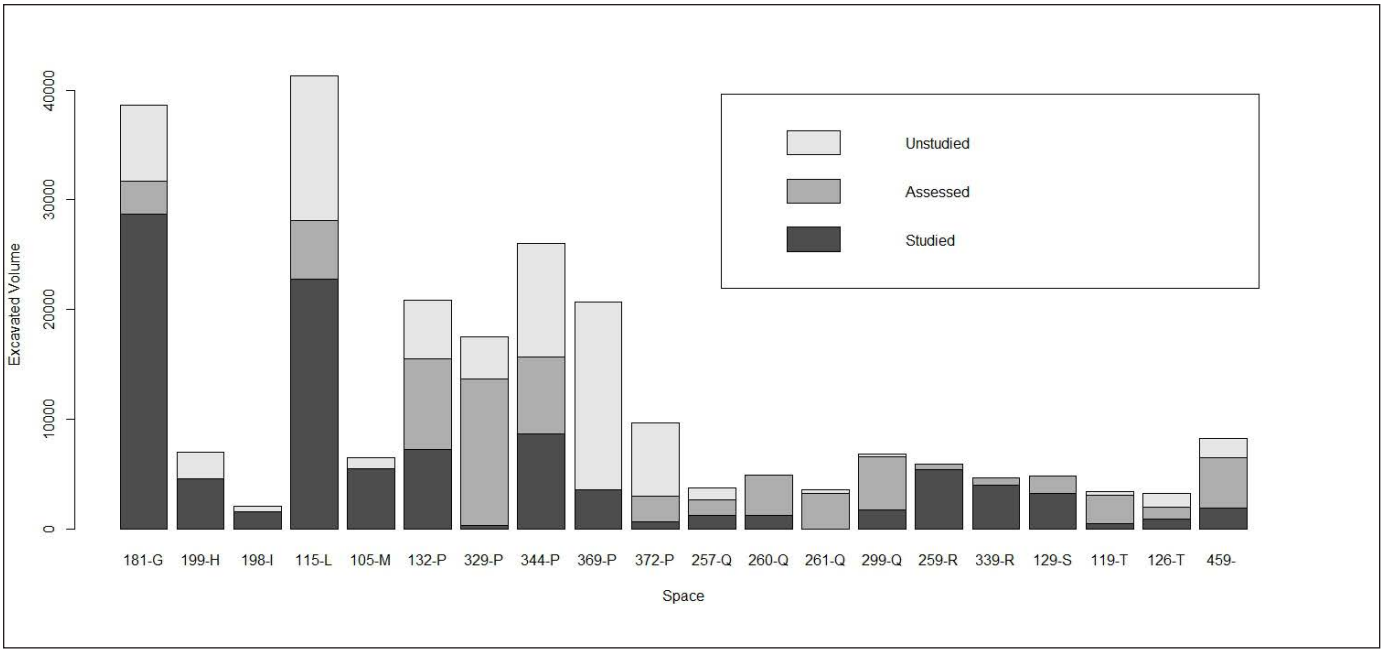


Figure 6.1. *Progress on the Midden Spine, scaled by volume of deposits.*

2014 Protocol: aims and blindspots

One of the concerns leading to the adoption of the 2014 Protocol was "*to minimize the recording of ovicaprid material…, allowing more material from other species to be examined*" (2014 Archive Report: 94). Two seasons onward, it's important to see how these recording decisions have achieved their aims. Table 6.2 shows the numbers of non-caprine specimens recorded in the South Area for a diagnostic set of post-cranial limb bones (i.e., no ribs, vertebrae, carpals/tarsals, or cranial elements/teeth) along with the proportion of those specimens recorded under the 2014 Protocol.

Taxon	Long-form (L)	Tier 1 (T1)	Assessment (A2-A5)	2014 Protocol (2014)	Partial (P)	Total	%A2014	%L or T1
Bos	1344	569	128	189	46	2277	8	84
Cervid	41	12	7	10	1	71	14	75
Equid	375	80	27	91	19	592	15	77
Sus	158	26	8	47	8	247	19	74
Carnivore	370	69	19	39	6	503	8	87
Lepus	31	9	3	7	0	50	14	80

Table 6.2. *Number of non-caprine specimens recorded in South Area.*

Depending on the taxon, 8-19% of the recorded specimens have been under the 2014 Protocol. As a first approximation, ignoring the myriad factors affecting faunal analysis at Çatalhöyük (size of faunal team, speed of analysis, concentrations of the animals in different contexts, context types studied, preservation, etc.), one would expect roughly 11% of these specimens would have been recorded during any two year span. Thus for all of the taxa except for *Bos* and carnivores, it appears that the 2014 Protocol has succeeded in increasing the amount of material from other species for study.

Why were carnivores and *Bos* specimens underrepresented in the 2014 Protocol? It is possible that contexts studied in the 2014 Protocol (primarily Levels South N, South O, and levels from the Midden Spine)

were different from earlier deposit types or were in periods with different consumption and depositional practices from periods studied with different regimes, though this seems hard to prove. Alternatively, it could be that the presence of *Bos* and carnivore remains affects the analysts' decision-making regarding the level of detail: 86% of *Bos* and carnivore specimens were recorded under Long-form or Tier 1, compared to 76% of the other non-caprine taxa. For all of the taxa, more specimens were recorded under the 2014 Protocol than any of the other assessment levels/partial systems combined (see Table 6.3).

Hodder Level	Total Sheep	Analyzed Units	2014 Protocol	Average Sheep/Unit
South G	1234	60	3	32.6
South H	71	19	2	1.8
South I	63	6	0	1.7
South J	30	33	0	0.8
South K	336	121	3	8.9
South L	1029	162	27	26.4
South M	717	93	6	19.0
South N	11	60	18	0.3
South O	931	228	21	24.5
South P	1693	236	20	45.5
South Q	1655	139	12	44.4
South R	1478	59	4	38.7
South S	3708	121	1	98.1
South T	283	42	11	7.5

Table 6.3. *Number of caprine postcranial remains.*

As for caprine remains, one consistent fear with the adoption of the 2014 Protocol is that we are ignoring valuable information about caprines and will thus no longer be able to make strong diachronic arguments about the management/consumption of them. To assess the risk that this is the case, Table 6.3 shows the number of caprine postcranial remains (using the same subset as in Table 6.2: no ribs, vertebrae, carpals/tarsals, or cranial elements/teeth) recorded in each Hodder Level, the number of units with recorded faunal remains, and the proportion of those units that were analyzed under the 2014 Protocol.

There is no statistically-significant correlation between the number of recorded sheep limb remains and the proportion of units analyzed under the 2014 Protocol. However, it is noteworthy that the two Hodder Levels, South N and South T, that have severely lower average sheep/unit values compared to nearby levels also have the two highest proportions of units analyzed under the 2014 Protocol. It is therefore advisable to fully-analyze more of the South N and South T units that have been previously assessed under the 2014 Protocol or are excavated in the final excavation season. Thus fully-analyzing units from Levels South N and South T (particularly Space 119, which is in the Midden Spine) should be a priority for the faunal team in the 2016 and 2017 seasons beyond the priority unit list.

Catalhöyük East project exports

Bos lower molars (37) were exported for isotopic analysis by Jesse Wolfhagen, spanning the occupation of the East Mound's South Area. These molars will undergo stable strontium isotopic analysis at Stony Brook University, using a combination of laser ablation inductively coupled plasma mass spectrometry (LA-ICPMS) and thermal ionization mass spectrometry (TIMS). This will investigate differences in patterns of landscape use by wild cattle (aurochsen) and domestic cattle at the site. Samples from these molars will also be analyzed for stable carbon and oxygen isotopes at University College London as part of Jesse Wolfhagen's dissertation research, funded by the Wenner Gren Foundation Dissertation Fieldwork Grant. This will investigate any behavioral differences in diet and birth seasonality between aurochsen and domestic cattle, which may elucidate the origins of domestic cattle at the site.

Fish bone was exported for zooarchaeological analysis by Dr Mulville. The majority of the material dates from 2005 and is either hand collected or contained within the >4mm sorted residue fraction. Ad-

ditional material of early excavation date was derived from the processing of older material, in total this comprised only 550 fragments. These cannot be analysed by the on-site faunal specialists as the range of species present requires a substantial reference collection and specialist archaeological knowledge to fully obtain the ecological information and exploitation of each species. Additionally the use of biomolecular methods may need to be employed to assist the identification of closely related species (e.g. using proteins). Cardiff University, UK, has fish specialists available and access to excellent reference collections. The biomolecular identification techniques are only available within two universities within the UK, and by exporting the material detailed; rapid and accurate analysis can be completed.

Report on faunal remains from the TPC Area, 2015

Julie Daujat

Introduction

Different tasks were carried out during this season on the material of TPC Area studied as a part of the project sponsored by the Polish National Science Centre (decision DEC-2012/06/M/H3/00286).

First of all, the analysis of faunal remains from secure Neolithic contexts of TPC Area (excavated in 2012-2013) was still the focus of this season, in the continuation of last year's work (for a detailed account of the objectives of the study of TPC Area faunal analysis see Archive Report 2014). In addition, when Neolithic layers were reached and excavated this year, several units were assessed as "priority" units to the excavators' request. This work was not necessary in 2014, since excavated units were dated to post-Neolithic contexts. These contexts are not the primary focus of Team Poznan's research objectives. However, this year an exceptional(?) deposit – including animal bones – dated to the Hellenistic period was excavated and therefore this unit was also assessed. The special bone deposit (see below) was recorded and sampled to be dated, as part of a starting PhD research project on post-Neolithic contexts of TPC area (A. Hordecki, University of Poznan). Finally, a lot of time was spent (i) pulling out suitable bone samples from several units excavated in 2013 for additional ^{14}C dating (Dr. A. Bayliss, University of Stirling), (ii) screening many of the Neolithic units excavated this year for suitable bone samples for both ^{14}C dating and isotopic – oxygen, carbon and nitrogen – analyses (Dr. Jessica Pearson, University of Liverpool; Dr. Elisabeth Henton, UCL).

The TPC Neolithic fauna

So far, a total of 5403 mammal bones (Table 6.4) were recorded from secure Neolithic contexts (B.110, Sp.485: (20124), (30232); B.110, Sp.486: (20215), (30216), (30221), (30241), (30269), (30716); in between two walls, Sp.494: (20255)) in TCP Area excavated to date. All of these contexts are infills. For the sake of clarity, human, bird and rodent bones were not included in the total NISP in this report. For information the total NISP so far is 5582.

TPC Area	NISP	%
N indeterminate species	4511	83.5
N determined species	892	16.5
NISP mammal TOTAL	5403	-

Table 6.4. *TPC faunal material recorded to date.*

Of this total NISP, only 16.5% were identified to the species; 83.5% are either of indeterminate size or identified into different size category, though still not identified to the species. This poor level of identification shows that the material from TPC Area is highly fragmented. The material presents both intentional fracturation – for bone marrow extraction, as well as post-depositional breakage due to redeposition. Indeed, most of the contexts in TPC Area are secondary, or also possibly tertiary, deposits from different sources (high post-depositional fragmentation, different surface condition of the bones, little or no anatomical connections), characteristic of room

infill. However, bones show little post-depositional taphonomic damages (gnawing, root etching, weathering, being trampled; this needs to be exactly quantified for the units recorded prior to 2014), which suggest a fast burying during their first deposition.

The mammal faunal spectrum is relatively diversified (Table 6.5). It is clear, however, that caprines are the dominant animals composing 77% of total identified mammal NISP, with as seen before (i.e. see Archive Report 2013, 2014), more sheep (21.6%) identified compared to goats (3.4%). *Bos* – most likely domestic cattle, is relatively well represented (11%). Again, this seems to indicate that the economy is mainly based on sheep and goat husbandry, yet it is still too early in the study to characterise the system(s) of exploitation. Dog is not very abundant amongst animal remains. However, its presence is more noticeable by the proportion of gnawed bones – again this still needs to be exactly quantified for the units recorded prior to 2014.

TPC AREA	% NISP	% DZ
Ovis/Capra	52	38.7
Ovis	21.6	36.7
Capra	3.4	9
Bos sp. (cf. *taurus*)	10.2	9.4
Large bovid	0.2	0
Equus sp.	0.3	0.5
Large equid	0.1	0.5
Small-medium equid	0.3	0.9
Cervus elaphus	8.3	0.2
Large cervid	0.3	0
Capreolus capreolus	0.1	0
Sus scrofa	0.6	0
Canis sp. (*familiaris*)	0.3	0.7
Vulpes vulpes	1.2	2.9
Lepus europaeus	0.3	0.6

Table 6.5. *Relative proportion of taxa in TPC Area to date. NB: the high proportion of* Cervus elaphus *is due to the relative abundance of antler fragments (*n*=64) in (20255). The real proportion of red deer is most likely to be below 2%.*

Wild animals represent 11.7%. However, as noted in the legend of Table 6.2, the relative proportion of red deer (*Cervus elaphus*) is exaggerated due to the high quantity of antler fragments in (20255). The real proportion of wild animals should be more around 5%, if the proportion of red deer is adjusted – i.e. the *n*=64 antler fragments recorded counted as *n*=1.

The majority of cervid bones are from red deer (*Cervus elaphus*), which represent almost 75% of the wild animals (*n*=104). However, if the proportion of red deer is adjusted (see above), then red deer only represents 36.6% of wild animals. Only one bone of roe deer (*Capreolus capreolus*) was identified in the recorded units. Fox (*Vulpes vulpes*) is relatively well represented amongst wild animals (10.6%, closer to 27% with an adjusted proportion of red deer). It is noteworthy that one of the fox elements (a tibia, 20215.F273) bear cut marks on the distal diaphysis. These cut marks refer more to a process of disarticulation rather than defleshing. In any case, this action could suggest that the inhabitants of Çatalhöyük could have hunted fox for meat as much as for fur. If it is still too early to assert such practice, all the more since it is no that frequent, a few other examples in the Neolithic period attest that small carnivores were indeed consumed by people (Vigne and Guilaine 2004; Matín *et al*. 2014).

Special deposits

This year, three special deposits have been excavated in TPC Area: one from (21084) dated to the Hellenistic period; two from Neolithic contexts, one from (31825) and one from F.8292.

At the beginning of the excavation season, the last post-Neolithic contexts were removed. Among these contexts was the second part of an infill (20184) of a pit (F.7371), located in the north part of Trench 4, which was excavated the previous year. In this infill (21084), two large fragments of late pots (21084.x1 and 21084.x2) were found within the infill and in association with them, two lower limbs of a young horse (Fig. 6.2 top).

The two lower limbs are both right side and almost complete. One is a lower right forelimb (Fig. 6.2 bottom left), this other one is a right lower hindlimb (Fig. 6.2 bottom right). Considering the epiphyseal stage (distal metacarpal and metatarsal unfused, proximal first and second phalanges unfused), these two lower limbs are likely to be from the same individual. In addition, both lower limbs show similar signs of localised trauma: on the first and second phalanges of the forelimb (Fig. 6.3 top) and the distal metatarsal of the hindlimb (Fig. 6.3 bottom, left). This pathology could be the result of infected wounds where a rope was tie, more than due a disease. Indeed, diseases tend to affect bones at the same spots on both side of the skeleton (C. Knusel pers. comm.). It is not known if the animal died naturally of its wounds, which would have developed into a severe infection, or it the young horse was purposely killed.

Figure 6.2. *Top: the two pots and horse lower limbs deposit* in situ *(Photo: Patrycia Filipowicz); Bottom: the two horse lower limbs in articulation.*

Figure 6.3. *Top, left: anterior first phalanx (21084.F6) with sign of trauma; Top, right: anterior second phalanx (21084.F7) with sign of trauma; Bottom, left: distal metatarsal (21084.F12) with sign of trauma; Bottom, right: proximal metatarsal (21084.F12) with cut mark.*

However, it is clear that the skeleton was processed as shown by the presence of a horizontal light cut mark (skinning or dismemberment) on the diaphysis of the proximal metatarsal just below the articular surface (Fig. 6.3, bottom right).

In addition, an almost complete piglet skeleton was found in this infill (21084). This deposit could be a special deposit of which the nature still remains to be determined.

The second deposit was a cluster (31825) in Sp.585, containing stones and two distal part of bird wings (Fig. 6.4 top). Articulated bird wings have already been found at Çatalhöyük. For example a single bird wing was found in the backfill of Sp.292 of B.67 in the 4040 (North) Area (Archive Report 2006) and another single wing of a large bird (20255.x43, 20255.F3, 20255.F4, 20255.F5) found in the midden (20255) of Sp.494 in TPC Area, among clusters of animal bones (Archive Report 2012). The deposit of this year is, however, a

bit more unusual in the sense that it contains two complete wings, a left (Fig. 6.4 bottom left) and a right (Fig. 6.4 bottom right), and most likely from the same individual. They probably belong to a wild goose (*Anser anser*, identification from photo by Teresa Tomek), and they are certainly part of a special deposit associated to a ritual of some sort.

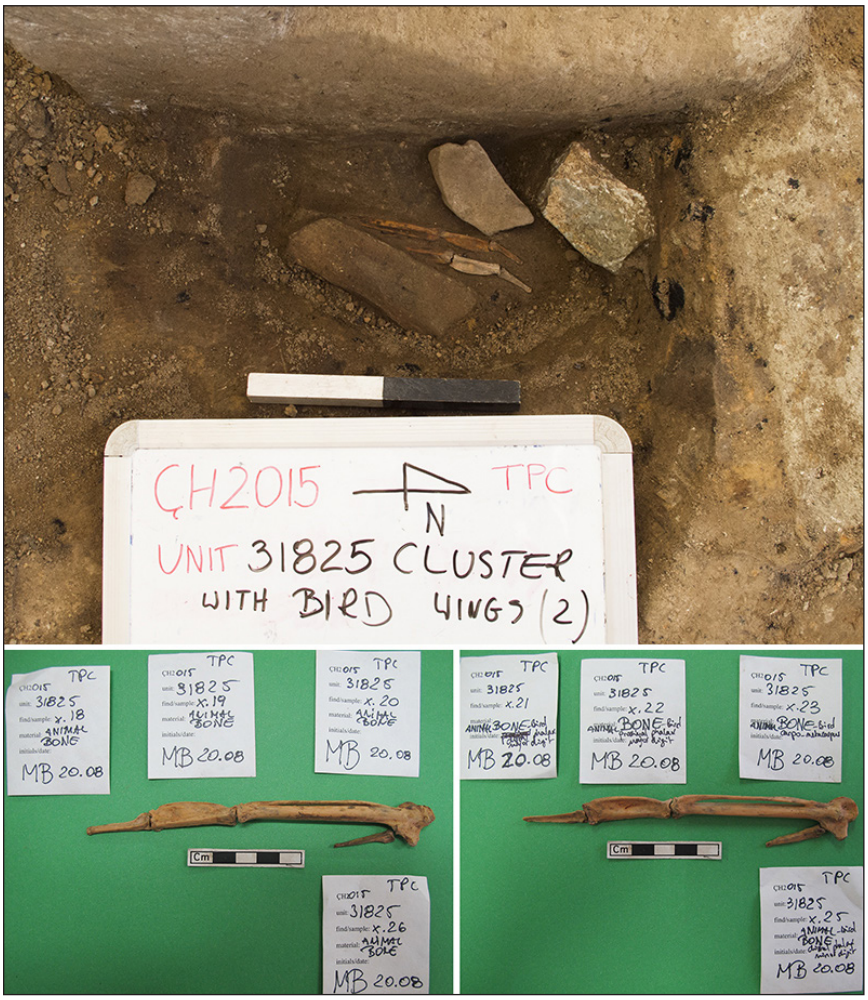


Figure 6.4. *Top: cluster (31825) with bird wings; Bottom, left: left wing (x20, x19, x18, x26); Bottom, right (x23, x22, x21, x25).*

Figure 6.5. *Bucranium/horncores in bench (F.8292) in Sp.562.*

The last animal bone special deposit of this season in TPC Area, is one of the most "popular", but also most remarkable, find at Çatalhöyük…a cattle bucranium! Many examples can be seen in previous Archive Reports, and from this year. It was not possible to see if a complete bucranium was included in the bench or if it is just horncores. This deposit (F.8292) was found less than a metre south from the painted wall in Sp.562 (Fig. 6.5). A couple of field measurements were taken, but the conservation state of the horncores is such that the whole length and thickness cannot be assessed, as well as the status of this animal, i.e. wild (*Bos primigenius*) or domestic (*Bos primigenius* f. *taurus*).

Account of assessed units and units sampled for ^{14}C dating and isotopic analyses units

This year, 17 "priority" units (on which excavators required feedbacks about the material to help in the determination of the unit) were assessed.

Also, 60 units from 2015 have been screened for suitable samples for ^{14}C dating (Dr. A. Bayliss, University of Stirling) and oxygen, carbon and nitrogen isotopic analyses (Dr. J. Pearson, University of Liverpool; Dr. Elisabeth Henton, UCL). In addition, 27 units from 2012-2013 excavations have been screened for additional suitable samples to increase the corpus of reliable Neolithic dates. In total, 55 articulated bones have been recorded (all the bones from articulation are recorded), photographed, sampled and exported for ^{14}C dating.

Among them are (21084.F3) from the young horse lower limbs and (31825.x20) of the bird wings, both described above. Finally, 54 (13 teeth from sheep/got mandibles) and 41 bones (from a large variety of species – sheep/goat, cattle, small/medium/large equids, wild boar, dog, fox – and contexts – 20 in total) have been recorded, photographed, sampled and exported for isotopic analyses.

West Mound faunal analysis

David Orton

Work continued on recording material from Trench 5, with the focus on achieving complete coverage of secure Chalcolithic units within B.98 and B.125. These data will be combined with the available volumes for fill units within the buildings in order to look at differences in deposition between spaces and between phases of infilling. Some units from B.106 and B.107 were also studied. All bones from the deepest part of Trench 7 were also recorded this season, along with selected contexts from elsewhere in the Trench, particularly the surface with complete pots (15107).

ZooMS collagen fingerprinting

In the second and final phase of a study that started in 2014, small (<1g) samples of bone from approximately 110 sheep/goat mandibles and pelvises from the West Mound and the South Area were exported for ZooMS peptide mass fingerprinting at the University of York. The aim of this study, led by David Orton, is to mprove our understanding of Neolithic/Chalcolithic herding at Çatalhöyük, by obtaining definitive species identifications for the two main anatomical elements upon which our age-at-death and sex ratio data are based.

A first tranche of results from mandible samples taken during 2014 became available in June 2015. These revealed that the original identifications to species (where attempted) were mostly correct, but also uncovered a roe deer mandible amongst the sheep and goats.

In addition, several unrelated specimens from West Trench 5 and from TPC (the latter selected by Julie Daujat) were sampled this year in order to check unusual species identifications.

West Mound ^{14}C dating

Radiocarbon dating of faunal samples from the West Mound is being carried out in parallel to the main East Mound dating program, using the same criteria for sample selection. The West Mound dating program is overseen by David Orton and Jana Rogasch, with assistance this year from Chelsea Wiseman and Romy McIntosh. Previous results from Trenches 5 and 7 are currently being prepared for publication and should be submitted by early 2016.

References

Martín P., P. Saladié, J. Nadal and J.M. Vergès

2014. Butchered and consumed: small carnivores from the Holocene levels of El Mirador Cave (Sierre de Atapuerca, Burgos, Spain). *Quaternary International*, 353: 153-169.

Vigne J.-D. and J. Guilaine

2004. Les premier animaux de companies, 8500 ans avant notre ère ?...Ou comment j'ai mange mon chat, mon chien et mon renard? *Anthropozoologica* ,39(1): 249-273.

Avian eggshell

Julia Best[1], Beatrice Demarchi[2], Samantha Presslee[2]
[1]Bournemouth University, [2]University of York

The Çatalhöyük eggshell assemblage is unparalleled in size and preservation both in its geographic and temporal situation, and also represents the largest known eggshell assemblage currently recovered archaeologically (Sidell and Scudder 2005; Mulville *et al.* 2014). The assemblage has the capacity to inform on human-avian interactions in prehistory, and it is a valuable dataset to be examined alongside the bone record.

Over 940 units have produced eggshell, providing thousands of fragments for analysis (Mulville *et al.* 2014). Eggshell has been recovered mainly through flotation, although there are a number of groups of hand-collected material. There are some large collections of eggshell with several individual contexts revealing numerous fragments, including some fragments of substantial size. To date only a sample of material from a range of feature types and areas relating to two Hodder Levels from the 1990-95 excavation seasons had been analysed using SEM (Scanning Electron Microscopy) (Sidell and Scudder 2005). Their results revealed a predominance of duck and goose eggs (Anseriformes), a small number of which had hatched. Other material remained unidentifiable, but was thought to be seabird (possibly gulls, spoonbills or storks), although the remains of these birds are rare on the site.

Eggshell analysis has, until recently, been limited to microscopic SEM analysis, which although providing valuable information, is restricted by expense, requires destructive coating of the samples, and is time consuming. Now microscopy (both SEM and, importantly, high-powered digital microscopy) can be used in conjunction with the analysis of eggshell proteins by mass spectrometry (ZooMS: Buckley *et al*. 2009; Stewart *et al*. 2013), which allows identification of taxon-specific protein markers for avian species present in a reference dataset (Presslee *et al*. in preparation). This is beneficial since it increases the number of samples that can be analysed and identified even where morphologically diagnostic features of the eggshell have been damaged by preservation or by hatching.

For this research forty samples (Table 6.6) were selected to test and demonstrate the potential of a combined approach to analysing this exceptional eggshell material using ZooMs and microscopic analysis of morphological and metrical criteria. The resorption of calcium from the internal structure of the eggshell was also assessed to determine if an egg was freshly laid/infertile (and as such likely used as a food resource), or if it came from eggs that had been allowed to hatch.

Results

Species

The results confirm that Anseriformes dominate the avian eggshell assemblage. Mass spectrometry has identified the majority of the analysed samples as duck, (but other Anseriformes may also be present – see below), possibly belonging to at least two different genera/species, on the basis of visual examination of the mass spectra. Microscopy has also revealed through observation of internal surface characteristics such as the mammillae and via counts and metrical analysis of the eggshell's morphological features that multiple species of duck are likely to be represented, and, although these cannot currently be assigned to specific species, this diversity is in agreement with the bone analysis (Russell and McGowan 2005). The thickness of several of the eggshells extends beyond the known average range for many duck species (Fig. 6.6), however duck eggshell thickness is very varied and the comparative dataset of metrical data from different duck species is incomplete. Additionally there is an overlap in size data between species of ducks and other Anseriformes such as geese (Keepax 1981; Sidell 1993).

Sample ID	Unit	Year	Area	Time period	Hodder Level	Building	Space	Feature	Interpretive category	Flot. #
Zc1	18174	2009	South	Neolithic	South P		132		dump, external	8850
Zc2	18174	2009	South	Neolithic	South P		132		dump, external	8850
Zc3	18174	2009	South	Neolithic	South P		132		dump, external	8850
Zc4	18174	2009	South	Neolithic	South P		132		dump, external	8950
Zc5	18174	2009	South	Neolithic	South P		132		dump, external	8850
Zc6	19564	2012	North	Neolithic			489		midden arbitrary layer	10164
Zc7	19564	2012	North	Neolithic			489		midden arbitrary layer	10164
Zc8	19564	2012	North	Neolithic			489		midden arbitrary layer	10164
Zc9	14012	2006	South	Neolithic	South Q	65	297	2096	ash dump/midden	7001
Zc10	19564	2012	North	Neolithic			489		midden arbitrary layer	10164
Zc11	19564	2012	North	Neolithic			489		midden arbitrary layer	10164
Zc12	13191	2006	4040	Post-Chalcolithic	4040 Post-Chalcolithic		1002	2247	burial fill	6982
Zc13	12654	2006	4040	Neolithic	4040 I		279		midden layer	6702
Zc14	19380	2011	South	Neolithic	South M		470	4098	fill	9672
Zc15	14126	2006	4040	Neolithic	4040 I		279		midden	7075
Zc16	14126	2006	4040	Neolithic	4040 I		280		midden	7075
Zc17	14315	2006	South	Neolithic	South Q	53	257		make up	7160
Zc18	13182	2006	4040	Post-Chalcolithic	4040 Post-Chalcolithic		1002	2245	fill of grave	6927
Zc19	13182	2006	4040	Post-Chalcolithic	4040 Post-Chalcolithic		1002	2245	fill of grave	6927
Zc20	13182	2006	4040	Post-Chalcolithic	4040 Post-Chalcolithic		1002	2245	fill of grave	6927
Zc21	11369	2005	South	Neolithic	South Q		260		midden, room fill	6107
Zc22	19114	2010	South	Neolithic	South P		344		midden layer	9233
Zc23	19114	2010	South	Neolithic	South P		344		midden layer	9233
Zc24	13103	2006	4040	Neolithic	4040 I		279		midden layer	6567
Zc25	13103	2006	4040	Neolithic	4040 I		279		midden layer	6567
Zc26	13151	2006	4040	Neolithic	4040 I		279		scorched layer	6776
Zc27	13151	2006	4040	Neolithic	4040 I		279		scorched layer	6776
Zc28	19245	2011	South	Neolithic	South O	97	365	3520	robber fill	9516
Zc29	19245	2011	South	Neolithic	South O	97	365	3520	robber fill	9516
Zc30	12508	2006	South	Neolithic	South P		132		midden	6747
Zc31	19116	2010	South	Neolithic	South P		344		midden layer	9215
Zc32	12654	2006	4040	Neolithic	4040 I		279		midden layer	6701
Zc33	12654	2006	4040	Neolithic	4040 I		279		midden layer	6701
Zc34	30625	2013	South	Neolithic	South H	118	510		midden layer in SW section	10743
Zc35	18192	2009	South	Neolithic	South P		372		midden	9011
Zc36	18192	2009	South	Neolithic	South P		372		midden	9011
Zc37	18192	2009	South	Neolithic	South P		372		midden	9011
Zc38	11367	2005	South	Neolithic	South Q		260		midden	6060
Zc39	11367	2005	South	Neolithic	South Q		260		midden	6060
Zc40	11367	2005	South	Neolithic	South Q		260		midden	6060

Table 6.6. *Samples selected for ZooMs and microscopic analysis of morphological and metrical criteria.*

There are a range of potential geese species that could be present however *Anser* geese (grey geese) were not identified during ZooMS analysis of the samples, making it unlikely that grey geese comprise much of the eggshell assemblage. This again supports the bone data as the most commonly identified grey geese (White-fronted Goose [*Anser albifrons*] and Lesser White-fronted Goose [*Anser erythropus*]) do not breed in the area today, and the bones did not appear to be large enough to represent Greylag goose (*Anser anser*), which does breed in the area (Russell and McGowan 2005). Further sequencing of the proteins from reference eggshell is needed for other related Anseriformes (such as black geese [*Branta*] and swans). Until then their presence cannot be eliminated using this technique.

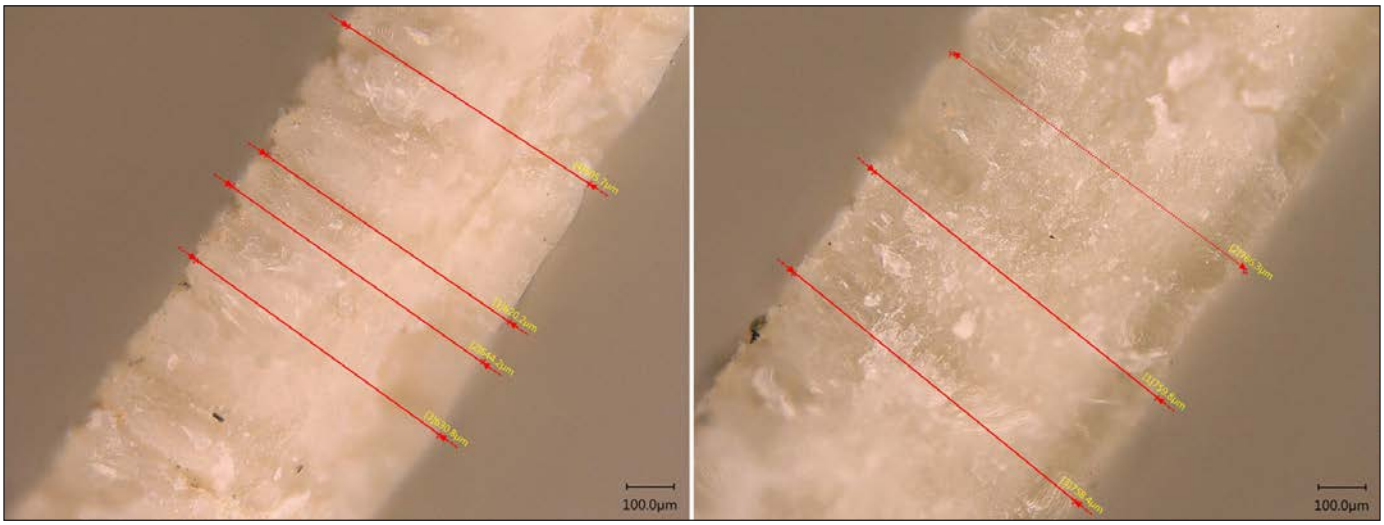


Figure 6.6. *Probable duck eggshell with unusual thickness requiring further exploration (Photos J. Best).*

One of the samples has been identified by mass spectrometry (protein sequencing) as crane. This specimen (Zc34) came from (30625), a Neolithic midden layer. Crane bone has previously been identified in the assemblage in small quantities (Russell and McGowan 2005; Mulville *et al*. 2014).

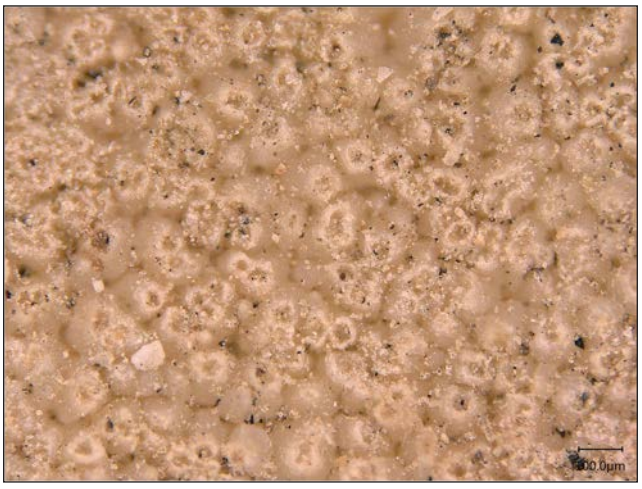


Figure 6.7. *Duck eggshell with evidence of chick development.*

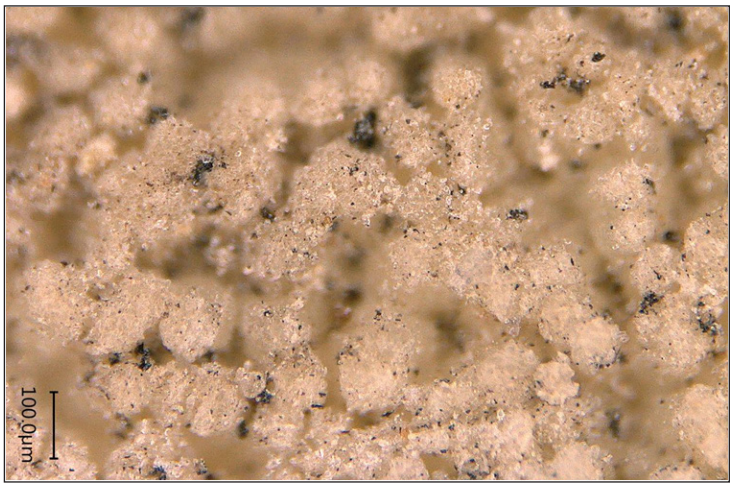


Figure 6.8. *Crane eggshell with no evidence of resorption from chick development.*

Developmental stage

Analysis of internal structure of the eggshell revealed that the majority of the samples analysed were derived from unhatched eggs. Within the Anseriformes a small number of the eggs exhibited the first stages

of resorption caused by the growth of a chick within the egg, demonstrating that these eggs were fertile (Fig. 6.7). At least two of the probable duck samples come from eggs that are very late in the developmental sequence indicating that a small number of live birds may have been hatching in the vicinity of the site. The crane eggshell specimen showed no signs of hatching and was thus from a freshly laid egg (or infertile) (Fig. 6.8).

Summary

In conclusion, this analysis suggests that egg exploitation largely focused on Anseriformes, with a range of duck species represented. There are also potentially geese species present but further work is needed to clarify this. Smaller, but significant contributions were provided by crane. Considering the potentially special and ritual role held by crane at Çatalhöyük this is a valuable find which expands our knowledge of interactions between humans and these birds.

Developmental evidence suggests that the eggs, being largely unhatched, would have provided a valuable food resource, but their role could have ranged from utilisation in pigment production to ritual significance.

The quantity of avian eggshell present at Çatalhöyük could potentially indicate early management of waterfowl which would be of international significance. Due to the scale of the assemblage this work needs to be continued on a larger proportion of material in order to clarify its taxonomic makeup accurately and to fully explore the roles that these different birds may have played. This unique avian assemblage is a prime candidate for further analysis. Continuing developments in the field of ZooMS analysis will allow increased examination of larger numbers of fragments, whilst integration with digital microscopy enables fast, non-destructive analysis of hatching profiles and morphology, and facilitates targeted SEM analysis of smaller subsamples.

Acknowledgements

EPSRC grant EP/I001514/1 *'Hard-Soft Matter Interfaces: from Understanding to Engineering*' funded the mass spectrometry work. Bournemouth University provided facilities for microscopy.

References

Buckley, M., M. Collins, J. Thomas-Oates and J.C. Wilson
2009. Species identification by analysis of bone collagen using matrix-assisted laser desorption/ionisation time-of-flight mass spectrometry. *Rapid Communications in Mass Spectrometry,* 23(23): 3843-3854.

Keepax, C.A.
1981. Avian eggshell from archaeological sites. *Journal of Archaeological Science,* 8: 315-335.

Mulville, J., K. Twiss, J. Wolfhagen, A. Demirergi, H. Foster, J. Daugat, R. Madgwick and J. Jones
2014. Faunal remains. In *Çatalhöyük Archive Report 2014*, http: //bit.ly/catal2014report

Presslee, S., B. Demarchi and M. Collins
In preparation. Identifying taxon-specific peptide markers for archaeological eggshell: a new proteomics approach

Russell, N. and K.J. McGowan
2003. Dance of the cranes: crane symbolism at Çatalhöyük and beyond. *Antiquity,* 77: 445–455.

Russell, N. and K.J. McGowan
2005. The Çatalhöyük bird bones. In *Inhabiting Çatalhöyük: Reports from the 1995-99 Seasons* (Çatalhöyük Research Project Volume 4), ed. I. Hodder. Cambridge: McDonald Institute for Archaeological Research; London: British Institute for Archaeology at Ankara, 33-98.

Sidell, E.J. and C. Scudder
2005. The eggshell from Çatalhöyük: a pilot study. In *Inhabiting Çatalhöyük: Reports from the 1995-99 Seasons* (Çatalhöyük Research Project Volume 4), ed. I. Hodder. Cambridge: McDonald Institute for Archaeological Research; London: British Institute for Archaeology at Ankara, 117-121.

Sidell, J.
1993. *A Methodology for the Identification of Archaeological Eggshell.* Philadelphia, PA : The University Museum of Archaeology and Anthropology.

Stewart, J.R., R.B. Allen, A.K. Jones, K.E. Penkman and M.J. Collins
2013. ZooMS: making eggshell visible in the archaeological record. *Journal of Archaeological Science,* 40(4): 1797-1804.

Ancient DNA

Füsun Özer, Nihan Dilşad Dağtaş, Mehmet Somel, İnci Z. Togan
Middle East Technical University, Ankara, Turkey

At the completion of the 2014 season, 29 sheep samples from the Çatalhöyük Faunal Remains Laboratory were submitted to METU for ancient DNA (aDNA) analysis of sheep (Table 6.7).

Modern sheep exhibit five mitochondrial DNA (mtDNA) haplogroups (HPGs): HPG A - E. HPG A and HPG B are the most common ones today. HPG B is the main HPG present in Europe and HPG A is more frequently reported in Asia. Among the modern sheep of Turkey, all five HPGs are observed and the frequency of HPG B increases from east to west. There is a short segment of mtDNA (144 base pair (bp) long) within which all five mtDNA HPGs can be identified (for a brief review see Demirci *et al.* 2013). Ancient DNA is highly fragmented; therefore to allow Sanger sequencing it is necessary to amplify short fragments and the 144 bp-long mtDNA fragment required for HPG identification is suitable for such studies. There are a range of comparative modern sheep whole genome sequences (described by 50K SNP) available in the literature.

The aim of this study is:

1. To isolate sheep aDNA from Çatalhöyük Neolithic samples.
2. To identify those individuals with relatively high quality aDNA to further undergo next generation sequencing
3. To sequence a short fragment of sheep mtDNA (144 bp-long) by Sanger sequencing
4. To unravel the evolution of sheep in Anatolia on the basis of whole genome sequences (by next generation sequencing) and of mtDNA HPGs (by Sanger sequencing).
5. Results from the Çatalhöyük sheep, combined with evidence from other sites, will contribute to our understanding of migrations of sheep within, to and from Anatolia.

Ancient DNA extraction of 24 samples (samples 1-24) was performed following Rohland *et al.* (2010). The aDNA obtained was amplified using the primers L15391 and H15534 as published in Cai *et al.*'s study (2007).

Eight samples (lab IDs 3, 4, 8, 10, 11, 14, 18 and 21) revealed 144 bp-long aDNA fragments on the gels. Samples with laboratory IDs 4, 8, 18 and 21 were most successful with 144 bp-long bands clearly identified on the gel, whereas samples 3, 10, 11 and 14 showed faint bands of the same length. In order to determine mtDNA HPGs, PCR products of samples 4 and 8 were sent to the Macrogen Company (South Korea) for Sanger sequencing. Unfortunately, the quality of the resulting sequences was low, and it was not possible to identify the HPGs.

All eight samples were exported to Stockholm University by Dr. Füsun Özer for whole genome sequencing. Double stranded DNA libraries were prepared in Dr. Anders Götherström's aDNA laboratory in Stockholm University. These libraries will be sent out for whole genome sequencing upon finding financial support to perform these analyses.

aDNA Lab ID	Çatalhöyük sample number	Description	Hodder Level	aDNA isolation (Y/N)	PCR (Y/N)	NGS (Y/N)
1	2	Tooth and mandible fragment	SM?	Y	Y	N
2	3	Tooth and mandible fragment	SM?	Y	Y	N
3	21	Tooth and mandible fragment	SK?	Y	Y	Y
4	15	Tooth and mandible fragment	SK?	Y	Y	Y
5	14	Tooth and mandible fragment	SK?	Y	Y	N
6	5	Tooth and mandible fragment	SQ	Y	Y	N
7	13	Humerus	SH	Y	Y	N
8	11	Metatarsal	SH	Y	Y	Y
9	13	Tooth and mandible fragment	SG-A	Y	Y	N
10	31	Tooth and mandible fragment	SS	Y	Y	Y
11	30	Tooth and mandible fragment	SS	Y	Y	Y
12	17	Metatarsal	SG-D	Y	Y	N
13	14	Tibia	SG-D	Y	Y	N
14	15	Femur	SG-D	Y	Y	Y
15	16	Radius	SG-D	Y	Y	N
16	1	Tibia	ST	Y	Y	N
17	2	Tibia	ST	Y	Y	N
18	7	Tooth and mandible fragment	SQ	Y	Y	Y
19	4	Cranial fragment, petrous	SQ	Y	Y	N
20	5	Cranial fragment, petrous	SQ	Y	Y	N
21	32	Radius	SP	Y	Y	Y
22	33	Tibia	SP	Y	Y	N
23	5	Tibia	ST	Y	Y	N
24	5	Tooth and mandible fragment	SM?	Y	Y	N
25	3	Tooth and mandible fragment	SP	N		
26	30	Tooth and mandible fragment	SG-B	N		
27	31	Tooth and mandible fragment	SG-B	N		
28	20	Pelvis	SR	N		
29	19	Pelvis	SR	N		

Table 6.7. *Çatalhöyük sheep samples, their identification codes, their states of aDNA isolation, amplification (PCR) and library preparation (NGS column). Y: Yes, N: No.*

Another amplification was carried out with 15 samples (samples 1, 2, 5, 6, 7, 9, 12, 13, 15, 16, 19, 20, 22, 23 and 24) which resulted in three successful amplifications (samples 1, 19 and 20 in Fig. 6.9). The PCR products were then sent to Refgen Company (Turkey) for Sanger sequencing. Subsequently the raw sequence files were analyzed using Geneious 8.1.7 software. These samples derived from a number of phases,

from South, G-D, H, K?, P, Q and S. All these samples were assigned to mtDNA HPG B, as noted above this is the most dominant HPG within Central Anatolia today.

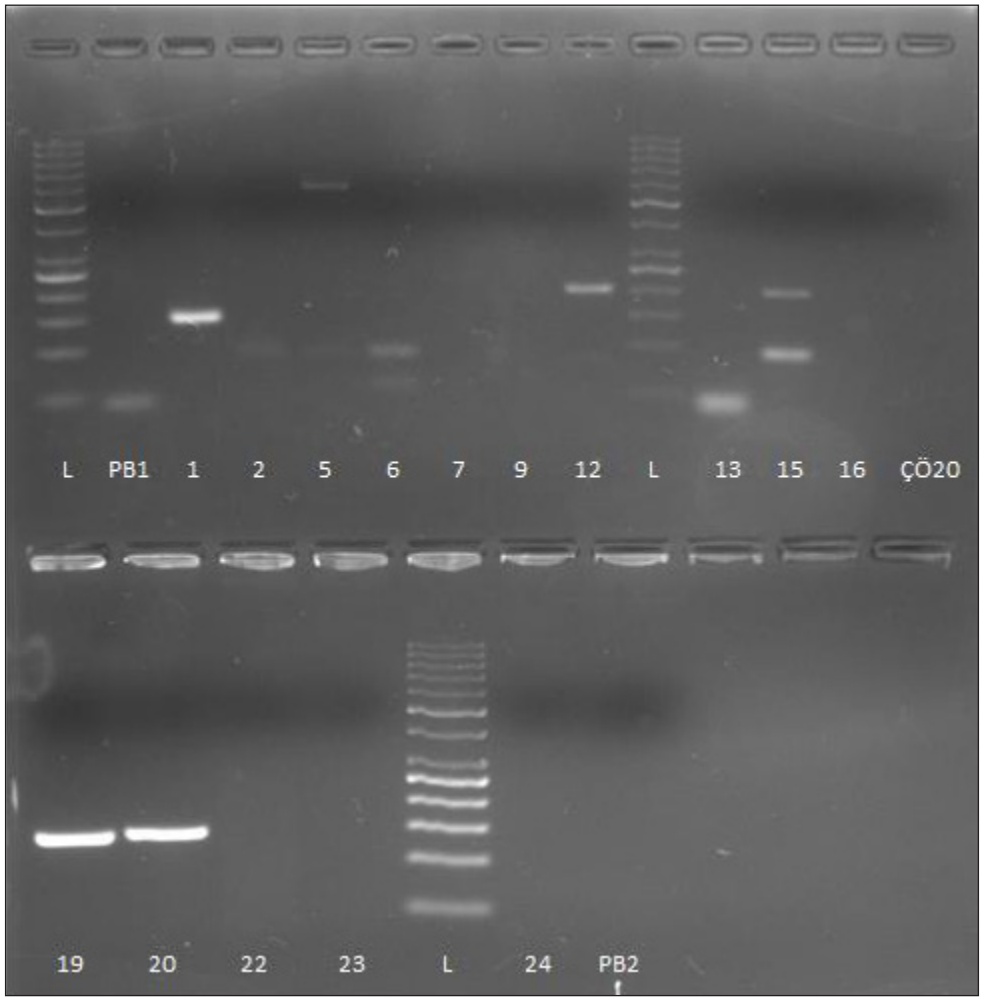


Figure 6.9*. An agarose gel image showing Çatalhöyük sheep PCR products. Numbers from 1 to 24, with leaps, represent sample lab IDs (PB1: PCR blank1, ÇÖ20: sample from another site, PB2: PCR blank2, L: Reference ladder). Here samples 1, 19 and 20 show positive results.*

References

Cai D-W., L. Han, X-L. Zhang, H. Zhou and H. Zhu
2007. DNA analysis of archaeological sheep remains from China. *Journal of Archaeological Science,* 34: 1347-1355.

Demirci S., E. Koban Baştanlar, N.D. Dağtaş, E. Pişkin, A. Engin, F. Özer, E. Yüncü, Ş.A. Doğan and İ. Togan
2013. Mitochondrial DNA diversity of modern, ancient and wild sheep (*Ovis gmelinii anatolica*) from Turkey: new insights on the evolutionary history of sheep. *PLoS ONE,* 8: e81952. 10.1371/journal.pone.0081952: 10.1371/journal.pone.0081952

Rohland N., D. Reich, S. Mallick, M. Meyer, R.E. Green, N.J. Georgiadis, A.L. Roca and M. Hofreiter
2010. Genomic DNA sequences from mastodon and woolly mammoth reveal deep speciation of forest and savanna elephants. *PLoS Biol,* 8: e1000564. 10.1371/journal.pbio.1000564: 10.1371/journal.pbio.1000564.

Chapter 7

Macro- and Micro-Botanical Remains

Amy Bogaard[1], Dorian Q. Fuller[2], Dragana Filipovic[3] and Mike Charles[1]

[1] School of Archaeology, University of Oxford, [2] Institute of Archaeology, University College London,
[3] Institute for Balkan Studies, Serbian Academy of Sciences and Arts

1- Introduction

The aims of this report are to summarise archaeobotanical work and preliminary results from flotation samples processed during the 2015 season, to discuss some significant archaeobotanical contexts encountered, and to assess the archaeobotanical results from recently excavated buildings that we have begun to analyse as key assemblages.

Archaeobotanical research included processing of sediment samples via flotation, preliminary sorting of subsamples from priority units identified by the excavators, and scanning of selected samples from buildings or spaces that have been identified as important for full analysis. The flotation team processed 650 samples from 605 excavation units (*c*.13,306 litres of soil) during the 2015 season (including nine dry-sieved samples from charred grain concentrations); excavations in TPC continued until the end of August, and a small backlog of *c.*40 flotation samples remains to be processed in 2016. As in previous years, the aim was to process 30 litres (where available) from each deposit; the average sample size was *c*.20 litres in 2015.

Use of the Level 1 assessment protocol, implemented in 2005 for all samples (Bogaard *et al.* 2005), was changed this year to reflect a new strategy for the final phase of the project. We have a good grasp of compositional variation among different types of context (Fairbairn *et al*. 2005), and the focus for full macrobotanical analysis is increasingly on high-integrity (primary and secondary) contexts only (Bogaard *et al*. 2013). Though our priorities for full analysis are now largely determined by archaeological context and phase, we still need a scanning system for all samples that will enable us to intercept single-activity residues (e.g. the remains of particular consumption and/or storage events) as well as samples that enable a strategic form of analysis (e.g. of intact animal dung pellets). Level 1 assessment additionally enabled us to track sample composition on the basis of quantitative analysis of a small subsample, and we have continued to use it as a means of selecting samples from certain buildings for further study (see below). This year we devised a new, rapid scanning system applied when each dried flot is sieved (at 4mm, 1mm and 0.3mm). This new 'sieve scan' entails scanning of the 4mm fraction for whole dung pellets, tubers, nuts etc, and of the 1mm fraction (where >50ml in volume) to assess whether or not the sample is dominated by a particular component (cereal grain, pulse, nut etc) and hence potentially from a single-activity residue. The new system allowed us, for example, to identify a pistachio-nut cluster from TPC and fused grain mass from the wall of a bin, also in TPC (Sp.493) (see below). Neither of these was selected as a project priority but they are candidates for full analysis as 'botanical priorities', and the new scanning system will enable use to intercept such cases. Prior to the introduction of the 'sieve scan', 4mm fraction of 200 samples floated in 2015 was assessed using DAFOR scale; afterwards, 359 samples were 'sieve scanned'.

Level 1 assessment was used on select groups of samples representing buildings, in particular B.114 and B.118, so that we could strategically plan the full analysis of these buildings. In terms of Level 1 assessment we sorted a subsample of 30 samples from B.114 and of 14 samples from B.118.

For project priority units we are continuing with Level 2 assessment as set out previously (Bogaard *et al.* 2005); this involves quantitative assessment of major botanical categories in a random subsample of the 4mm and 1mm fractions.

The results of Level 1 and 2 assessment this season expanded on and confirmed previous results: the dominant food plant categories are glume wheats (especially the extinct "new type" or "striate emmeroid", but also standard emmer, one-grain and two-grain einkorn), with widespread evidence of routine dehusking of glume wheat across the site. Free-threshing wheat (bread wheat) and barley are also present, including a range of barley types. Lentil was a common companion crop amongst pulses, although pea, bitter vetch and grasspea remains were identified. Among fruits, after the very common hackberry (*Celtis*), some wild-type *Pistacia,* and occasional acorn (*Quercus*) were also found. Flotation finds of these fruits are reinforced by hand-collected samples by the excavators that are predominantly *Celtis* followed by some large acorn pieces, with more occasional plums and pulses (see §8). Small wild, or weed seeds are dominated by *Bolboschoenus glaucus* sedge nutlets (also known under the old synonym *Scirpus maritimus*), which probably entered the record by a variety of routes, including animal dung burned as fuel. Further discussion below explores some basic quantitative patterns relating to Level 1 analysis of samples from B.114 and B.118.

In addition to Level 1 and 2 assessment, one of us (AB) conducted full identification/quantification of 29 samples from key buildings (B.79, B.80, B.89 and Sp.493), following the protocols outlined in Bogaard *et al.* 2013. Photos were taken of a few problematic weed types for further identification. Analysis of B.80 is now more or less complete, while that of B.79 and Sp.493 is well underway and will be completed through ongoing work by Laura Green (see §9). A series of dirty floors from B.89 were analysed and remaining samples from primary contexts will be completed in future seasons.

Overall, the strategy for full botanical study during the final seasons is emerging, and focuses on full analysis of *in situ* burning contexts from a series of buildings in Level South O (especially B.76, B.79, B.80, B.96, B.97) that provide an opportunity to gain understanding of a 'neighbourhood' comparable to North G; other buildings that provide crucial chronological coverage (such as B.118, B.89, TPC's Sp.493); and completion of B.52 (pre-burning), B.77 (pre-burning), B.113, B.131 and B.132 in the North Area. Below we summarise this season's findings that relate to the 2015 excavations.

2 - Preserved grain stores and other priority contexts in TPC

Naked barley bins

These bins come from the same room (Sp.493) as bins excavated previously in 2013 and appear to have been filled with clean stores of naked barley grains. In some deposits, charred grains were inter-bedded with ashy deposit consisting of pure silificied (phytolith) remains of barley chaff. Full analysis of two units ((22709) and (22713), the latter representing the infill of a partially destroyed bin excavated by Laura Green) yielded potential weed seeds as well as well preserved barley grains. These deposits thus provide key opportunities to isolate the arable weed flora and to assess its ecology (see also §9 below).

Other priority contexts in TPC

These mostly included building fill units of low or very low botanical density and containing a mixture of residue from various activities such as crop processing, food preparation and dung fuel use. Two units had medium and high density and they represent 'burnt fill' above the barley bins in Sp.493 (see above); the fill is most likely post-Neolithic in age but is mixed and includes material from preceding (Neolithic) levels. This may explain the presence of barley grains; also found in the sample are glume wheat and free-threshing

wheat grains. Notable is a relatively high quantity of sedge seeds, tubers and fragments of parenchyma. Ethnographic studies indicate a number of possible uses of sedge stems, leaves and tubers, including as matting material that can be used for lining and/or covering storage containers (e.g. Erkal-Tsetsekos 2006: 85-98).

Suitable material for ^{14}C dating was selected from eleven TPC units. Following the request by the excavators, 1/8 subsamples of 1mm sample fractions from two of the units were fully sorted and quantified; the units are thought to derive from post-Neolithic/Chalcolithic (31351) and Hellenistic levels (22712). The sample from (31351) (Fl. 12173) is a fraction of the deposit recognised as a concentration of charred grain in the fill of Sp.577 and seems to derive from a one-off disposal of burnt material. The sample from (22712) (Fl. 11887) represents fill of a fire-related feature (fire pit?) composed of fine layers of ash with inter-bedding layers of burnt soil; although seemingly intact, mixing with earlier deposits cannot be excluded here since the fire installation does not seem to be in its 'original' location (it is found in a room fill). Both samples are of very high density ((31351) = 912 items per litre sediment; (22712) = 214) and dominated by cereal remains. The range of cereal types is very similar to the Neolithic spectrum at Çatalhöyük and includes one- and two-seeded einkorn, emmer, 'new type' glume wheat, free-threshing wheat and barley (hulled in the Chalcolithic deposit). The Chalcolithic sample is mainly composed of two-seeded einkorn grain, emmer glume bases and (hulled) barley grain. The Hellenistic sample contains a relatively large quantity of 'new type' glume wheat glume bases, followed by emmer and einkorn glume bases; also prominent are einkorn grains (mostly two-seeded type) and grains of wild einkorn/*Triticum boeticum*; in smaller numbers grain of free-threshing wheat, emmer and 'new type' glume wheat were also found; bitter vetch is the only registered pulse crop in this sample. The wild component of the Hellenistic sample is quite abundant and highly diverse, containing some 17 different taxa among which most numerous are seeds of a wild barley type and of medusa grass (*Taeniatherum caput-medusae*), as well as *Bolboschoenus glaucus* nutlets and seed endosperm probably of *Polygonum aviculare* type. These wild types have been known from the Çatalhöyük samples of Neolithic age and, unless their presence in the Hellenistic sample is a result of (post-)depositional mixing of the layers (or bioturbation), they may indicate continuity in the composition of wild/weed flora at the site.

Acknowledgements

TPC archaeobotanical work was financed by the Polish National Science Centre (decision DEC-2012/06/M/H3/00286).

3 - Preserved grain stores in Building 131: 'new type' glume wheat spikelets

The extensive burning that closed Building 131 preserved extensive charred grain clusters, presumably from stores in the building at the time of the fire. These were hand excavated by Amy Bogaard and Lara Gonzalez Carretero, in addition to extensive flotation from associated sediments. Unit (22637) was a *c*.1 litre 'new type' glume wheat cluster near the oven in Sp.500 (Fig. 7.1). Grains were observed to be in 'spikelet articulation' before excavation, and some grain 'pairs' were recovered during excavation (i.e. fused in spikelet formation due to charring). Chaff was underrepresented, probably due to charring conditions. All chaff found was well preserved and represents the 'new type' (also sometimes called "striate emmeroid"). From (22656), in the 'alcove' Sp.556, a large concentration of 'new type' spikelets was found (Fig. 7.2). These are disarticulated spikelets, which were also in evidence as impressions on the floor/lower fill below the cluster. The presence of a human long bone (juvenile femur), visible in Figure 7.2, under this spikelet cluster indicates that it was not a 'normal' storage deposit.

Figure 7.1. *Cluster of 'new type' glume wheat spikelets near to oven in Space 500.*

Fig. 7.2. *Cluster of 'new type' glume wheat spikelets in 'alcove' Space 556.*

4 - Preserved textiles from Building 131 (burial)

The burning of Building 131 led to the baking or partial carbonization of organics including a subplatform burial Sk(22661). The organics in this burial included faecal material (§5) and textile/cordage material. Cordage appeared to be tied around the skeleton and it was found below and above the remains, around the arms. It consisted of thick, rope like cords but composed of many strands of twined yarn. Preliminary observations in the field suggest that these are linen (flax) based on fibre similarities to those previously studied from Building 52 (see 2014 archaeobotanical Archive Report).

5 - Preserved coprolite from Building 131 (burial)

A brown "sediment" found within the pelvis of Sk(22661) appeared to be faecal material partly preserved within the body of this burial. Examination of this at the microscope indicated that it contained one whole stone of hackberry (*Celtis* sp.), and small fragments of bone (the exterior surface and some of the spongy inner surface), and small charred black lumps that resemble starchy food stuffs. This suggests that the final meal of this individual, consumed only some hours before death, included fruit, meat and cooked foodstuffs. It is hoped that further analysis (by SEM) of starch and phytolith extractions will be able to reveal more (see §9).

Figure 7.3. *Cereal ear and straw in building material from Building 52 (Unit 22262, Sample 4).*

6 - Other priority units from 2015

Seventy-six priority units deriving from all four excavation areas were assessed to Level 2 during the season. Priorities from Building 52 included more impressions of whole cereal ears and other plant parts in building materials, including in the matrix and on surfaces of the building (Fig. 7.3). Their occurrence supports the idea from previous analysis of burned mudbricks (Bogaard *et al.* 2008) that building materials were prepared in off-site locations adjacent to threshing/primary crop processing areas, likely on a seasonal basis A dirty floor (22287) from this building yielded a high number of glume wheat glume bases, probably from dehusking events that took place nearby.

The largest number of priority units came from Building 89 and they included dirty floors, hearths, bin fill, pit/cut fills and a burial fill. Whereas the majority of the units were of very low density or completely devoid of seed/fruit material, several dirty floor units produced abundant evidence of dehusking in the form of large number of glume wheat glume bases (from around 100 to more than 500) accompanied by small amounts of inclusions such as cereal grain and sedge seeds, seeds of some other wild seed and an occasional pulse. In contrast to the abundances of glume wheat glume bases, the number of wild seeds other

than Cyperaceae is very low in these samples. Several dirty floor deposits from Building 80 were prioritised for the specialists' analysis; in an archaeobotanical sense they were all very poor. The richest samples originate from Sp.489 and Sp.490 – the middens located between Building 52 and Building 131. They contain a lot of wood charcoal fragments, hundreds of glume wheat glume bases, and little cereal grain; some also have significant quantities of fruit/nut remains and wild seeds. It has already been observed that, besides pure concentrations of charred plant material, middens display the highest botanical density (Fairbairn *et al.* 2005; Bogaard *et al.* 2013; Filipovic 2014). Two other priority units had 'midden-like' composition and perhaps represent re-used midden material: burial fill (21634) in Building 77 and mortar unit (20892) in a wall of Sp.558.

7 - Assessing whole building assemblages using Level 1 protocol: Buildings 114 and 118

As indicated above, our strategy has shifted towards high integrity contexts and/or groups of related contexts of inherent archaeological interest, such as those relating to the life history of particular buildings. We therefore completed Level 1 scanning on the available, previously unstudied samples from Building 114 (Level North G) and Building 118 (Level South H). We are now in a position to assess overall patterning through the sequences of these buildings and to compare across contexts, in order to strategically target samples for full analysis in future study seasons.

Building 114 (Level North G) is a small, single rectangular room, with considerable evidence relating to activities in terms of burials, three ovens or cooking areas, and replastering and remodelling. Excavations of this building closed in 2015. Seventy-two flotation samples from this building have been assessed, representing 1090 litres of floated sediment, with 68 having Level 1 scanning and four priority units with Level 2 scanning, producing a total of ~6,200 identified plant remains. When multiplied up to account for subsample fractions, this represents an estimated 43,476 plant macro-remains from this building, and average of over ~39 items per litre. However, these varied widely from low-density samples like brick and wall plaster samples (ave 0.4 items/L, *n*=3), to moderate/low density samples like floor and make-up samples (ave 15 items/L, *n*=31), "average" density samples in various infill samples (ave: 35 items/L, *n*=23) and most hearth or oven fills or clean-outs (ave: 31 items/L, *n*=11). Two contexts had extremely high densities, including the first oven infill (21169) (196 items/L) and a burned dump (20488) (891 items/Litre). A single sample of burial infill (21527) has a lower density (8.5 items/L). Most samples from this house were markedly low in cereal processing waste, with glume bases recorded from only 18% samples, despite grain being present in the most samples (97%). Dung fuel is also rare or absent with dung fragments noted from three samples and sedge nutlets recorded in another three. This makes it unusual in comparison to the majority of domestic and midden contexts across the site, and remarkably low in routine dehusking waste. Instead, most samples consist of food grains (glume wheat, then barley and free-threshing wheat). Bitter vetch was found in 70% of samples, while other pulses were rare but included lentil, pea and chickpea. The burial fill was rich in cereal grains and free-threshing chaff (barley and naked wheat), bitter vetch and *Celtis*, but lacked glume-bases.

Building 118 is a larger, more typical Çatalhöyük building in the lower part of the South Area (Level South H). Excavations of this building continued in 2015 and have not yet finished, but altogether 38 flotation samples from this building have been assessed to Level 1 and 7 priority samples to Level 2, with a total of *c*.4,210 identified plant remains from Level 1 scanning or Level 2 priority scanning, so there is sufficient data to provide some preliminary comments.

8 - Assessment of organic finds not floated (2015)

Not all archaeobotanical remains pass through flotation, and especially larger more obvious items are tagged and logged with finds. These are then catalogued and placed in OR (Organics crates). An effort has been made to assess and identify these. Table 7.1 presents a catalogue of seeds/macrobotanicals from crate OR11.

Unit	Area	Date excavated	Sample no.	Taxonomic identification	Comments
22221	North	22/7/2015	s9	*Bolboschoenus glaucus* tuber	Sedge tuber, complete, charred
22659	North	21/7/2015	'botanical material'	*Pisum sativum* x4	4 peas. Photographed
22765	TPC	20/7/2015	s5	Tuber fragment, cf. *Bolboschoenus*	
21661	North	13/7/2015	H.P. "seed"	*Bolboschoenus glaucus* tubers, x2	
21661	North	7/7/2015	D.S.	*Celtis* sp., fruit stone, fragments x9	MNI=2
21659	North	4/7/2015	D.S. "seeds"	*Celtis* sp. stone x1, *Bolboschoenus glaucus* tuber x1	
22310	South	1/7/2015	"plant, seeds"	*Celtis* sp., stone x2	
21660		5/7/2015	D.S. "seeds"	*Celtis* sp., stone x7	
22225	North	6/7/2015	"seed"	*Celtis* sp., stone x1	
22221	North	21/7/2015	s8	*Bolboschoenus glaucus* tuber x1	Split in two; large, 14mm diameter
22238	North	19/7/2015	x3	*Bolboschoenus glaucus* tuber x1	15 mm diameter
19886	South, B.89	21/7/2015	HS "seeds"	*Celtis* sp., stone fragment, x1	Also 1 small bone piece (phalanx) removed and sent to Osteology
21799	South	25/7/2015	s3	*Triticum monococcum* (2- grain) x 1; *Hordeum vulgare*, twisted grain x 1; Cereal frag. indet. x 1;5 pc wood charcoal	
22635	North	18/7/2015	"seeds from immediately on floor"	*Triticum dicoccum* x 10	Complete grains (*n*=5) appear to be true emmer
22713	TPC	11/7/2015	7		Looks like burnt clay. No seeds.
20827	South	23/7/2013	s3	cf. *Phragmites*	Clay with impressions of reed
21688	North	26/7/2015	s11		Dung and bone
21655	North	4/7/2015	HP botanical	*Bolboschoenus glaucus* tuber	

***Table 7.1**. Catalogue of seeds/macrobotanicals from crate OR11.*

9 - Doctoral research projects

There are presently four doctoral research projects on Çatalhöyük archaeobotany. **Elizabeth Stroud** is completing her D.Phil in Oxford on the archaeobotany of the West Mound. **Petra Vaiglova**, University of Oxford, is in the final stages of stable isotope analysis of archaeobotanical material to reconstruct the nature of agricultural management in early farming contexts, including material from Çatalhöyük. **Laura Green** is continuing a D.Phil in Oxford with a focus on arable ecology and weed flora from the East Mound, as well as other early farming sites in western Asia; she started in Oct. 2013. **Lara Gonzalez Carretero** started her PhD at UCL in October 2013 on the origins of bread culture, with a focus on studying cereal processing and processed cereal products from Çatalhöyük and the extent to which any changes in the practices of cooking/baking can be reconstructed through the sequence.

10 - Concluding remarks

The overall picture of archaeobotanical evidence at Çatalhöyük continues to be consistent. Glume wheat, processed routinely from storage as spikelets, was commonplace and contributes to the charred material in almost all contexts. In some contexts this is accompanied by other indicators of crop processing or food preparation waste, most often as cereals; wild foods are far less common, but a range of wild foods was also used. We also know that, despite a diversity of wheat types (one and two-grained einkorn, emmer, as well as bread wheat), the 'new type' wheat (a glumed tetraploid) often appears to be more common than other types.

Nevertheless, integration of datasets from previous phases of work (e.g. Fairbairn *et al.* 2005; Bogaard *et al.* 2013; Filipovic 2014) has begun to reveal clear shifts in the predominance of specific cereals and pulses through time (Bogaard *et al.* in prep). Thus the consistent taphonomic picture and general composition of samples and house assemblages forms the backdrop to shifts and innovations in crop use by Çatalhöyük farmers over the millennium-long occupation of the East mound. Full analysis of key buildings and phases from the final years of excavation will be crucial to refine understanding of these patterns. We are also undertaking targeted work to improve understanding of the domestic status of the 'new type'; as previously observed (Bogaard *et al*. 2013: 96), the disarticulation scar of these spikelet forks is sometimes 'smooth', and forks often remain attached to their lower rachis segment. Was this cereal taxon under domestication at Çatalhöyük, in contrast to the [fully domestic] Levantine cereals einkorn and emmer?

References

Bogaard, A., M. Charles, M. Ergun, G. Jones, K. Ng, M. Polcyn and N. Stone
2005. Macro-botanical remains. In *Çatalhöyük Archive Report 2005*, http: //www.catalhoyuk.com/archive_reports/2005/ar05_13.html

Bogaard, A., M. Charles, M. Ergun, F. Ertuğ and D. Filipovic
2008. Macro-botanical remains. In *Çatalhöyük Archive Report 2008*, http: //www.catalhoyuk.com/archive_reports/2005/ar05_13.html

Bogaard, A., M. Charles, A. Livarda, M. Ergun, D. Filipovic and G. Jones
2013. The archaeobotany of mid-later Neolithic occupation levels at Çatalhöyük. In *Humans and Landscapes of Çatalhöyük: Reports from the 2000-2008 Seasons* (Çatalhöyük Research Project Volume 8), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 93-128.

Erkal-Tsetsekos, A.
2006. *The Ethnobotany of Wild Food Plant Use in the Konya Basin: A Quantitative and Ethnoarchaeological Approach*. Unpublished master thesis. Graduate School of Natural and Applied Sciences of Middle East Technical University, Ankara, Turkey.

Fairbairn, A., J. Near and D. Martinoli

2005. Macrobotanical investigation of the North, South and KOPAL Area excavations at Çatalhöyük East. In *Inhabiting Çatalhöyük: Reports from the 1995-1999 Seasons* (Çatalhöyük Research Project Volume 4), ed. I. Hodder. Cambridge: McDonald Institute Monographs; London: British Institute of Archaeology at Ankara, 137-201.

Filipovic, D.

2014. *Early Farming in Central Anatolia - An Archaeobotanical Study of Crop Husbandry, Animal Diet and Land Use at Neolithic Çatalhöyük*. Oxford: BAR Archaeopress.

Chapter 8

Phytoliths

Marco Madella, Carla Lancelotti, Abel Ruiz-Giralt, Judit Barastegui and Juan José García-Granero

Universitat Pompeu Fabra (Barcelona)

From June 24th to August 5th 2015, five members of the phytolith team were present on site. A total of over 700 samples were collected, 60% of which are going to be exported for full analysis.

The main work for this field season has consisted in:

- Fast-track priority unit analysis (*c.*60): units identified as priority during excavation were quickly scanned under the microscope to provide fast feedback on phytoliths content. Some of these units were then exported, according to the results of this first assessment for full study.
- Quick scanning of plant-related contexts and concentration of phytoliths (*c*.65): samples coming form contexts related to plant activity or particularly interesting for phytolith analysis (concentration of pure phytoliths) were quickly scanned at the microscope and some of them exported for full analysis. These samples included seeds concentrations, bins, burial infill, baskets and other burial deposition practices. Sub-sampling of archive material of important contexts, related to domestic and ritual practices: *c*.1,400 samples coming from fire structure, middens, dirty floors, floors and makeups and burials have been selected for exporting.
- Sampling of grinding tools and pottery for starch and phytolith analysis (*N*=10): these were all exported in the form of dry and wet sediment and control samples to check for contamination (total of 89 samples).
- Grid sampling of floor surfaces for spatial analysis: samples of in phase floors were collected in a 50x50cm grid to be analysed spatially for phytolith, starch and geochemical contents in order to identify possible activity areas inside buildings. Four buildings were sampled (Buildings 52, 80, 89 and 131) for a total of 42 floor surfaces and a total of 364 samples.
- Database reconstruction and systematisation: with the help of Dominik Lukas we modified both the sample register and the field and full analysis reports so that the phytolith database is now fully integrated with the general database of the excavation.

Micro-remains finds of 2015 (1): plants in burial contexts at Çatalhöyük

During July 2015 the micro-botanical remains team analyzed several samples coming form matting and baskets in burials. Some of the most interesting finds come from B.77/B.132 where it seems basket were woven using two different type of plants: one for the internal structure (reeds culms, tough and resistant) and the other for the outer coiling (e.g. rushes, more flexible).

Building 114 also presented interesting burial fills. Unit (21527) was exceptionally rich, presenting high concentrations of wheat/barley type cereal chaff, some of which showed the typical threshing-sledge marks indicating intentional deposition of de-husking byproducts in the pit (Fig. 8.1).

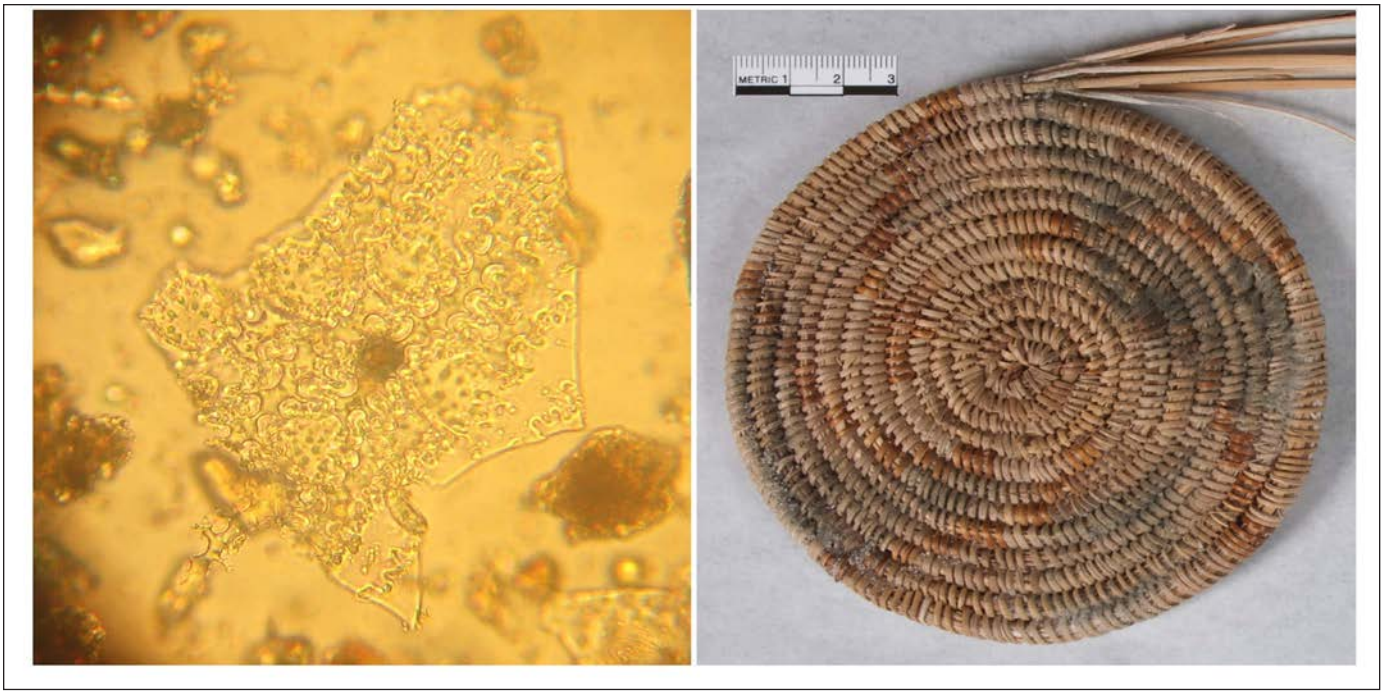


Figure 8.1. *Cereal husk silica skeleton with presence of possible threshing sledge cut-marks (left) and an example of how the baskets could have been woven (right).*

Figure 8.2. *Burial in B.17 showing the wooden plank.*

Building 17 (22517) provided one of the most interesting context so far, where a skeleton was found laying on a wooden plank (Fig. 8.2), covered by a layer of reed culms and leaves. Nearby the skull area an extremely high concentration of broad leaves' phytoliths was also encountered, indicating perhaps the presence of a pillow. Deciduous leaves were also present in other parts of the body but in a much lower concentration (and more than one species present). The sample collected near the wall of the showed some traces of cereal chaff (wheat/barley type) possibly indicating rests of a food offering. On the sternum, rests of twisted fibers are possibly the remains of cloth in which the body was wrapped.

Micro-remains finds of 2015 (2): storage practices in TPC

In a small space in Building 122 (Sp.493) several storage bins (Fig. 8.3) were found that held one of the highest volume of pure phytolith remain. About 40 liters of pure phytoliths were recovered in (31312), and a similar situation occurred in (30831). A high number of barley and wheat grains were recovered from this space in the past and the majority of the phytoliths from the bins do indeed belong to wheat and barley chaff. However, at least other four types of plant tissues were encountered (some shown in Figure 8.4) in-

dicating that more than just these two cereals were stored here. No charred seeds were found in the two bin fill that, however, contained a polisher and other stone tools and animal bones.

Figure 8.3. *Storage bins in Building 122.*

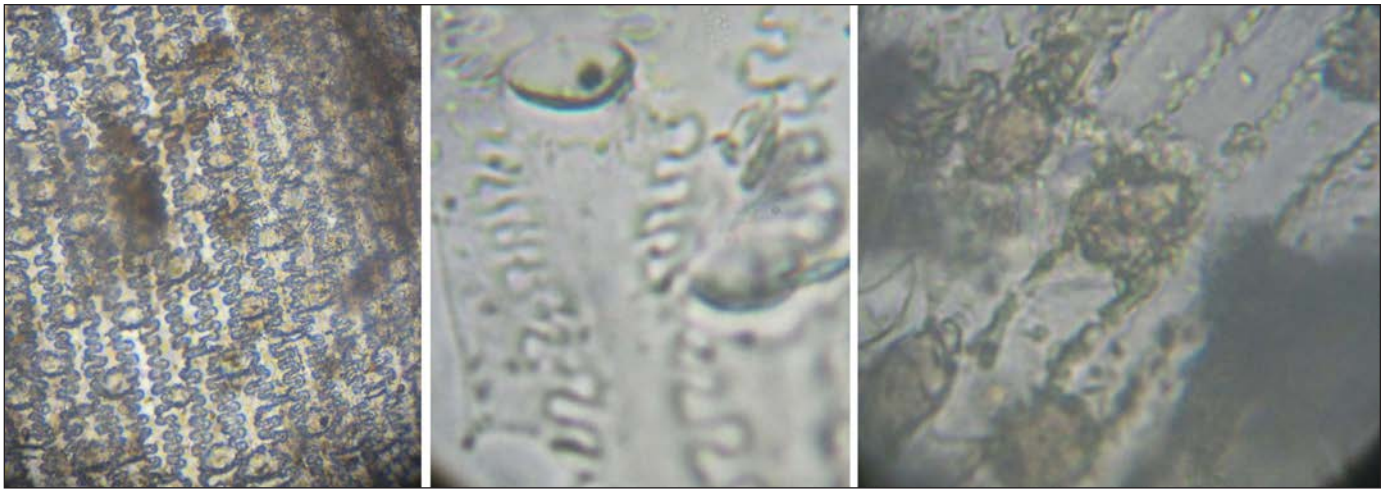


Figure 8.4. *Different type of plant tissues recovered from the bins.*

List and preliminary results of the onsite quick-scanning of priority units

CH2015 South Area unit 21755.s1 phytoliths (HP) – it does not seem to have much phytoliths

CH2015 TPC Area unit 21094.s3 phytoliths (GNT) – several grass phytoliths mostly culms (LC + trichomes) and very few from inflorescence [macros seem typical of dirty floor (21914)]

CH2105 South Area unit 21923.s3 phytoliths (GB) – several grass phytoliths mostly culms (LC + trichomes) and very few from inflorescence. Some silica skeletons of cereals.

CH2015 South Area unit 21924.s3 (GB) – more phytoliths, abundant silica skeletons seem cereals but need to check for reed leaf.

CH 2015 South Area unit 21925.s3 phytoliths (GB) – less phytoliths especially less silica skeletons than sample before. Did not see any possible cereals.

CH2015 South Area unit 21754.s3 phytoliths (KA HP) – few phytoliths many microcharcoals.

CH2015 TPC Area unit 21095.s3 phytoliths (BNT) – some phytoliths but not particularly rich.

CH2015 South Area unit 21926.s3 phytoliths (GB) – interesting mix LC from both culm and inflorescence but also very thin and long ones and some epidermis with elongate psilate.

CH2015 South Area unit 21927.s3 phytoliths (GB) – some phytoliths but not many, mostly elongate psilate no inflorescence. Few silica skeletons mostly elongate psilate.

CH2015 South Area unit 22506 (not exc.) S x2 phytoliths (EJ) – Several grass phytolith nothing special. Not much.

CH2015 North Area unit 21634.s3 (B.77) phytoliths (MM) – this is the matting covering a body. It is incredibly well-preserved and it is still possible to se a matting plaited pattern whitish/yellowish in colour. Under 400x magnification there are elongated “strands” similar to elongated cells but which do not disappear under cross polarised light. Maybe because they still have organic matter attached? Other that seem spiny but not exactly typical spiny. Have idea of organic matter. The matting is very fine wire with the single strand *c*.2/3mm and I wonder whether it was more like a rough textile. Left some in bleach to look at tomorrow morning. It has similarity with a sample form 2007 (13386). After 12 hours in bleach it is more clear that they are elongated cells from culm, *Juncus* or similar.

CH2015 TPC Area unit 22713.s2 phytoliths (LG) – Some phytoliths but difficult to see because of the very dark sediment. Mostly elongated cells form culm/leave but do not see bulliforms. Very very few echinates long cells.

CH2015 South Area unit 20890.s3 phytoliths (SE) – Some phytoliths, same problems as the sample above, and same assemblage. No inflorescence phytoliths.

CH2015 South Area unit 20890.s4 phytoliths (SE) – even if this has the same unit number as the sample above it probably come form a different spot. It is clearly rich in organic residues in the form of grey flocks. Under the microscope it shows abundant echinates and dendritics. It could be a deposit of chaff, probably very localised.

CH2015 TPC Area unit 22739.s3 phytoliths (PH) - Almost sterile, some very elongated cells phytoliths with pointed endings (probably not grasses). One or two *Phragmites* leaf silica skeletons.

CH2015 South Area unit 21928.s3 phytoliths (EB) B.89 - Not particularly rich, some long cells, one possible

Phragmites bulliform.

CH2015 South Area unit 21772.s2 phytoliths (MD)- Not particularly rich, almost sterile – some long cells, nothing characteristic.

CH2015 South Area unit 21772.s6 phytoliths (MD) - This sample is very rich, mostly culm/leaf phytoliths from grasses. I do not think there is phragmites – could be a wild grass but must have done processing for producing the rope so to eliminate most of the leaves. There are quite a lot of hairs and trichomes. Photos leaf + hair + leaf/culm with hair (possible *Phragmites*).

CH2015 South Area unit 21634.s8 phytoliths (MM) - This is a subsample of s8. This is xx phytoliths from a basket (lid? bottom?). Interestingly, there seem to be two different types of silica skeletons, one typical *Phragmites* culm (photo), the other thin elongated long cells again from some kind of culm. Probably the basket was made using two different materials, one for the core (*Phragmites*) and one for the outside (more flexible culms, ex *Juncus*).

CH2015 TPC Area unit 21094.s3 phytoliths (ENT)- Very poor, almost sterile – a few bulliform and long cells, no skeletons.

CH2015 South Area unit 21949.s3 phytoliths (EB) - Almost sterile, very very few elongate dendritics/psilate.

CH2015 South Area unit 21787.s2 (KR) - Some white stuff attached to a big lump of sediment – not phytoliths probably calcium carbonate from combustion. Absolutely no phytoliths in the loose sediment included in the same sample bag.

CH2015 North Area unit 21677.s6 – organic material basket from a foetal burial - Quite a few phytoliths mainly elongate psilate (some also in anatomical connection), very thin, which might indicate *Juncus* culms rather than leaves. Occasionally some phragmites culms but not very common. Probably the basket was made of some species of rushes (*Juncus*).

CH2015 North Area unit 21677.s7 – organic material within basket. - Almost sterile. A couple of very small silica skeletons of sinuate elongate cells (leaf) not *Phragmites* and a couple of bulliforms. Leaves but nothing diagnostic.

CH2015 North Area unit 21677.s8 – organic material within basket (I think this is the basket). A small fragments that present two layers (one very white and one orangish). The white part is very rich (almost pure phytoliths). Again it seems formed of two different types of elongated cells, the long thin that we associate to *Juncus* and the *Phragmites* culms. Possibly a similar situation to (21634). Short cells are very few and mostly saddle and trapeziforms. The orange part probably represents just the impression of the basket without the white layer. It still has a lot of phytoliths compared with many other samples even if they are less than those of the white layer. Interestingly the juncus/stipa type are more abundant and the *Phragmites* really less, which would substantiate the hypothesis of the basket being made of internal *Phragmites* and external coils of *Juncus*/*Stipa*. Same house, different burials same basketry technique.

CH2015 North Area unit 22655.s1 (MM) – organic material attached to a bone. Very few phytoliths, we mounted three slides to see anything. On the third slide we found a couple of silica skeletons, one too dirty to see what it was, the other a dicot wood with epidermal cells (polyhedral) and possibly one hair. It might be coming from the internal bark and might represent a fibrous rope?? Too little evidence to conclude anything substantial.

CH2015 South Area unit 21749.s2 (VR) - Almost sterile – few elongate psilate and echinates, basically background noise.

CH2015 South Area unit 21945.s3 (GR) - Some phytoliths, not very rich, basically background noise.

CH2015 South Area unit 21946.s3 (CHM) - This is richer than (21945) – a mix of phytoliths, elongate psilate, echinates, dendritics but it might be the result of filling the bin with general sediment rather than intentional deposition of plants.

CH2015 South Area unit 21948.s3 (CHM) - Similar to (21945).

CH2015 North Area unit 22635.s2 (AJM) - Room fill of B.131. Almost sterile, a few elongate psilate but nothing diagnostic.

CH2015 North Area unit 22638.s7 (MM)- Ashy fill of the small room of B.131 that was full of carbonised new glume wheat seeds. This is an extremely rich sample, almost only silica skeletons of cereals (C3- photo). Mostly inflorescence but some leaves as well (no culms). Some Cyperaceae phytoliths (photo) but very few. Some phytolith partially melted (photo) indicating pockets of very high temperature but in general temperature quite low as the number of possible burnt phytoliths is very low. This seems to be a deposit of grains stored in their chaff but quite clean (a few first stage crop processing remains but just impurities). Some of he few leaf skeletons seem to have threshing sledge cut patterns.

CH2015 North Area unit 22656.s3 (LGC) - Unit of the burnt seeds. Same assemblage that (22638) some burnt phytoliths (photo).

CH2015 North Area unit 22656.s4 (LGC) - Similar assemblage to s3, a few burnt phytoliths, some *Phragmites* (photo), some threshing marks on the few culms (photo).

CH2015 North Area unit 22656.s6 (LGC) - Similar assemblage, much less phytoliths

CH2015 North Area unit 22656.s8 (LGC) - This sample is much lighter and orangish in colour. Phytolith assemblage is similar to the other samples of this unit, mostly silica skeletons of C3 inflorescence and a few culms. Very abundant freshwater sponge spiculae indicating wet sediment was part of this sample's formation.

CH2015 North Area unit 22656.s9 (LGC) - Same assemblage as the rest of the unit, lower concentration similar to s6.

CH2015 North Area unit 22248.s3 - This is a plaster cavity in the floor (the plaster of the floor continues down in this small cavity that when we sampled B.52 seemed like a rubified circular spot on the floor). Almost no phytoliths, a couple of cereal bulliforms and elongate psilate indicating maybe that some leaves were present but unintentional deposition.

CH2015 North Area unit 22271.s3, F.7765- Was interpreted as a posthole but it might have been a fire-related feature as there was a nice spilling of ash next to it on the floor and there are phytoliths in it, mainly chaff (elongate echinates). Exporting to get a proper look.

CH2015 TPC Area unit 22762.s2 (TA) – A few silica skeletons of grass chaff (possibly C3 cereals). However too few to be considered intentional deposition. Almost no single cells and the few that are present are elongate psilate.

CH2015 TPC Area unit 22765.s3 (PH) - Possible floor in connection to one excavated last year and dated to the Neolithic. Sterile, a few bits of plant tissue but nothing recognisable.

CH205 TPC Area unit 22765.s4 (PH) – phytoliths outside plaster - One silica skeleton of elongate dendritics possible chaff from C3 cereal (photo), plus one that might be burned. A few microcharcoal and wood tissue.

CH2015 South Area unit 21950.s3 phytoliths (EB) - This is a dirty floor with quite a few single cells elongate psilate (grass culms) but no silica skeletons. Also, a few sponge spiculae, which imply the use of waterlogged sediment, maybe related to the culms? (culms of reed/sedges?).

CH2015 South Area unit 21952.s3 phytoliths (GB) - Reverse of (21950), quite a few inflorescence and a few elongate psilate. The inflorescence seem like C3 cereal type though difficult to say as there are no silica skeletons. This goes in accordance with macrobotanical findings that highlight abundance of barley spikelets in this sample.

CH2015 South Area unit 21954.s3 phytoliths (GB) - Similar to (21952) but with lower concentration.

CH2015 South Area unit (21790) phytoliths (KA) - Almost sterile, a few elongate psilate and elongate echinates but just background noise.

CH2015 South Area unit 22512.s3 phytoliths (JL) - One cereal chaff silica skeleton (photo), almost sterile no phytoliths.

CH2015 South Area unit 22513.s3 phytoliths (FC) - *Phragmites* bulliform? (photo). A few hairs and trichomes with big dimensions (dicot?), and hair bases (photo). Also some globular psilate (photo). Considering that wood produces very few phytoliths (up to 20 times less than grasses), I am quite confident that there was some wood ash involved in the formation of this sample.

CH2015 South Area unit 22515.s3 phytoliths (FC) - Sterile.

CH2015 North Area unit 22650.s3 phytoliths (PC) – pit fill. Quite a few phytoliths, all grass leaf morphotypes (elongate psilate and bulliforms). If this is in phase with (22638)/(22656) this could be the deposition of first stage crop-processing of the glume wheat found charred in the small room of the building.

CH2015 South Area unit 21956.s3 phytoliths (CMM) – infill of ovoid pit. A couple of bulliforms of grass leaves but nothing diagnostic.

CH2015 South Area unit 21957.s3 phytoliths (CMM) – dirty floor. Almost sterile, one bulliform, one *Phragmites* leaf. Nothing conclusive.

CH2015 South Area unit 21959.s3 phytoliths (CMM) – infill of hearth. Moderately abundant phytoliths, all elongate psilate, even some silica skeletons. A few short cells trilobate and trapeziforms with sinuate base. C3 straw – possible use of dung as fuel?

CH2015 South Area unit 22326.s3 phytoliths (KPJ) – floor surface + makeup. Almost sterile, a few elongate psilate, no silica skeletons – nothing diagnostic.

CH2015 South Area unit 21797.s2 - Sample almost empty. One silica skeleton of cereal chaff.

CH2015 North Area unit 22642.s44 – plastered floor. Moderately rich in phytoliths, with lots of silica skeletons of very different things: cereal chaff and straw, *Phragmites* sp., wood, etc. It looks like a mix of all the activities that were taking place in the house. These are great news for the spatial analysis that we have been doing since we can expect positive results.

CH2015 North Area unit 22642.s46 – plastered floor. Phytoliths moderately abundant. Many silica skeletons and lots of elongate psilate (straw?).

CH2015 North Area unit 22668 S2 – hearth floor. Abundant phytoliths. Lots of silica skeletons, mostly *Phragmites* sp., culms and cereal chaff.

CH2015 South Area unit 21964.s3 – pit infill (very ashy). Moderately abundant phytoliths, mostly small silica skeletons of cereal chaff (barley/wheat type) but also some big skeletons and a few elongate psilate single cells. Possible residue of dung burning.

CH2015 South Area unit 21969.s3 – dirty floor. A few elongate psilate but nothing else.

CH2015 South Area unit 21972.s3 – rim of hearth. Same as (21969). One slighter burnt silica skeleton of (possible) barley chaff.

CH2015 South Area unit 21973.s3 – dirty floor. Very low concentration of phytoliths but interestingly, all seem to be from monocots leaves (grasses): broad elongate psilate + stomata. It is difficult to find a good explanation for this.

CH2015 South Area unit 21799.s2 – laminated plaster + makeup of a floor with seeds impressions. Very low concentration: a few chaff elongate echinates, but nothing conclusive.

CH2015 South Area unit 21799.s5 – laminated plaster + makeup of a floor with seeds impressions. Very low concentration. Mostly elongate psilate from grass leaves, but nothing conclusive.

CH2015 South Area unit 22400.s2 – ashy layer. Almost sterile. A couple of elongate psilate and *Phragmites* sp. leaves but nothing conclusive.

CH2015 South Area unit 22402.s2 – laminated hearth floor. Sterile.

CH2015 North Area unit 22672 S2 – plastered floor of hearth. Extremely low concentration of phytoliths. A few elongate but nothing conclusive.

CH2015 GDN unit 22833.s3 – roof impressions. RIGHT STRAND: Phytoliths very abundant. Lots of silica skeletons: some of *Phragmites* sp. culms, but the majority is from elongate dendritics that are usually associated with chaff of C3 cereals. Unlikely for a roof, further analysis is required. LEFT STRAND: Almost sterile. A couple of elongate psilate. It could be a mix of wood and reeds.

CH2015 TPC unit 30831.s5 – bin F.7196. Extremely abundant sample with at least four different types of silica skeletons. One possibly wheat/barley type and one *Phragmites* sp. leaf. The other two would required further analysis whether using a comparative reference collection or morphology to be correctly identified.

CH2015 TPC unit 31321.s3 – floor. Almost sterile. One elongate psilate and a couple of elongate echinates but nothing conclusive.

CH2015 South Area unit 22406.s4 – dirty floor of storage room. Very abundant phytoliths, lots of silica skeletons of, mostly, wheat/barley chaff. Some with signs of threshing, other with pounding marks. There is also some leaves of *Phragmites* and leaves of another unidentified species of grass. Storage of grains and some de-husking activities.

CH2015 South Area unit 22407.s2 – burnt layer of platform F.3437. Almost sterile. A small silica skeleton from an unidentified leaf, but nothing conclusive.

CH2015 South Area unit 21746.s4 – burnt layer of platform F.3437. Sterile. One fragment of elongate echinate and one hair. Nothing conclusive.

CH2015 South Area unit 31600.s3 – Sp.565 patchy floor. Sterile. Just one small silica skeleton of *Phragmites* sp. leaf.

CH2015 South Area unit 22332.s3 – midden below (22326). Low concentration of phytoliths. Mix of cereal

chaff and reed leefs. Also some cereal culms in small silica skeletons. It is a typical midden with a bit of everything though concentration is modest.

CH2015 North Area unit 22295.s3 – mortar. Almost sterile – a couple of dicot wood (one globular psilate, one vascular system) – no grasses.

CH2015 TPC unit 31331.s3 – rubble. Very low concentration of phytoliths – some elongate echinates also in small silica skeletons but they can come form anywhere and are not abundant enough to be considered intentional deposition.

CH2015 South Area unit 21980 – dirty floor. Extremely low concentration of phytoliths – a mix of everything: chaff, culms, *Phragmites* and broad leaves phytoliths. Typical dirty floor.

CH2015 North Area unit 21692.s2 phytoliths (DE) – midden-like deposit inside B.132. Not very rich but moderate presence of phytoliths, mostly all elongate psilate or *Phragmites* leaves; some small silica skeletons of chaff and a few of what seem to be dicot phytoliths (photo of very long transport tissue?).

CH2015 North Area unit 31537.s2 phytoliths (AK) – mortar hip? Even lower concentration than the previous one but essentially the same assemblage. However, this seem to have more micro-charcoal and maybe some partially melted phytoliths. Comparison between these two samples: MAYBE they are the same.

CH2015 North Area unit 31411.s3 phytoliths (CH) wall plaster beneath installation. Extremely low concentration but all phytoliths are from straw (few single cells plus one silica skeleton of more than 100 cells elongate psilate).

CH2015 South Area unit 22425.s2 phytoliths (MD) ashy makeup for clay surface. Almost sterile, a couple of chaff silica skeletons but too few to be indicative of anything specific.

CH2015 TPC unit 31355.s? phytoliths MK- fill of Sp.577 (next to the storage room). Very rich sample, a mix of C3 cereal chaff and *Phragmites* culms – some occasional woody dicot silica skeleton. Also, lots of grass culm silica skeleton (elongate psilate), more or less same as chaff indicating presence of whole plants.

CH2015 South Area unit 31611.s3 phytoliths (MC) – wall infill of Sp.565. Very low concentration of phytoliths – some occasional elongate psilate and dendritic. One *Phragmites*-type bulliform but nothing really diagnostic or indicating intentional deposition.

Chapter 9

Figurines

Lynn Meskell[1], Carolyn Nakamura[2], Lindsay Der[1]

[1]Stanford University, [2]Leiden University

This season Lynn Meskell and Lindsay Der were briefly joined by Monique Arntz (Leiden University) who helped with data entry and also developed a potential research project. This year we recorded 69 figurines in total. Twenty-four examples came from the 2015 excavations, while the rest were returns from other labs covering previous years, some going back as far as 1996. As is the norm at Çatalhöyük zoomorphic figurines were the most numerous with horn fragments dominating, followed by abbreviated forms and finally anthropomorphic examples.

Figurine form	Count	Examples
Zoomorphic	45	21660.H1, 19850.H1, 21661.H3, 22130.x1
Abbreviated	18	22060.x1, 22635.H3, 21122.H1
Anthropomorphic	3	22641.x1, 31852.x3
Non-diagnostic	3	21183.H1
Total	**69**	

Table 9.1. *Figurine types and tallies from the 2015 season*

Figure 9.1. *31852.x3 in the fill of Sp.585.*

Figurine 31852.x3

Very late in the season, excavators in the TPC Area recovered a rather large, headless human figurine made of stone (31852.x3) (Fig. 9.1). Since all specialists were off season we rely on the recording by others and plan to examine it in Its dimensions are 11.3cm high, 10.2cm wide, 7.1cm at its thickest point and weighs 890 grams. It was found in association with a fire spot in Space 585, in rubble fill, with burnt material directly above a floor. Below/very close to the figurine unit, excavators found another cluster of objects just east of the platform; this contained numerous worked bones and stones, flint and obsidian tools, a fragment of a horn core and two wings from a large bird.

In terms of form, 31852.x3 is a familiar robust headless (broken off) human form in a standing or vertical position. The arms and hands are folded across the mid-section and rest under flattened breasts; the upper arms and shoulders appear to be quite fleshy, while the lower arms and hands are more delicate.

The large divided legs are straight and taper to rounded feet. The thighs and buttocks are quite exaggerated and from side, the buttocks project horizontally outward with the lower body forming an exaggerated triangular shape. Just under the waist in the front, a rounded triangular area protrudes slightly from the main body and bears a wide vertical line with rather rough edges down the center. It does not appear that the piece is self-standing. The head appears to have been intentionally removed. Based on photographs, Christina Tsoraki has observed that the smoothing above the arms goes over the fractured edge (especially near the shoulder area), which indicates that the head was snapped off before the figurine was finished by smoothing/grinding its surface (Fig. 9.2).

Figure 9.2. *31852.x3 (three views of the figurine).*

While we do have examples similar to this figurine in form, treatment and deposition, they are rather rare. So 31852.x3 is notable in a few ways: first, like the other stone anthropomorphic examples we have found to date it is quite large; second, we rarely find figurines of this type in clusters, and third, the vertical line down the front of the figurine – if original – is unique among Çatalhöyük figurines. This last feature is likely to provoke immediate interpretations of femaleness, since at first glance it evokes a striking emphasis on female genitalia. However, at present (without having been able to examine the object in person) we remain skeptical of this interpretation for various reasons that we outline below. We discuss other examples that bear similarities to 31852.x1 in terms of material, deposition context, treatment, and form.

Parallels in material, treatment, form and deposition

The current excavations have found only seven human figurines made of stone and these range significantly in size and form (Table 9.2), and we have records of 26 pieces from Mellaart's excavations. Stone figurines, therefore, comprise 33 (18%) of approximately 180 anthropomorphic figurines found at Çatalhöyük. Examples 1-5 in Table 9.2 all portray the familiar fleshy human form. All five figurines have their arms across their stomach area and depict fleshy or even rotund legs and back ends. While the overall forms of 10264.x1 and 12102.x1 are rendered more abstractly, there is a clear emphasis on the lower rear portion of the body suggestive of this general trend to exaggerate the buttocks and legs, which is especially visible in 10475.x2 and 15839.x10.

	Id	Image	context	Height / Weight	Level
1	7814.x1		midden	1.56cm	TP R
2	10264.x1		cluster	9.13cm / 203gr	North H
3	10475.x2		pit/burial fill	7.51cm / 84gr	South R
4	12102.x1		midden	4.6cm	North I
5	15839.x10		fill	1.61cm / 2gr	TP O
6	18523.x1		construction/make-up	12.02cm / 152gr	South O
7	18545.x1		fill	8.54cm / 92gr	South O

Table 9.2. *Stone anthropomorphic figurines*

In terms of treatment, there are two other examples of stone figurines with their heads removed, most likely intentionally. 12102.x1 is a limestone figurine that appears similar in form to 10264.x1 (see Table 9.2). Karen Wright suggested that a head was originally attached to the neck stump of 12102.x1. A close examination of the neck reveals that the break has been carefully executed at the precisely the same point all

around the neck. She argues that since the neck is quite thick relative to the shoulder area, the detachment cannot be attributed to simple breaking; marble does not fracture in this neat way. Furthermore, the neck stump was abraded down to form a flat surface, although the grinding was not to the same level of fineness as on the rest of the artifact (Wright pers.com. in Nakamura and Meskell 2013). Based on Christina Tsoraki's observations, it is possible that the head and neck of 31852.x3 underwent a similar process. She suggests that there appears to be a worn (possibly polished?) edge around the circumference of the break. It is hard to understand how the head and neck could have been broken off with such an even break located so close to the shoulder line. Tsoraki proposes that they may have first scored a line around the neck to ensure that the head and neck broke off along a certain line.

In addition, an example from Mellaart's excavations now in Ankara (79-8-6), also appears to have had its head intentionally removed (Figure 9.3). This figurine, from a late level (A.II.1) made from limestone, has some close stylistic similarities to 31852.x3. Although the bodily posture is different - seated with legs crossed instead of straight legs in a vertical orientation – its overall form and rendering is very similar: it has broad shoulders with arms crossed under flattened breasts, a slightly protruding stomach in front and an emphasis on rotund legs and presumably the buttocks (which cannot be seen in the photo). Hands and feet are depicted in a way similar to 31852.x3 (Fig. 9.3). Neither ground stone nor figurine specialists have examined this piece in person, so we cannot say anything more about the head removal, material or production techniques. We also have no details about the context from which it came. However, in terms of style and treatment, this figurine may be the closest parallel to 31852.x3.

In terms of deposition, we most commonly find figurines in secondary contexts such as fill and midden. Figurines rarely occur in clusters of objects. To date we have only found three human figurines in such contexts. 14522.x8 was found in a possible placed deposit in the southeast corner of Building 65, under the pre-construction make-up of platform F.2086 (Figure 9.4). This cluster included an equid scapula, unworked animal bones and stones, a pot fragment and the leg of a baby. This figurine, made from soft, light colored clay, also depicts a rather fleshy body in a vertical or standing position. The arms and head are missing and the breakage points appear to be very worn (Fig. 9.4).

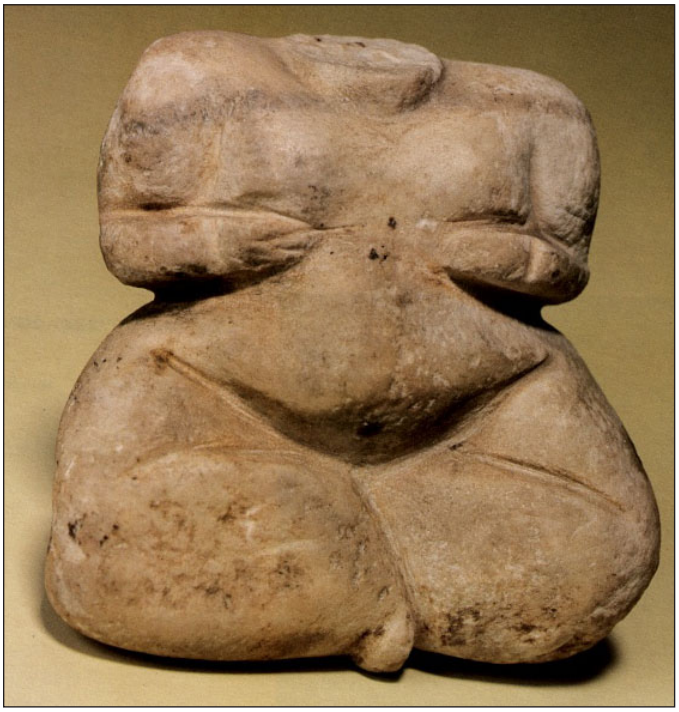


***Figure 9.3**. Figurine (79-8-6) from Mellaart's excavations.*

***Figure 9.4.** Figurine 14522.x8.*

12401.x7 (Figure 9.5) is an unusual clay figurine found in the Istanbul area near the edge of the mound; it was made headless, with a dowel hole and depicts a robust female with large breasts and stomach on the front and a skeleton on the back (see Meskell and Nakamura 2005 for detailed description). The figurine was found in the southwest part of Sp.252, in an ashy area along a wall that contained many worked stones, some tools, a grinding stone, a mace head and this figurine.

Figure 9.5. *Figurine 12401.x7.*

Figure 9.6. *Figurine 10264.x1.*

Finally, 10264.x1 (Fig. 9.6) (also noted in Table 9.2) was found in a rich cluster of artifacts in the southeast corner of B.58. Other materials included obsidian arrowheads, a nearly complete pot, a horn, worked bone, green stones, animal bone, shells and flint. This cluster just above the floors came from building infill rich in artifacts. Since many building infills are relatively clean and contain few artifacts, excavators suggested that this deposit resembled bedded midden; however, it is also similar to the infill of B.2.

Obviously, these four examples do not provide a very robust data set. Moreover, three of the four cluster contexts do not provide clear indications of intentional placement. Except for (14522), which is more suggestive of an intentional act of marking (Nakamura and Pels 2014), these clusters may have resulted from trash disposal or more deliberate building infill practices. It is, perhaps, notable that three clusters occur in fill just above room floors and all four occur in the southern areas or corners of rooms. Further studies of the specific materials and artifacts from these clusters may provide a stronger argument for intentional deposition if objects appear to be intact and/or intentionally damaged or broken.

Finally, we should address the possible depiction of a vagina on this piece. In an earlier paper (Nakamura and Meskell 2009), we quantified the depiction of certain physical traits across the anthropomorphic figurine corpus and found an emphasis on bellies, buttocks and breasts and striking de-emphasis on genitalia. Aside from a few phalluses and two figurines with pubic triangles, sex-

ual traits are not present and there are no examples of female genitalia in the Çatalhöyük figurine corpus. Furthermore, stomachs and breasts are often depicted as sagging and oftentimes small, while buttocks and thighs are consistently exaggerated and are sometimes quite sensuously rendered. We have thus suggested that these idealized bodies could have articulated ideas of maturity, longevity, abundance, and perhaps mature sexuality, rather than fertility and reproduction, or indeed, divinity (Nakamura and Meskell 2009; Pearson and Meskell 2013, 2014).

Examining high-resolution photographs and videos provided by Jason Quinlan, we suspect that the vertical line down the mid-section of the body is not original to the piece and traverses the stomach or abdomen rather than the pubic region. The central vertical line appears more coarsely rendered than the other lines of the figure, and other examples found by Mellaart and the current project depict the stomach/abdomen area as a rounded projecting triangular area located at the upper intersection of the lower limbs. The other anthropomorphic figurines, while certainly exaggerative of the bellies, buttocks, and breasts do maintain a sense of proportion and anatomical positioning. If this originally intended to represent a vagina, it is overly large in comparison to the rest of the body, and sits above the axis at which the buttocks begin.

We have asked Christina Tsoraki to examine this object in future seasons to determine if the vertical mark is a feature added later, possibly as an act of defacement or deliberate destruction. Currently, because of the encrustations it is not possible to say how the vertical groove intersects with the open U-shaped groove (that forms the border between the top of the thighs and the pubic area) without using a microscope. If someone has transformed the abdomen into a vagina, snapped off the head and placed it in an unusual context, then we need to consider what such actions might have meant in a Neolithic context. There are interesting earlier parallels for possible defacement and/or crude rendering of female genitalia, remembering that in almost all cases there are no explicit renderings of females as opposed to images of phalluses at Çatalhöyük. At Göbekli there is a female image incised on a stone slab on a low bench. This splayed figure has minimal facial features, sagging breasts that hang to the side of the torso and thin arms and legs. Most striking, however, is the exposure of the body, the complete opening up of the naked form. Specifically, the explicit depiction of the genital region, previously unknown in the Turkish and Levantine Neolithic (Hodder and Meskell 2011), is marked by an engraved hole that might be interpreted as being penetrated by a disconnected penis. On either side of the penis are incised areas that can be seen as accentuating the penis or perhaps representing emissions from the vagina. Since the splayed figure is the only female portrayal from Göbekli, was on a bench that people may have sat on and is a passively penetrated figure, one might interpret this as not being a particularly positive rendition of women and is unlikely to be associated with notions of fertility or matriarchy (see Hodder and Meskell 2011).

Research projects

This year Lindsay Der continued her doctoral research on the role of changing human-animal relations in the social and material organization of Çatalhöyük continues with an examination of the correlation between figurine horns and faunal horns, tusks, and antlers in buildings. The latest study focuses on the North Area and has revealed changes through time with a strong linear relationship occurring in the middle levels which is absent in the later levels (although a non-linear relationship may exist). Future work will expand this analysis to the South and TP/TPC areas of the site.

We were joined briefly by Monique Arntz from Leiden University who worked with us on cataloguing, data entry and figurine analysis. Arntz is also interested in the ways in which materiality and context can lead to new insights into the potential functions and meanings in prehistoric society. In line with our own work, she suggests that simply studying prehistoric figurines based on their imagery, style and iconographic

content is problematic and has created a bias in that there has often been a general focus upon intact anthropomorphic figurines. She proposes to study figurine production sequences and examine more closely their material properties. By looking at patterns of weathering between different types of figurines in different contexts and investigating surface markings she hopes to gain insight into how figurines are affected by various processes after deposition and to what extent surface markings can still be identified as being a result of their production or use. This may provide evidence about the life-cycle of figurines and further explore the meanings association with their production, use and deposition.

References

Hodder, I., and L.M. Meskell

2011. A 'curious and sometimes a trifle macabre artistry': Some aspects of symbolism in Neolithic Turkey. *Current Anthropology,* 52(2): 235-263.

Meskell, L..M., and C. Nakamura

2005. Çatalhöyük figurines. In *Catalhöyük Archive Report 2005*, http: //www.catalhoyuk.com/downloads/Archive_Report_2005.pdf.

Nakamura, C., and L.M. Meskell

2009. Articulate bodies: forms and figures at Çatalhöyük. *Journal of Archaeological Method and Theory,* 16: 205-230.

Nakamura, C., and L.M. Meskell

2013. Figurine worlds at Çatalhöyük. In S*ubstantive Technologies at Çatalhöyük: Reports from the 2000–2008 Seasons* (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 201-234.

Nakamura, C., and P. Pels

2014. Using "magic" to think from the material: tracing distributed agency, revelation, and concealment at Çatalhöyük. In *Religion at Work in a Neolithic Society: Vital Matters,* ed. I. Hodder. Cambridge: Cambridge University Press, 187-224.

Pearson, J.A., and L.M. Meskell

2013. Isotopes and images: fleshing out bodies at Çatalhöyük. *Journal of Archaeological Method and Theory,* 20(3): 1-22.

Pearson, J.A., and L.M. Meskell

2014. Biographical bodies: flesh and food at Çatalhöyük. In *Early Farmers*, ed. A. Whittle and P. Bickle. London: British Academy, 233-250.

Chapter 10

Chipped Stone

Sean Doyle, McMaster University

The following report details the initial study of chipped stone material from all areas excavated and processed throughout the 2015 field season. It follows the most recent interpretations of the obsidian and flint production industries at Çatalhöyük as outlined in the Substantive Technologies volume (Carter *et al*. 2013). A total of 284 bags were entered into the database. 1,606 artifacts were recovered from the dry sieve and hand picking, with a combined weight of 1.9kg, while another 1,703 came from heavy residue, weighing 113g. Below, these numbers are broken down contextually by building and space, and descriptions of some of the more significant finds are provided. The data were collected between July 1st and August 6th, and much of the heavy residue was diligently counted and weighed by several field school students over two weeks of the season.

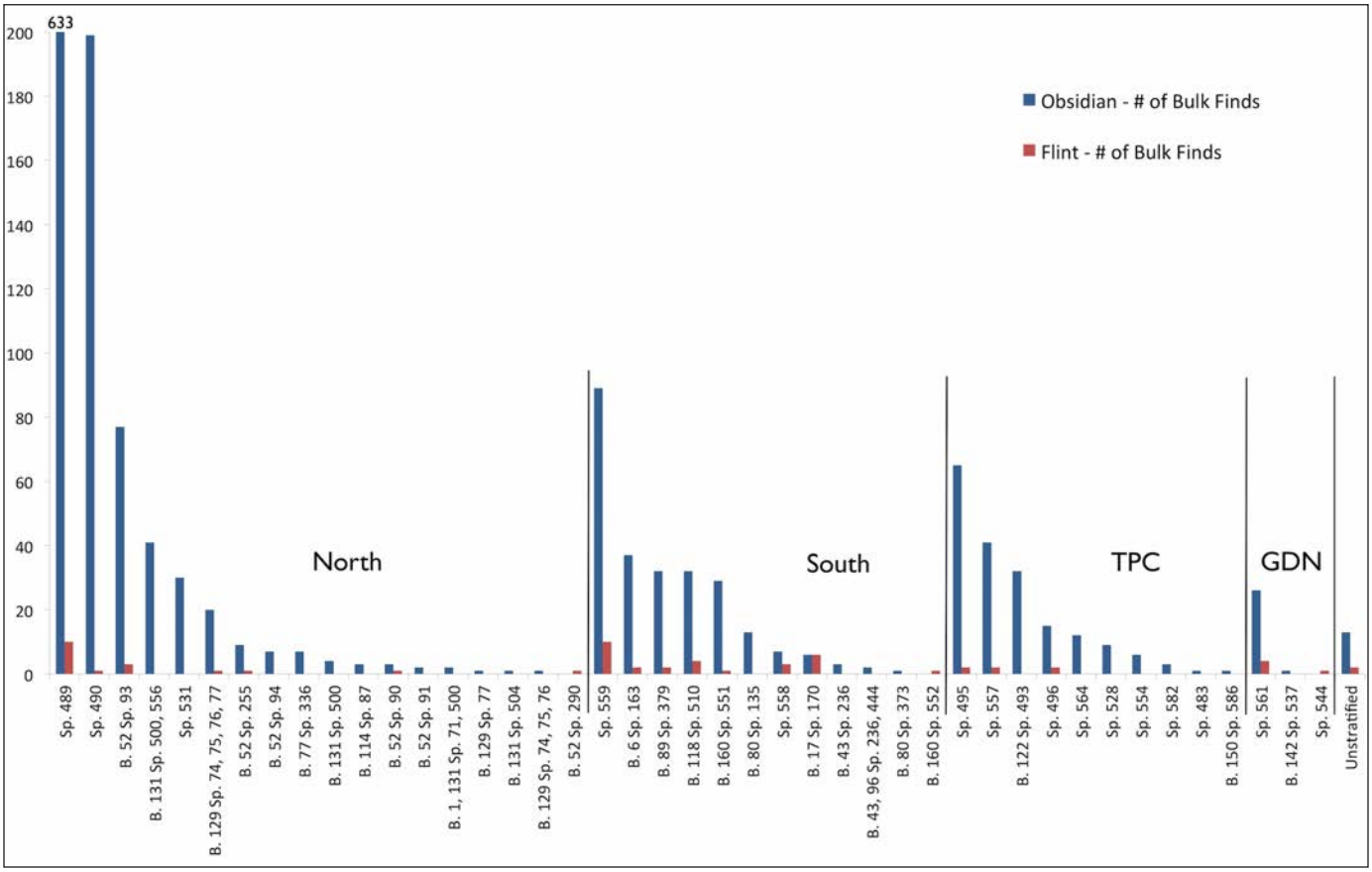


Figure 10.1. *Bulk find frequencies by space.*

All finds were entered into the Level 1 database, which comprised weighing and counting the artifacts and entering all appropriate information from the label. A more detailed study was reserved primarily for the priority units and X-finds. A majority of the obsidian was subjected to the visual characterisation program established at Çatalhöyük by Kayacan and Milić (Archive Report 2008), which has since been expanded and tested against the chemical composition of over 750 artifacts obtained using several different analytical techniques (Carter and Shackley 2007; Poupeau *et al*. 2010: 2715-16). A series of blind tests has

resulted in the ability of trained chipped stone lab members to determine the obsidian source with 94 – 97% confidence (Milić *et al*. 2013).

Figure 10.1 illustrates the distribution of hand picked and dry sieved chipped stone material (hereafter referred to as 'bulk finds') excavated and processed in 2015. Strikingly, 53.5% of these finds came from Spaces 489 and 490, two midden deposits in the North Area. These highly productive middens are reminiscent of others found at Çatalhöyük, and typically contain a mix of multiple technological industries, mostly on obsidian from several different sources, but also the occasional flint artifact.

Spaces 489 and 490 again came up big in terms of heavy residue frequencies (Fig. 10.2), containing 63.9% of all material excavated and processed through the flotation machine in 2015. Again, this is typical of midden deposits at Çatalhöyük, comprising mostly waste material from multiple chipped stone technologies.

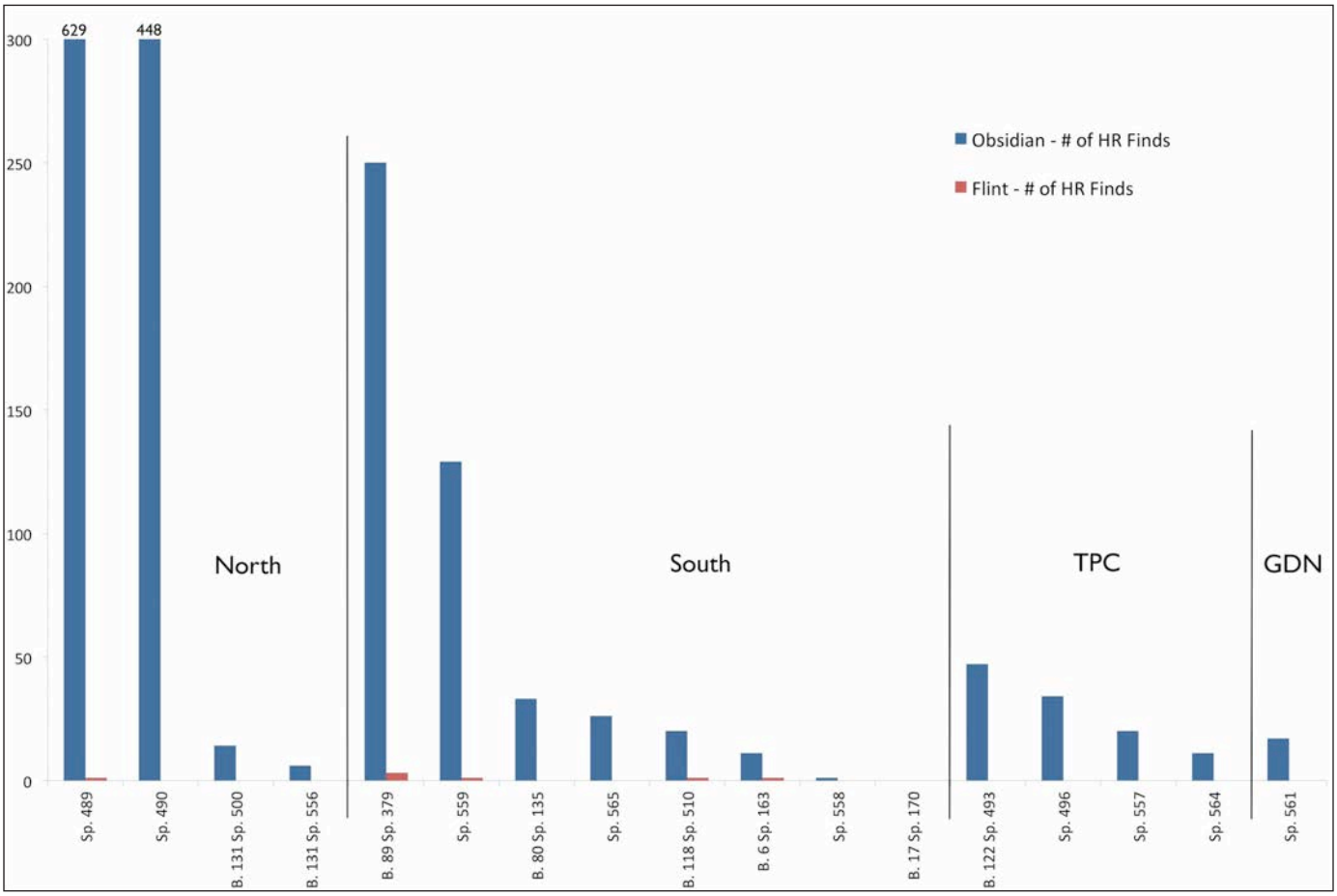


Figure 10.2. *Heavy residue frequencies by space.*

North Area

Space 489

In terms of frequency and weight of artifacts, Sp.489 contained the most productive deposits excavated in 2015, and it comprised of only two units, (21660) and (21661). These units contained a total of 633 obsidian artifacts and 10 of flint. The obsidian assemblage included material produced exclusively with percussion-based technologies, a majority of which belongs to the flake and blade-like flake traditions previously

known as *obsidian industry 1* (Carter *et al*. 2013: 418-420). This tradition involves the procurement of raw material in the form of large, thick and patinated flakes of East Göllü Dağ obsidian, a source located approximately 200km north-east in Cappadocia. Due to the distinctive colour and patination of the this material, it was likely procured as ready made cores from the large quarrying debris at the 9th millennium BC Kaletepe-Kömürcü blade workshop, and brought back to site with little modification (Binder and Balkan-Atlı 2001; Carter *et al*. 2013: 418). The quarry flakes that were not hoarded, and those that were later retrieved from such caches, were reduced 'in house' to produce small irregular flakes and blade-like flakes (Carter *et al.* 2013: 420).

Another dominant presence is that of bifacial reduction waste also produced on Kaletepe quarry flakes, previously known as *obsidian industry 7*. Caches of these bifacial point preforms have been found elsewhere in the North Area, particularly a deposit of four of them in B.60 (13111) alongside a large cortical flake from Nenezi Dağ, but a cache of raw quarry flakes has yet to be recovered anywhere outside the South Area. The waste material from these flake/blade-like flake and biface production industries, which are now believed to belong to the same technical scheme (Carter *et al*. 2013: 420), comprise roughly two-thirds of the Sp.489 chipped stone assemblage. The remainder is made up of equal parts other East Göllü Dağ sources and Nenezi Dağ. The complete lack of prismatic blades, and the relatively low frequency of Nenezi Dağ obsidian, tentatively suggests that this midden deposit accumulated during the earliest part of the transition phase spanning Levels 6 and 7 of the site's occupation. During this time the dominant obsidian type shifted from Göllü Dağ to Nenezi Dağ, true prismatic blade products were introduced, and microlithic traditions previously known as *obsidian industry 2* and *flint industry 1* ceased to be exist (Carter *et al*. 2013).

Space 490

The midden assemblage in Space 490 was very similar to Space 489 in terms of technology and raw material, containing 199 pieces of obsidian and 1 flint. One key difference was the inclusion of that microlithic component absent from Space 489, with several complete microblades modified into asymmetric trapezes, and nine possible fragments, exhibiting usewear and major traces of retouching. Otherwise, the majority of this assemblage also comprised waste material and used/discarded implements from the flake/blade-like flake and biface reduction industries on Kömürcü-Kaletepe obsidian. Interestingly there was one piece from West Acigol, another source in the Cappadocia region, which also does not make an appearance onsite until the Level 6 to 7 transition period previously discussed.

Building 132

One very interesting deposit of note was a cluster of chipped stone implements (Fig. 10.3) from burial F.7634 (see Chapter 5 for further detail), found in the infill of B.132 directly underneath B.77. The cluster was found near the abdominal region of the skeleton and was likely enclosed within a textile or hide bag. The remarkable thing is the number of sources represented in this group of grave goods, which might be interpreted as a collection of exotica. Of the four pieces of obsidian, 21634.x11 is a near complete tanged projectile that was made on a blade previously used to cut herbaceous plants, an interesting case of recycling with the remodified final product left completely unused (Lemorini, pers. comm.). The other three are small flakes, and all originated from Nenezi Dağ. When this burial was placed within the demolished remains of B.132, Göllü Dağ was the primary supplier of obsidian to the site. Perhaps at this time Nenezi Dağ was still considered an exotic source, possibly controlled by another social group, but this hypothesis is purely speculative at this time. The significance of this fact is that the only obsidian included within the cluster in the grave fill (21634) came from Nenezi Dağ, during a period of occupation dominated by Göllü Dağ products, even though the sources lay only seven kilometres distant from one another.

Figure 10.3. *Chipped stone cluster from burial F.7634, Building 132, North Area.*

Of perhaps more obvious and visually striking significance is the range of colours represented in the flint component of the cluster. As Figure 10.3 demonstrates, there are 12 visually and/or textually distinct chert types represented, but whether or not these types are from 12 distinct sources or simply accountable to intra-source variation from several chert-rich regions, it is impossible to say at this stage of analysis. The interesting thing is that no chert type is represented twice, and that multiple different tool types are present. This includes several types of side and end scrapers, two types of perforators and a large cutting implement. This tool, 21634.x21, measures 8.5cm in length and was produced by retouching the edges of a large percussion blade-like flake into one long straight cutting edge and a spokeshave on the end. It shows evidence of being used to cut wood or woody plants, and perhaps of once being hafted to a handle (Lemorini, pers. comm.).

Another rich burial from the same layer within the sealed structure of B.132 was F.7632, filled by (21630), which contained a long flint dagger (Fig. 10.4) placed near the neck of the deceased alongside two bone points, with some plaster from the haft still preserved and attached to the tang. The dagger, measuring 15.7cm, was produced on an excellent quality crypto-crystalline chert, ranging in colour from grey to an opaque dirty white, and highlighted frequently with small brown specks. Its source remains unknown at this stage of analysis.

The dagger was produced by retouching the edges of a large unipolar blade, likely made via indirect percussion, although this is difficult to corroborate due to the presence of a thick layer of plaster covering the proximal end that once helped attach a handle to the tool. This blade was probably produced and/or

imported from elsewhere, as no comparable flint cores or associated production debris have been recovered at Çatalhöyük. The retouch is very minor, mostly denticulated with occasional linear to invasive, though it does span the length of both edges, and was accomplished only for sharpening the edges as no additional thinning or major shaping was necessary upon removal of the blade from its core. The dagger shows evidence of being used to butcher at least one medium to large sized animal, resharpened, and then interred with the deceased individual fresh and unused (Lemorini 2015: pers. comm.). The presence of plaster on the tang suggests that it might have once been hafted to a handle, perhaps comparable to the bone handle carved into the shape of a coiled snake found in a North Area Level VI burial (Conolly 1999: 42). While that particular piece belonged to a different set of technological traditions, with a polished ventral surface and complete invasive retouch along both dorsal edges, it is not unreasonable to imagine a similar handle attached to the most recent example, although where that handle was eventually deposited no one yet knows.

Figure 10.4. *Flint dagger from burial F.7632, Building 132, North Area.*

Building 131

While only 46 pieces of obsidian and no flint were recovered from B.131, there were several interesting artifacts worthy of mention here. Discovered on the last day of excavation while cleaning up for end of season photographs was a double pointed biface (Fig. 10.5) seemingly placed on the floor (31703) of B.131 before it was demolished. Future excavations are required to determine if this was a foundational deposit, or simply part of the room fill, but nonetheless it is a provocative item. Measuring 13.6cm long, the biface is likely the final stage preform before modification into a functional spearhead (closely resembling a Conolly Type 2 [Conolly 1999: 39]), as there seems to be no traces of the fine retouch that sharpens the edges of most other chipped stone tools for use. If one looks closely at Figure 10.5, one might notice along the lower edge a series of step terminations that were meant to be final thinning flakes, but terminated too abruptly. One failure led to another, each time making it exponentially more difficult to correct the mistake, and resulted in an asymmetrical biface that did not fulfill certain requirements (whether esthetic or functional). The left shoulder of the biface became indented into the centre, and it became impossible to salvage without sacrificing too much width for platform preparation. At this point the biface was either tossed away or used in the closing ceremonies of B.131.

Another peculiar find came in the form of three pieces of Nenezi Dağ obsidian placed together at the bottom of the largest and central post-hole identified in Sp.500. The post-hole was filled with burnt soil, and phytolith specialists identified at least one layer of leaves (possibly associated with the wheat grains in

Sp.556) situated at the top of the fill. The obsidian consists of one unipolar percussion blade, a multidirectional flake core potentially used as a wedge for woodworking, and a perforator. The surface of the blade is quite strange; it is covered with small bubbles that appear to have dirt inside of them, as if it was subjected to extremely high temperatures.

Figure 10.5. *Double pointed biface from Building 131, North Area.*

Some studies have shown that obsidian can experience extreme mechanical change at 1000°C (e.g. Shackley and Dillian 2002). Although there does seem to be much of evidence of burning at high temperatures in several areas of B.131, it is difficult to imagine such intense heat being sustained for long enough to alter this one piece so dramatically, and it still does not explain the lack of similar surface alteration on the other two artifacts found with it. Perhaps these pieces had very different use-lives and depositional contexts before they were collected and deposited into the post-hole retrieval pit prior to the final dismantlement and closure of B.131. Another interesting note is that all three pieces originated from Nenezi Dağ, while the rest of the building's assemblage comprised roughly a 50-50 ratio between Nenezi and East Göllü Dağ obsidian.

South Area

Space 559

Space 559 contained 89 pieces of obsidian and 10 of flint, with the majority coming from two layers of midden accumulation (22314) and (22320). Roughly half of the obsidian came from the Kaletepe workshop of East Göllü Dağ, with several early biface thinning flakes having quarry flake patina present on the dorsal surface. Typically, the rest is associated waste material comprised of biface thinning flakes and flakes/blade-like flakes from the dominant chipped stone industries at Neolithic Çatalhöyük. Also present are core rejuvenation flakes and microblades from the early microlithic industry. These assemblage components, in conjunction with a virtual lack of any prismatic blade technology and the low frequencies of Nenezi Dağ obsidian, indicate that this midden likely accumulated before the Level South O-M transition period. The flint component includes a biface thinning flake and other percussion-based knapping debris, along with a side

and end scraper on a long percussion blade that displays heavy use-wear and retouching. There is evidence for in-house production of blades and flakes on both obsidian and flint, along with activities such as intense hide preparation as suggested by the presence of several heavily used and discarded scrapers.

Building 6

A remaining wall from B.6 was excavated in 2015, and it contained an interesting assortment of finds. Of the 37 pieces of obsidian and six of flint, the majority was small waste material from percussion-based industries, including biface thinning flakes and exhausted flake/blade-like flake cores. Oddly, there was a near complete projectile produced with a bipolar percussion blade technology on East Göllü Dağ obsidian. It was continuously retouched on the dorsal surface, and occasionally on the ventral primarily for shaping of the tip and tang, the very ends of which are unfortunately missing. There is a deep hinging flake taken out of the base that might indicate production failure and subsequent disposal of the point, or alternatively it could represent breakage through use, although why it ended up inside of a wall (unknown whether it came from the brick or the mortar) is difficult to ascertain at this point.

Building 89

Space 379 of B.89 contained 32 pieces of obsidian and two flint, virtually all recovered from floor and dirty floor deposits, which is quite characteristic of this otherwise immaculately clean building. A majority of this assemblage comprised shatter and preparation flakes from percussion based industries along with pressure flakes from sharpening the edges of obsidian tools. Interestingly, the two pieces of flint were both recovered from dirty floor (21954); a medial section of a percussion blade and a thick blade-like flake, both exhibiting only slight evidence of use and retouching. It is not very typical of dirty floors to have even fragments of finished tools, but at this stage of analysis it is unknown whether they were deposited intentionally before the closure of B.89, or if they were accidentally pressed into the floor and lost during the building's occupation.

TPC

Excavations in the TPC Area continued for almost a month after my departure, and so unfortunately the current analyses are based upon a period of excavations for which many of the units were mixed and/or post-Neolithic in date. The following report deals with what material was available for study prior to August 6th.

Space 495

Space 495 contained 65 pieces of obsidian and two of flint. The vast majority of these were pressure blade fragments and associated production debris from both East Göllü and Nenezi Dağ. One noteworthy piece was a teardrop shaped side and end scraper made on a thick percussion blade of Nenezi Dağ obsidian. Clearly this assemblage originated in the Late Neolithic, well after the introduction of prismatic blade technology to the site, but at this stage of analysis not much more can be offered.

Space 557

Space 557 contained 41 pieces of obsidian and two of flint. Roughly half of the pieces were prismatic blade fragments, and the rest associated waste material. Almost all of the pieces were from Nenezi Dağ, indicating that they were likely produced during the very late stages of site occupation.

Building 122 Space 493

Building 122 contained 32 pieces of obsidian, one of which was arguable the most exciting find from the

available TPC material. Contained within the top part of bin infill (22748) was a complete double pointed projectile made on a thick blade with a triangular profile of Nenezi Dağ obsidian, likely produced on a unipolar indirect percussion core. It is slightly tanged but without shouldering, and displays continuous marginal retouch on both edges. The presence of complete projectiles placed within bins and post-retrieval pits is attested elsewhere at Neolithic Çatalhöyük, the ceremonial placement of which is suggested to be a highly significant event within the closing rituals of a building's life.

GDN

Space 561

Space 561, an abandoned building filled with midden material in the GDN Area, contained only 26 pieces of obsidian and four of flint, but had a rather unique selection of chipped stone material. Of the 16 prismatic blade fragments recovered in (22811), 13 came from East Göllü Dağ sources, and only two from Nenezi Dağ. This is atypical, as it reverses the trend of prismatic blades being produced primarily on Nenezi obsidian. Perhaps this midden accumulation represents a knapper or social group learning new production techniques but using the familiar and traditional Göllü material, thereby maintaining ancestral relationships to the source during a period of change. This proposal might be supported by the presence of flakes removed to shape a core that had likely entered the site as a rough preform, and several platform rejuvenation flakes, one displaying a series of step terminations that might represent a knapper learning a new technique. Regardless, the ratio of obsidian sources represented and the dominance of prismatic blade technology should place this midden deposit firmly in, and likely towards the end of or shortly after, the transition period spanning Levels South O to M of the site's occupation.

The last prismatic blade fragment, a proximal end displaying heavy use-wear on both edges, originated over 600km away in Eastern Anatolia, from the peralkaline mountain sources of Bingöl and/or Nemrut Dağ. This characteristically oily green obsidian is extremely rare at Çatalhöyük, with one known example from Level IV in the 1960s excavations, and another four recovered in the IST Area, comprising a mere 0.11% of that chipped stone assemblage (Carter *et al*. 2008: 903). Presence of this obsidian has been used to propose a reconfiguration of regional interaction in the Anatolian Early Ceramic Neolithic, linking Çatalhöyük to the distant south-east through processes that might include agricultural expansion, gift exchange, bride-wealth, or westward migrations of people and/or technology (Carter *et al*. 2008).

References

Binder, D. and N. Balkan-Atlı

2001. Obsidian exploitation and blade technology at Kömürcu-Kaletepe (Central Anatolia). In *Beyond Tools*, eds. I. Caneva, C. Lemorini, D. Zampetti, and P. Biagi. SENEPSE 9. Berlin: ex oriente, 1-16.

Carter, T., S. Dubernet, R. King, F.-X. Le Bourdonnec, M. Milić, G. Poupeau and M.S. Shackley

2008. Eastern Anatolian obsidians at Çatalhöyük and the reconfiguration of regional interaction in the Early Ceramic Neolithic. *Antiquity* 82: 900-909.

Carter, T. and M. Milić

2013. The chipped stone. In *Substantive Technologies at Çatalhöyük: Reports from the 2000-2008 Seasons* (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology, 417-478.

Carter, T. and M. Shackley

2007. Sourcing obsidian from Neolithic Çatalhöyük (Turkey) using energy dispersive X-Ray Fluorescence. *Archaeometry* 49(3): 437-454.

Conolly, J.
1999. *The Çatalhöyük Flint and Obsidian Industry: Technology and Typology in Context*. BAR International Series 787. Oxford: Archaeopress.

Milić, M., K. Brown and T. Carter
2013. A visual characterization of the Çatalhöyük obsidian. In *Substantive Technologies at Çatalhöyük: Reports from the 2000-2008 Seasons* (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology, CD Appendix 21.1.

Shackley, M.S. and C. Dillian
2002. Thermal and environmental effects on obsidian geochemistry: experimental and archaeological evidence. In *The Effects of Fire and Heat on Obsidian*, eds. J.M. Loyd, T.M. Origer, and D.A. Fredrickson. Sacramento: US Bureau of Land Management, 117-134.

Chapter 11

Ground Stone

Christina Tsoraki, Leiden University

During the 2015 excavation season a team of four people worked on the ground stone material from the East Mound excavations: Dr. Christina Tsoraki (Team Leader- Leiden University, the Netherlands), Markéta Šťovíčková (University of Sheffield, UK), Juliette Hemelaar and Sophie Vullings (Leiden University, the Netherlands). The ground stone team took part at the tri-weekly priority tours and recorded material from 47 priority units including heavy residue samples, and provided immediate feedback to the excavation teams. In addition, the ground stone team re-visited material excavated between 1993 and 2009 and collected data for the size, weight and state of preservation of polishing tools and stone palettes. By looking at the spatial and temporal distribution of these object categories the aim is a) to investigate possible variation in the execution of plastering and mineral processing activities across different areas of the site, and b) to address questions about the nature of activities (specialised or not) that relate to the plastering of walls and floors, the processing of colorants and the production of wall paintings.

Hodder Level	Frequency	Percent
Unassigned	984	35.7
North ?G	1294	46.9
North G	31	1.1
North H	3	0.1
North I	3	0.1
North Post-Chalcolithic	1	0.0
North Unknown	2	0.1
BACH ?G	2	0.1
IST Unassigned	1	0.0
Scrape ?G	1	0.0
Scrape Unstratified Neolithic	1	0.0
South ?L	1	0.0
South H	136	4.9
South L	6	0.2
South N	34	1.2
South O	18	0.7
South P	3	0.1
South Q	2	0.1
South S	178	6.4
South Unknown	1	0.0
TP M	1	0.0
TP O	2	0.1
TP W	1	0.0
TPC Unstratified Neolithic	54	2.0
Total	**2760**	**100**

Table 11.1. *The temporal distribution of ground stone artefacts recorded during the 2015 season.*

Preliminary observations on the 2015 ground stone assemblage

In total, 2,760 objects originating from the North, South, TPC and GDN Areas were studied. The recorded material comes from both internal and external areas and is mainly dated to Levels North G and South H (Table 11.1). Natural waterworn pebbles with no apparent use in ground stone technologies make up the vast majority of the recorded material followed by different types of grinding and abrading tools (e.g. querns, abraders, palettes and polishers), stone axes and adzes, flakes and other waste by products from the production of ground stone artefacts.

A group of objects unearthed during the 2015 excavation season deserve special mention.

Maceheads

Three maceheads, two complete and one broken in half, were found in 2015. To date, less than 30 examples have been recovered including 15 examples from Mellaart's excavations stored at the Konya Museum (Wright 2013). They tend to appear later in the temporal sequence at Çatalhöyük (Wright 2013). The choice of raw materials with a striking color and textural patterning for the production of maceheads at Çatalhöyük—and similar to other Neolithic sites (e.g.

Neolithic Knossos-personal observation)—indicates concern for the creation of objects of a visually distinctive appearance. This *in tandem* with the considerable level of skill and effort invested in their production may suggest an interest in creating an object that was meant to be visually powerful (Tsoraki 2008).

Figure 11.1. *Complete macehead 30008.x1 (Photo: Jason Quinlan).*

30008.x1 (*Level North G, B.114, Sp.87, F.8100, burial fill)* (Fig. 11.1): complete sub-spherical macehead that measures 59x63x58mm and weighs 322g. The object is most likely made of gypsum rock. The banded texture of the raw material is very interesting and clearly the maker took advantage of the natural texture to create a very aesthetically pleasant end-result. A circular area of more homogenous texture is followed by a series of bands which are translucent; the same pattern is replicated on two opposed surfaces of the macehead. The macehead originally had well polished surfaces, but its surface has eroded since and many pits from disintegrated grains are visible on its surface. The perforation is biconical with concentric striations, but the drilling was not performed with great accuracy and the interior of the perforation is irregular. Both ends of the perforation are flattened by grinding. No percussive wear is visible on the surface of the macehead or around the perforation and its possible use for percussive activities cannot be substantiated.

22829.x4 (*GDN Area*): complete sub-spherical macehead that measures 63x62x48mm and weighs 286g. It is made of hard limestone/marble with a veined texture creating an interesting visual effect, especially where the surface of the object is well polished. The drilling of the central perforation was not executed to a high level and is off center. The interior of the perforation is well polished and this could relate to the way the object was hafted. The area around the perforation is flattened and small removals and chipping are visible in places around the perforation. The limited damage on the surface does not provide adequate information about a possible use in percussive activities.

22676.x1 (*North Area, B.131, Sp.500, F.7963, burial fill*): a macehead made of limestone (conglomerate) that was broken in half. The surviving dimensions are 32x64x48mm and the weight is 133g. The raw material is white and grey in colour and has rounded clasts. The surface is eroded and only in very small areas the original polished surface survives. The central perforation is very symmetrical and was executed well. No percussive wear are visible around the edges of the perforation.

Ground stone core

21661.k18 (*North Area, Sp.489, midden)*: a serpentinite nodule with evidence for sawing (ground stone core) that relates to the production of edge tools (i.e. stone axes, adzes and chisels) (Fig. 11.2). The nodule which is rectangular in plan view and in transverse section has two U-shaped grooves on two of its surfaces and was in the process of being sawn in half. The lack of waterworn surfaces and the overall shape of the nodule suggest that this was extracted via quarrying. Veins are running through the raw material and the texture is not homogenous. The presence of this core improves our understanding of the *chaîne opératoire* of edge tools at Çatalhöyük and suggests that not only river pebbles and cobbles were used as nodules

during production, but quarried material was also employed in the manufacture of these implements. The technological and social implications of this observation will be discussed elsewhere.

Figure 11.2. *Serpentinite nodule with evidence for sawing (Photo: Sophie Vullings).*

Querns

20892.x1 (*South Area, Sp.558, F.8003, construction/make-up/packing*) (Fig. 11.3): quern made of grey porphyritic andesite was found embedded in the West foundation wall (F.8003) in Sp.558. The quern measures 157x215x64mm (about half of the original quern survives) and weighs 2317g. It is ovate in plan view and has one concave use face which exhibits heavy degree of wear. This is one of the very few examples of querns with a deep concave use face found at Çatalhöyük to date (the majority of querns have flat or slightly concave use faces). The interior of the use-face is polished near the margins as a result of heavy use and has gone through different phases of use and maintenance prior to its deposition suggesting a long biography. The quern cut through several courses of mortar and brick (Excavation Unit Sheet) and was clearly added to the wall after its construction. The reuse of grinding tools as building material is a practice encountered in different Neolithic settlements as examples from the Levant and the Aegean suggest (Rosenberg 2013; Tsoraki forthcoming-a). A common assumption is that the incorporation of seemingly mundane objects such as grinding tools in walls and in other construction elements is guided by practical considerations and notions of efficiency. In the case of 20892.x1, considering that the wall was made up of bricks very uniform in size and shape, the embedded quern reduced the stability of the wall and therefore the incorporation of the quern within this foundation wall cannot be explained in purely functional terms. Instead, the act of placing of seemingly mundane objects in structural elements needs to be approached as a practice embedded in a wider frame of social meanings (Tsoraki forthcoming-a).

Figure 11.3. *Quern 20892.x1 that was found embedded in the foundation wall F.8003 in Sp.558 (Photo: Jason Quinlan).*

Figure 11.4. *The location of quern 20892.x1 in the foundation wall F.8003 (in the photo the courses of mudbricks and mortar are visible) (Photo: Christina Tsoraki).*

Figure 11.5. *Andesite 21767.x2 found in B.80, Sp.135. (Photo: Jason Quinlan).*

21767.x2 (*South Area, B.80, Sp.135, Level South O, floors (use*) (Fig. 11.5): quern made of pink andesite with porphyritic texture that was found within the make-up layer of the floor in the main room of the building. The use-face of the tool was never covered by the floor, but instead it was visible during the use of the floor and therefore it could have been used as a fixed grinding installation in this position. The quern belongs to a type of carefully manufactured grinding tools with regularly shaped margins and often body surfaces exhibiting a higher level of investment in their manufacture (Tsoraki forthcoming-b; Wright 2013). A groove that is 126.27mm long and 12.05mm wide and 7.46mm deep (deepest point) runs along the margins.

Comparative analysis of external areas and buildings: preliminary observations

Work on material excavated prior to 2015 continued and material unearthed from external areas was targeted for detailed technological and contextual analysis. The main focus was the study of Sp.488, Sp.489, Sp.490, Sp.511 (henceforth midden area), located in the North Area between B.77 and B.52, that contain midden deposits attributed to Level North G (Fig. 11.6). Justine Issavi (Stanford University) initiated a pilot refitting study of grinding tools looking for cross-contextual links between external and internal areas (see research projects below). While this study did not yield any refits between external and internal areas, the comparative study of the material highlighted variability in assemblage composition and degree of preservation between these sub-assemblages. The midden area contains a large number of natural waterworn limestone pebbles and a considerable amount of debitage of mostly pink andesite. The debitage consists of tertiary or rejuvenation flakes and is associated with the later stages of the production and the maintenance of grinding tools (grinders and querns). Units with distinct concentrations of debitage are (19564) and (20487) in Sp.489, and (20965) in Sp.511. As noted in the 2013 Archive report (Tsoraki 2013), (20965)

contained twelve flakes that come from the same reduction episode, some of which refit. The presence of flakes from the working of the same nodule and the overall good condition of the material possibly suggests *in situ* production of andesitic grinding tools. This observation provides further insight into the location of the production of grinding tools. While flakes of andesite are often present in floor assemblages (*dirty floors)* [e.g. B.89 and (21945); B.118 and (30615), see Tsoraki 2013]—an observation also made by Wright (2014)—the situation observed in Sp.489 and Sp.511 suggests that, at least in some occasions, the production of querns and of other grinding tools was carried out in external areas. Refits were established between (20965) and (20988), and (21661) and (21660). In addition, a few abrading tools including a grooved abrader and schist palettes were among the objects unearthed from the midden area.

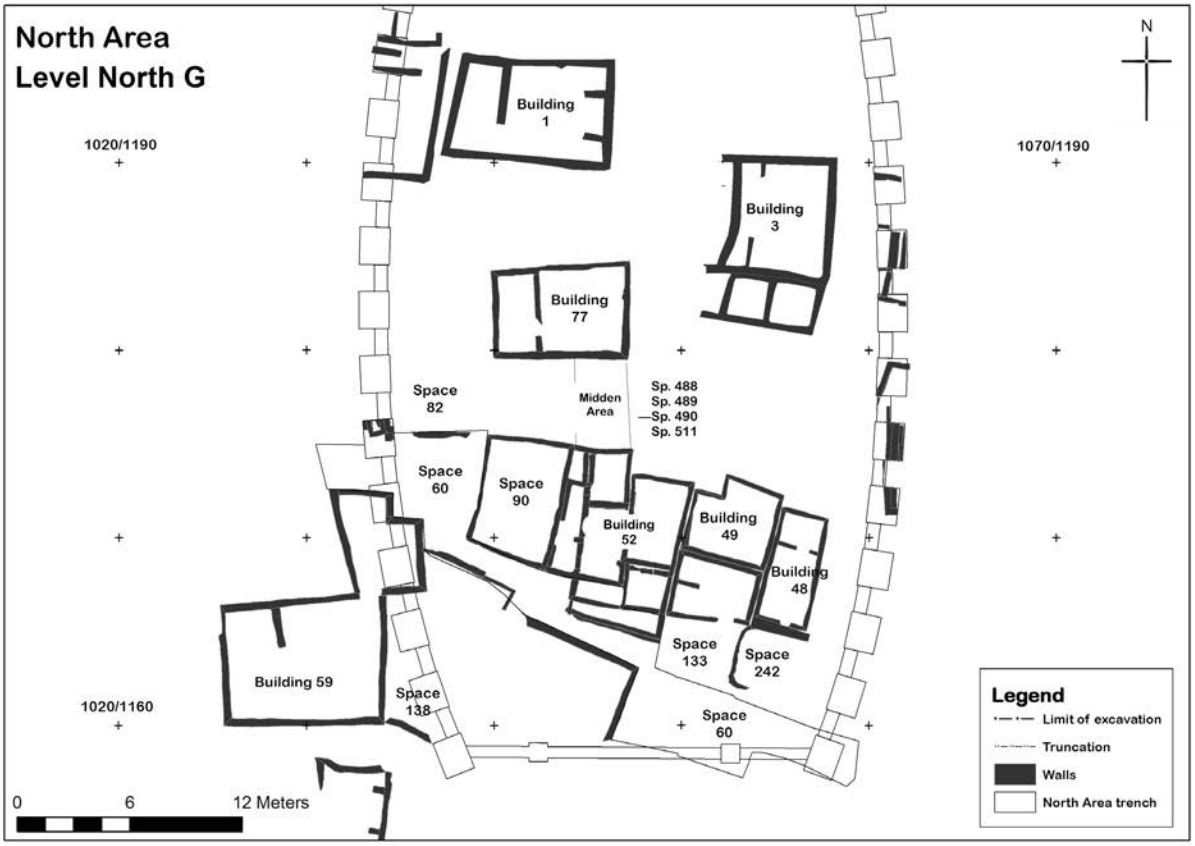


Figure 11.6. *North Area Level North G.*

Although analysis of the ground stone material from external areas is still on-going, there seem to be significant differences in the assemblage composition between B.77 and B.52, and the midden area, with grinding tools and fragments being more common in the buildings, while natural waterworn cobbles and debitage occurring more frequently in the midden area. Similarly, comparative analysis of the external spaces in the North Area and midden deposits excavated in the South Area (Sp.559 and Sp.510) also suggest variations in assemblage composition. The latter contained a large number of natural waterworn limestone pebbles and cobbles, while the presence of debitage was very limited. For instance, (22332) in Sp.510, flagged as a priority unit in 2015, contained in total 136 stone objects, 90% of which was natural waterworn pebbles of a similar size with grinding tool fragments making up *c*.2% of this assemblage. The varied levels of preservation and the presence of burnt and unburnt material suggest that this assemblage represents dumped material and not primary deposition. Space 510 is dated to Level South H and observed differences between this and the midden area in the North Area might relate to temporal variations, but could also

reflect variations in the formation processes of middens and ultimately in the way external areas were appropriated in different areas of the settlement and/or in different phases in the lifecycle of the settlement.

On-going research projects

Work on placed deposits and 'clusters' (cf. Tsoraki 2013) continued and in 2015 the stone component from deposit (11648), that was placed under the southwest platform of B.44 in the South Area (Level South S) and was originally excavated in 2005, was fully re-analysed. Emphasis was placed on the systematic recording of use-related attributes, fragmentation patterns and the overall state of artefact preservation. A refitting study was undertaken, while a large number of tools were selected for microwear analysis. The deposit contained 176 objects in total among which different types of grinding and abrasive tools (e.g. querns, grinders palettes), edge tools, and percussive tools (Tsoraki in preparation).

A project, in collaboration with the microbotanical team, investigating food processing techniques through the integrated study of microbotanical residues (phytoliths and starch) and the microwear analysis of different types of grinding tools continued with the sampling of tools originating from B.52, B.80, B.114, B.44, Sp.558 and Sp.556. Preliminary results of this integrated approach to the study of grinding tools were presented at the Association of Archaeological Wear and Residue Analysts (AWRANA) meeting held at Leiden University in May 2015 and at the EAA meeting in Glasgow in September 2015.

As part of her on-going project on the use wear analysis of the ground stone assemblage (Marie Curie Project CRAFTS), Tsoraki conducted the functional analysis of material that derives from B.77, B.52, B.79, B.80, B.89, B.44 and Sp.558. The on-site analysis was conducted with the aid of a stereomicroscope with coaxial illumination (perpendicular light) (Leica M80 and LED5000 CXI) and the use of silicone casts of high resolution impression material. The casts will be studied under a metallographic microscope (with higher magnifications up to 300x) and will be compared with material from the experimental ground stone collection located at the Laboratory for Artefact Studies at the Faculty of Archaeology, at Leiden University. Activities that have been identified so far through the functional analysis of the ground stone assemblage include plant processing, wood-working, plastering, clay processing, and pottery smoothing/burnishing.

A pilot refitting study of ground stone objects from internal and external areas

Justine Issavi, Stanford University

Introduction

A pilot refitting study of ground stone artifacts was conducted at the site of Çatalhöyük, Turkey, from July 1st to July 20th, 2015. The aim of the refitting study was to establish cross-contextual and cross-area use associations between internal and external contexts in order to better understand the movement of people and artifacts within and between areas on a neighborhood or multi-structure scale. The ground stone assemblages from two buildings (B.77 and B.52) along with the midden area between the two buildings (Sp.488, Sp.489, Sp.490, and Sp.511) were targeted for the pilot study (see Farid 2014; House 2014; Tung and Klimowicz 2013). The selected areas are broadly contemporaneous and are attributed to Level North G within Çatalhöyük's chronological scheme (Fig. 11.6).

Background

During 2013 field season, a fragment from a grinding tool recovered from an external context (13370) was refitted with other fragments, which were recovered from a cluster used as packing for the construction of the adjacent structure's oven (14078) (Tsoraki 2013). The characteristics of and the treatment of ground

stone—specifically the large grinding tools (Wright 2014)— at Çatalhöyük, along with a refitting precedent, provided the impetus for this project. The ground stone assemblage from B.77 and much of the assemblage from B.52 have been analyzed by ground stone specialists prior to the 2015 field season (Tsoraki 2014; Wright 2013). The ground stone material from the midden area was analyzed on an on-going basis throughout the 2015 season as the area was being excavated. Although initially this study focused on fragments of large grinding stones, such as querns, all ground stone artifacts from B.77, B.52, and the midden area (Sp.511, Sp.488, Sp.489, and Sp.490) were utilized in the study, with the exception of: complete artifacts, natural stones, beads, artifacts that had been relocated to off-site museums, and small pebbles from heavy residue samples.

Methods and results

Refitting generally consists of the identification and connection of two or more fragments that originally belonged to the same entity. Several methods for refitting exist across different artifact classes. This project utilized mechanical refitting conducted based on the physical attributes of the material that are visible to the naked eye and touch. These attributes include: geological category, raw material, artifact category, texture, striations, topography, and color of the artifact. The study was conducted in the Lithics Lab on-site, under the guidance of ground stone specialists Christina Tsoraki and Markéta Šťovíčková. Materials from the internal and external contexts were laid out on four tables in order to aid the visual identification of refits.

Cross-contextual refits consisted of a refit of a natural stone from (20965) and (20988), a midden and a fill layer in Sp.511, respectively (Fig. 11.7). Two sets of flakes were refitted from a single external context (19564) in Sp.489 (Figs. 11.8 and 11.9). However, refits across internal and external contexts were not iden tified. Beyond the stratigraphic relationship and the information provided by the section, no direct use-as-

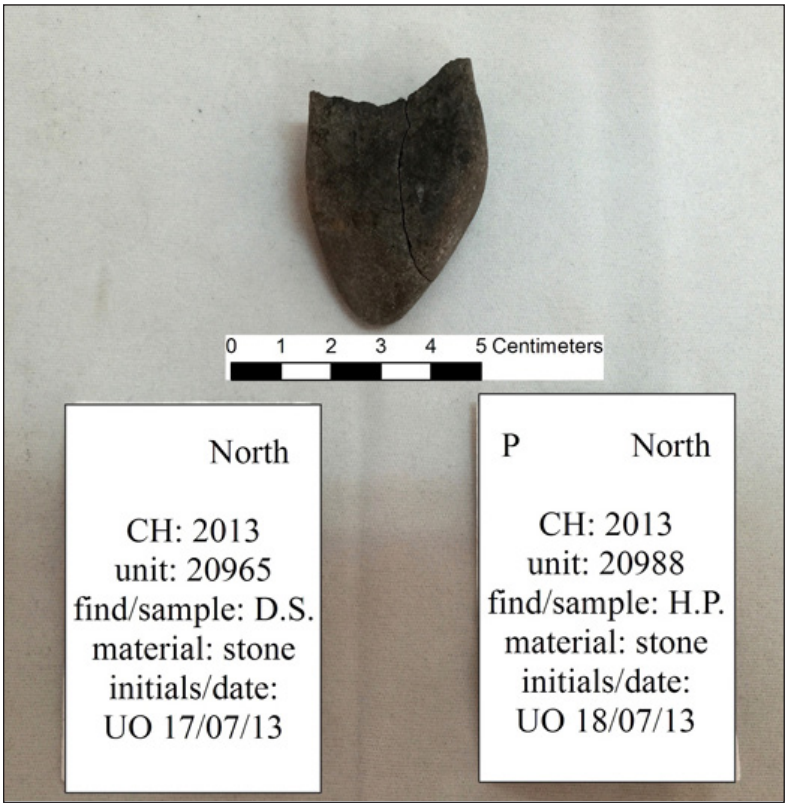


Figure 11.7. *Cross-contextual refit from external contexts.*

Figure 11.8. *Andesite flake refit from a single context.*

sociation between a building and the external space could be made based on the refitting of ground stone artifacts at this time.

Figure 11.9. *Andesite flake refit from a single context.*

Discussion

It is becoming increasingly clear that the deposition of ground stone varies across internal and external locations and practices and assemblages tend to be idiosyncratic and vary by structure and area. For example, the ground stone assemblage from Sp.511 differed greatly with the middens in the upper levels of Çatalhöyük, such as the middens from the TP Area (Tsoraki 2013: 185). While B.77's assemblage was dominated by grinding stone fragments and quern rough-outs, the midden assemblage was characterized by natural cobbles, flakes while the presence of grinding tool fragments was very limited. Furthermore, B.77 contained an extraordinary number of ground stone artifacts in relation to the other structures at Çatalhöyük (Tsoraki forthcoming-b; Wright 2013, 2014); even B.52 had a smaller and more varied assemblage (Wright 2013). Remarkably, a large part of B.77 and B.52's assemblage has been retrieved from the occupation deposits immediately preceding or associated with the buildings' conflagration and abandonment, pointing towards the relation of specific and distinct ground stone deposits with different phases in a structure's life (Tsoraki forthcoming-b). Instances of flakes refitting in external areas support the idea that the deposit could be *in situ* and that some activity related to ground stone production or maintenance occurred in external areas. It is important to note that the large clusters of flakes in the midden areas between B.77 and B.52—specifically, Sp.489 and Sp.490—are not typical finds in such quantities and concentration (Tsoraki, pers. comm.).

Furthermore, several refitted ground stone fragments (within and between contexts) reveal distinct wear traces, indicating differential use and treatment of the pieces post-fragmentation (Tsoraki in prepa-

ration; Tsoraki 2013). Accordingly, the investigation of distinctive depositional practices and patterns of ground stone use at Çatalhöyük could provide an avenue for the study of various types of external spaces throughout its sequence. While this pilot does not eliminate the possibility of refits across internal and external spaces at Çatalhöyük, it does highlight important peculiarities in depositional practices and patterns of ground stone use.

References

Farid, S.

2014. Buildings 52/51. In *Çatalhöyük Excavations: The 2000-2008 Seasons* (Çatalhöyük Research Project Volume 7), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 357-398.

House, M.

2014. Building 77. In *Çatalhöyük Excavations: The 2000-2008 Seasons* (Çatalhöyük Research Project Volume 7), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 485-503.

Rosenberg, D.

2013. Not 'just another brick in the wall?' The symbolism of groundstone tools in Natufian and Early Neolithic southern Levantine constructions. *Cambridge Archaeological Journal,* 23(02): 185-201.

Tsoraki, C.

2008. *Neolithic Society in Northern Greece: The Evidence of Ground Stone Artefacts*. PhD Thesis, University of Sheffield.

2013. East Mound ground stone. In *Çatalhöyük Archive Report 2013*, http: //www.catalhoyuk.com/downloads/Archive_Report_2013.pdf.

forthcoming-a. Biographies of buildings and objects: deconstructing the social significance of the reuse of ground stone artefacts as building material in the Neolithic.

forthcoming-b. The ritualisation of daily practice: exploring the staging of ritual acts at Neolithic Çatalhöyük, Turkey, in I. Hodder (ed), *Religion, History and Place in the Origin of Settled Life*: University of Colorado Press.

In preparation. Ritual and domestic: grinding activities as a history-making process at Neolithic Çatalhöyük, Turkey.

Wright, K.I.

2013. (with contributions by C. Tsoraki and R. Siddall) The ground stone technologies of Çatalhöyük. In *Substantive Technologies at Çatalhöyük: Reports from the 2000-2008 Seasons* (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 365-416.

2014. Domestication and inequality? Households, corporate groups and food processing tools at Neolithic Çatalhöyük. *Journal of Anthropological Archaeology,* 33: 1-33.

Chapter 12

East and West Mound Ceramics

Duygu Tarkan, Ingmar Franz

East Mound ceramics

Duygu Tarkan, Istanbul University

Between June 20th and August 19th the ceramic lab carried on East Mound ceramics by Duygu Tarkan with assistance of Duygu Ertemin and Kerim Ergen and also the special participation of Rosemary Joyce and Russell Sheptak.

The main aims were:

- To edit the crate registers on the Finds Register Database
- To process newly excavated material derived from the North, South, TPC and GDN Areas and provide feedback on material derived from priority units excavated during the season.
- To continue registering material from TPC, South and North Areas excavated in 2012-2013-2014 seasons

The majority of material from the 2015 excavation came from the TPC Area, smaller quantities from the GDN Area and significantly less from the North and South Areas.

South Area

In 2015 season, no pottery was recovered from inside of the buildings (B.80 , B.89 , B.96, B.32, B.160 and B.17) that were excavated in the South Area. The primary reason for this is because the majority of internal spaces produced relatively small ceramic assemblages in Çatalhöyük (Last 1999; Yalman *et al.* 2013). Also, 2015 excavations mainly concentrated on the lower levels where less pottery was likely to be found.

It has long been clear that the external middens contain most of the site's ceramics. The only excavated context which contains ceramics in the South Area from this year is a midden Sp.552 located between B.118 and B.160. Twelve sherds from Sp.552 (22320) , (22332) were all chaff tempered bowls i.e. typical examples of early pottery tradition on the site. One profile of an open hemispherical bowl (22320) has been found, first seen in Hodder Level South L in the midden Sp.115, and was allocated to Mellaart Level VIII. The Sp.115 midden materials are also dominated by typical Early Neolithic wares: unoxidized fabrics tempered with abundant coarsely chopped vegetable matter; smoothed or burnished mottled surfaces ranging from dark grey to light yellowish brown in color; thick-walled simple bowl forms with upright rims and extremely thick flat bases (Last 1999). However, some sherds have thickened rim parts which are characteristic for Mellaart Level IX. Therefore the midden Sp.552 should be taken in correlation with higher phases of Level IX and lower phases of Level VIII.

North Area

One of the prominent contexts seen in the North Area excavations is defined as midden (Sp.489). Ten sherds were found in Sp.489. Five of these were thin-walled Dark Gritty Ware, resembling Mellaart Level VIII tradition; others were thick-walled Light Silty Plant-tempered ware which is a typical example of early level ceramic production seen in Mellaart Level XI to Level VIII. Due to a simultaneous occurrance of the two ware groups, it is possible to say that the midden could be dated to the transition layer from the early

levels to the middle levels. As we mentioned above (See South Area section), middens are important contexts in terms of obtaining the ceramic material. The amount of materials derived from midden contexts which were excavated in previous years from North Area also proves this. However, only a small amount of ceramic sherds was encountered in this midden. This is probably due to the fact that in the early levels smaller quantities of ceramic vessels were produced.

Another significant ceramic assemblage from the North Area excavations came from infill of B.131/B.129 (22642). Twenty-two sherds were found. There are two half profiles, comprising seven and eight sherds which all display old breaks. All sherds belong to one of the uncommon ware groups, i.e. Red ware. This group is thought to be related to the Taurus Mountains in the south of Konya Basin. This ware group has reddish surface and a paste with coarse-grained mica-schist and phyllite content that can easily be distinguished (Tarkan 2015). It is noteworthy that twenty-two sherds that belong to this ware group, which is generally represented in low numbers across the settlement, were found in a single building. Similar densities of Red Ware group were also uncovered in B.68 (in the South Area) and B.55 (in the North Area) respectively. It is important to mention that all three buildings belong to correlated levels. Plans for further investigation of the community based relationship between these buildings have already been made.

GDN Area

A relatively large assemblage of pottery that belongs to later levels was recovered from the GDN Area. The largest group consisting of a hundred sixty-eight sherds came from midden Sp.561 (22811). According to rims and base parts of the sherds it is possible to say that they belong to nine different vessels. There is a greater range of wares found in this area belonging to ware groups that had been previously recognized, that is to say no new ware groups were documented. Two of these ware groups belong to uncommon subgroups of Light Silty ware which had only been documented in Levels South S and North I. One bowl with S-profiled wall and everted rim type had also been discovered in Level South S.

***Figure 12.1**. (22833) Vessel placed in the floor of Building 2.*

The most striking find for the ceramic team during the 2015 season was the almost complete vessel (Fig. 12.1) found placed on the floor of B.2 (22833). Due to very fragile structure it is hypothesized that the vessel was first found during the 1960's excavations and subsequently buried again after being left for some time in unfavorable conditions. This vessel has a large sized bowl form with rounded junction which is not typical for the late level traditions.

According to Marek Baranski, who is conducting the GDN excavations, the area can be related to B.81 which was uncovered during TP Area excavations in the previous years. For the purposes of answering this question it is planned to look into the materials of GDN Area and B.81 in comparison during 2016 season.

TPC Area

TPC excavations that have begun to provide links between South and TP Areas, also yielded the largest proportion of ceramic materials since 2012.

This season we focused primarily on pottery from contexts uncovered from 2012 to 2014 seasons. The excavated contexts belonging to later Neolithic levels of the site reflected the disturbance made by activities in later periods (Chalcolithic, Bronze, Hellenistic and Roman Age). So far we processed 12,554 (375.4kg) sherds. The post-Chalcolithic sherds were sorted, counted, weighed and registered in the database. The Neolithic pottery sherds were sorted by their contexts, compared and/or merged with material from previous years and studied in detail. The sherds coming from the later levels of the site, as mentioned earlier, are important to understand the later traditions. For instance, the B.110 is in the same level as B.5, which was excavated by Mellaart in 1960's and has been identified as Level III (see archive report 2014).

The overall assessment of studied materials coming from the TPC Area, and particularly Trench 4, shows similarities with Levels South S-T, North J, TP M-N and IST Area by existence of Collared / S-Profiled forms, larger vessels, more bowl forms rather than deep-jars, enlargements of the wall thickness, increase of red slipping surface treatments and variations of the ware groups. Another thing that should be noted is that the one of the typical wares of Level TP O defined as Shelly Ware was not seen in the TPC Trench 4. This situation strengthens the probability that the material could be earlier than the Level TP O layer. In the long season, intended to clarify this, it is planned to complete further detail analyses of all assemblages uncovered in this area.

Some of the most significant finds in 2015 season are two vessels found in an infill of a Hellenistic pit (21084) in north part of Trench 4. One of these is a simple cooking pot seen in Hellenistic period (Fig. 12.2). The other one is an "oinochoe form" which is a wine pitcher characterized by a trefoil or clover shape mouth and a curved handle extending from the rim (Fig. 12.3). According to records found in Konya Archaeological Museum this pottery form can be dated to 330-300 BC in the Konya region.

Figure 12.2. *Hellenistic cooking pot (21084).*

Figure 12.3. *Hellenistic oinochoe (21084).*

Another outstanding find is an incised decorated base sherd (Fig. 12.4) from the infill layer (22764) located in west part of the Trench 4. The very well made curves of this decoration almost look like relief. Horn-like lines that can be seen on this base sherd resemble the bucranium decoration found on the well-

known face pot (Fig. 12.5). The pot is ring based with foot and slightly ellipsoid in shape, like the elaborated ceramics in Catalhoyuk.

This project was financed by the Polish National Science Centre; decision DEC-2012/06/M/H3/00286

Figure 12.4. *Incised Decoration (22764).*

Figure 12.5. *Face pot.*

Whole pots in houses: review of trends

Rosemary A. Joyce and Duygu Tarkan

Were the sizes of pots embedded in the floors of houses systematically related to the size of the community of people who took part in activities in those houses? To address this question, we reviewed the data recorded for 13 complete hole mouth jars of Dark Gritty Ware that were found embedded in the floors of houses. All but three of the buildings (B.3, B.73, and B.75) were recorded as completely excavated. Key re-

Unit No.	Weight (g)	Rim diameter (mm)	Base diameter (mm)	Depth (mm)	Body diameter (mm)	Height (mm)	Width (mm)	Body thickness (mm)
10044.S2	2500	200	100	292	280	310	230	6.4
10664.x1	192	100	60	95	120	119	97	4.6
10673.x1	1500	140	80	221	250	105	160	6.4
11235.x1	380	140	72	182	185	190	173	5
11446.S2	1238	160	83	225	245	235	216	5.6
12839.x1	109.2	100	45	90	45	116	114	4
13925.S1	546.4	120	65	151	170	145	155	7.6
13970.x1	1105	142	65	170	160	177	182	5.3
14515.x1	2300	185	75	270	255	280	255	6.8
15282.x5	1272	100	60	175	180	190	170	7
16221.x1	594	110	50	134	150	145	134	6.2
5417.x1		130	75	185	240	200	210	6.5
5430.S1	1600	110	65	250	250	260	200	7.2

Table 12.1. *Complete hole mouth jars from excavated houses.*

corded data for each pot initially examined were weight; rim diameter; body diameter; base diameter; depth; height; and body thickness (Table 12.1). In one case, weight was missing from the data record.

Our analysis had two stages: understanding variability in the whole vessels; and assessing correlation with size-related variables and the number of people related to a house, using burials in the house as a proxy.

Variability in whole vessels: Size versus shape

Using an exploratory data analysis program (Datadesk), we reviewed every pair of recorded data for each pot in order to understand the relationships between different potential measures of size (rim, body, and base diameter, depth/height, and weight). We expected weight to be correlated with rim diameter, because we assumed rim diameter would have a regular relationship with size, increasing as pots increased in size to allow access to the interior of the vessel. However, rim diameter and weight proved to be only weakly correlated (Fig. 12.6).

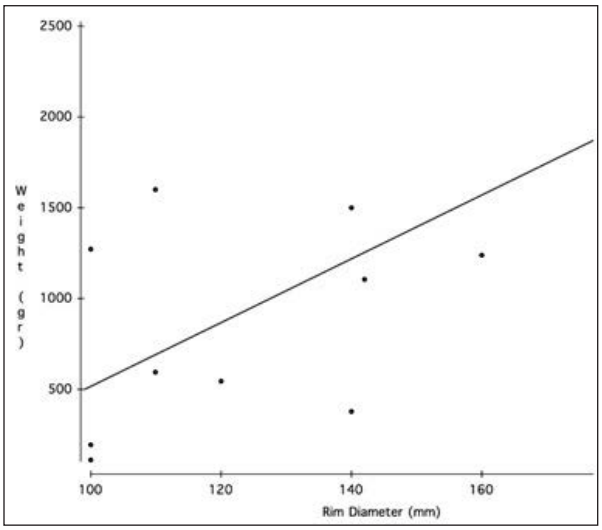


Figure 12.6. *Weight of vessel by rim diameter.*

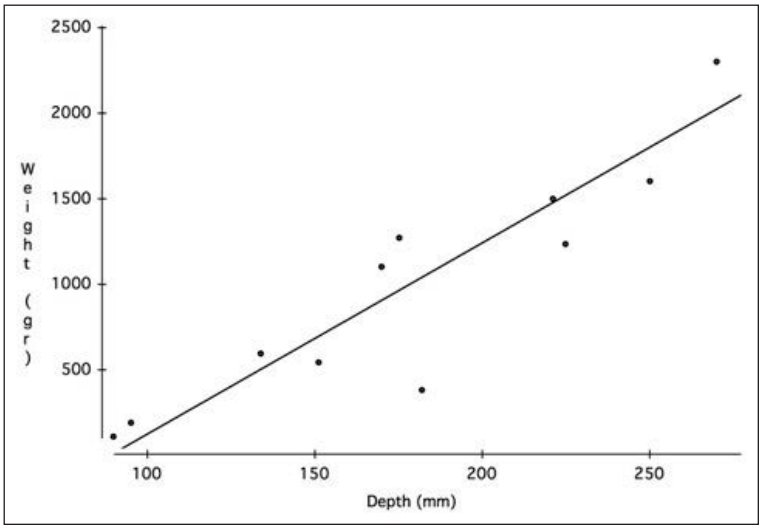


Figure 12.7. *Weight of vessel by depth.*

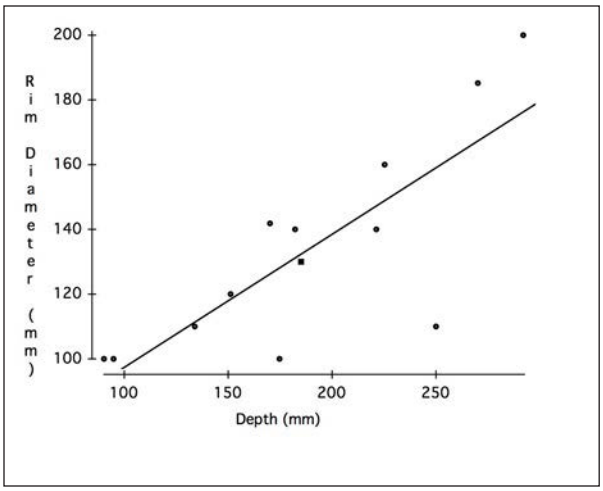


Figure 12.8. *Rim diameter by depth.*

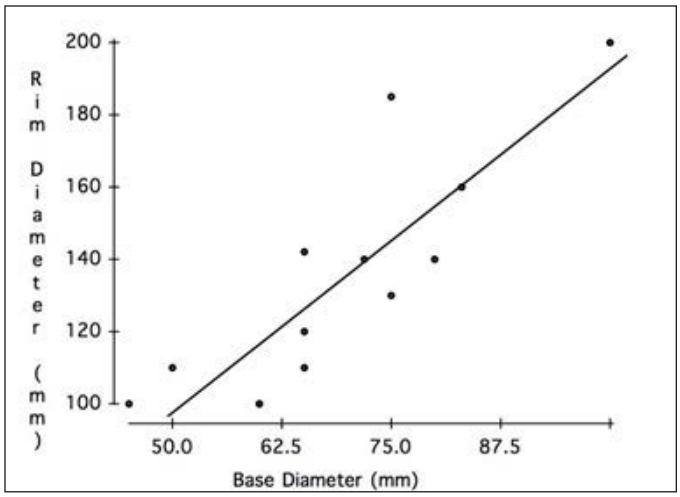


Figure 12.9. *Rim diameter by base diameter.*

The strongest correlation of vessel weight was with depth and height. Depth and height are two measures of the same characteristic: the vertical dimension of the vessel. Of the two, depth (interior measurement) proved to be the most tightly correlated with weight (Fig. 12.7).

We next examined the relationship between depth and rim diameter, hoping that this would show a regular relationship, with deeper vessels having larger rims. While weaker than the relationship of depth to vessel weight, there was a relatively strong relationship of rim diameter to depth (Fig. 12.8). A stronger relationship was demonstrated between rim diameter and base diameter (Fig. 12.9). This suggests that rim diameter reflects the potter's shaping of vessel symmetry.

Following these initial indications that rim diameter does not closely vary with other indicators of vessel size, a series of regression analyses were carried out. They indicate that the best indicators of vessel size are a combination of vessel weight, depth, and body diameter. Rim and base diameter, or either alone, are indications of vessel shape (symmetry). The correct variables to assess vessel size in relation to house related population, therefore, would be depth, body diameter, or weight (or all three).

Unit	Building	Weight (g)	Body diameter (mm)	Depth (mm)	Number of burials in building
10044.s2	45	2500	280	292	7
10673.x1	44	1500	250	221	10
5430.s1	42	1600	250	250	8
11446.s2	44	1238	245	225	10
5417.x1	42		240	185	8
14515.x1	65	2300	185	270	17
11235.x1	44	380	185	182	10
15282.x5	73	1272	180	175	0
13925.s1	63	546.4	170	151	2
13970.x1	63	1105	160	170	2
16221.x1	75	594	150	134	3
10664.x1	44	192	120	95	10
12839.x1	56	109.2	45	90	4

Table 12.2. *Hole mouth jars from excavated houses sorted by body diameter.*

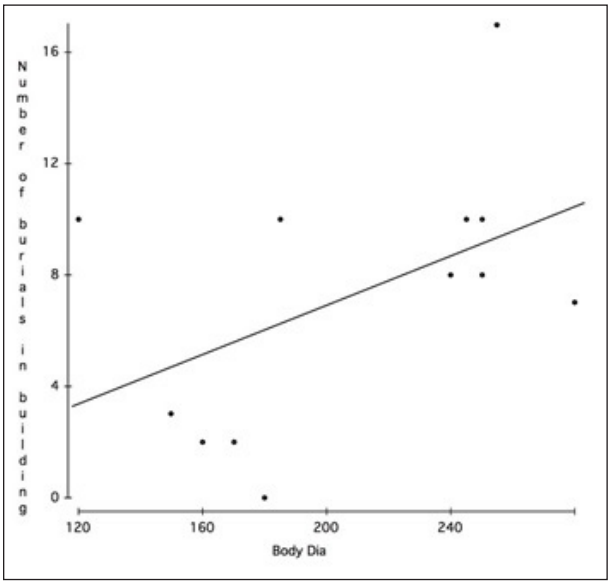


Figure 12.10. *Rim diameter by base diameter.*

Relating pots to houses

Our next step was to use exploratory data analyses to see if pot size, measured by the three identified characteristics, was related to the population of people who were engaged with each house. The underlying assumption would be that the pot volume would increase as the number of people who might be fed during one event increased. Burial numbers served as a proxy for the population size that could be engaged in an event at a specific house. Simple examination of the data shows that the largest pots are not apparently concentrated in houses with the largest numbers of burials (Table 12.2). One anomalous record was noted at this point (a vessel with a recorded rim diameter of 100mm, and a recorded body diameter of only 45 mm; this vessel was excluded from exploratory data analyses using this measurement).

Regression analysis of body diameter with number of burials showed very little correlation between them, evident in the scatterplot of these two variables (Fig. 12.10). None of the other variables measuring size (including rim diameter, depth, and weight) showed a stronger relationship with number of burials in the house.

As a final attempt to discern a relationship between the size of a population related to a house, and the possession, incorporation in the house, and display and use of pots, we examined the possibility of a correlation between number of burials of humans, and number of buri-

als of pots. For each house, this involved examining possible relations between number of burials, number of pots, and a measure of the total weight of all vessels in the house (adopted as a possible measure of pot size, given the relationship demonstrated between weight and depth of pots).

Number of burials in a house was virtually unrelated to number of pots in the house. Weight of all pots in a house was slightly more strongly related to number of burials in the house, but not significant statistically.

Conclusions

The sample size involved is very small, and thus the relationships between the small number of whole pots and the houses that contained them might be expected to be uninformative. With one exception, all the recorded whole pots in house floors came from buildings with burials. The houses with multiple pots were at the high end in numbers of burials as well: two or more pots were found in houses with eight or more burials. However, the house with the largest number of burials (17) contained only one pot. While there likely are relationships related to social ties behind the co-occurrence of pots and burials in some houses, these are apparently more indirect than would be expected if pots were present to serve groups of people of different sizes.

Research projects

Professor Rosemary Joyce and Russell Sheptak from UC Berkeley, with the participation of Duygu Tarkan, continued their research titled "*Making of pottery at Çatalhöyü*k".

The main aim of the research is to address the question was the pottery in Neolithic Çatalhöyük made by a range of producers with different approaches? The concept of "community of practice" suggests that an assemblage of pots reflects the group of people who made them, because those people learned socially not just how to make pots, but what constitutes a good pot. We can study individual pots (or sherds) using the *chaine operatoire* to reconstruct a set of steps involved in making a single pot. If we find repeated sequences of steps, then we might be able to talk about a "technical/technological style", a way of making that was socially reproduced. Technological style results from the learning, expertise, and innovations of people, people who make up a community of practice (for the details see Archive Report 2014).

For several seasons now we have already been doing preparation work in order to delve deeper into a number of particular questions. One of our main objectives for the season 2016 is to try and answer weather it is possible to identify the rise of individuality based on the ceramic assemblages.

Also in coloboration with West Mound Pottery specialist Ingmar Franz and with Lucy Ebony Bennison-Chapman, who is driving the Geometrical Clay Objects, we will try to make sense on some overlaps between the clay-based materials. These overlaps mainly classify as; small unfired clay balls and unfired pottery, pottery production wastes, shaped pot sherds and miniature vessels. However, the cooking practices ranging from the early to the later levels on the site also included in the team's future work program.

References

Last, J.

1999. Pottery. In *Çatalhöyük Archvie Report 1999*, http: //www. catalhoyuk.com/downloads/Archive_Report_1999.pdf

Doherty, C. and D. Tarkan

2013. Pottery production at Çatalhöyük: a petrographic perspective. In *Substantive Technologies at Çatalhöyük: Reports from the 2000–2008 Seasons* (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 179-189.

Yalman,N. , D. Tarkan and H. Gültekin
2013. The Neolithic pottery of Çatalhöyük: recent studies. In *Substantive Technologies at Çatalhöyük: Reports from the 2000–2008 Seasons* (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 143-179.

Özdöl-Kutlu, S. and D. Tarkan
2014. Ceramics. In *Çatalhöyük Archive Report 2014*. http: //www.catalhoyuk.com/downloads/Archive_Report_2014.pdf

Tarkan, D.
2015. *The Investigation of Clay Use and Resources of the Neolithic Pottery at Çatalhöyük East Mound*. Unpublished MA Thesis, Istanbul University

West Mound ceramics, Trenches 5-7

Ingmar Franz

Pottery crates inventory and first level registration

During the 2015 excavation season, the sorting of diagnostic and undiagnostic material (based on morphological features of a sherd), and the weighing and counting of sherds was completed for all units from the years 2007-2013. In total 1,773.464kg of pottery were registered, which comprises 817.190kg of diagnostic pottery (46%) and 956.456kg of undiagnostic pottery (54%). The total sherd count is 84,107, which consists of 19,792 (23%) diagnostic pieces and 64,315 (77%) undiagnostic pieces. This means that the average weight of a diagnostic sherd is *c*.41g, and that of an undiagnostic sherd *c*.15g. On average, diagnostic sherds are *c*.2.7 times heavier, and therefore also in the same degree, larger then undiagnostic sherds (see Table 12.3).

Space	Unit	Unit description
340	16880	room fill
	17213	pottery cluster
	17225	room fill
	15389	artifact cluster
	16950	room fill
	16992	fill above floor
341	18313	room fill
	16980	room fill, 5 vessels and ^{14}C-sample
	16989	unfired pottery cluster
452	15340	room fill, also Sp.450
	16976	fill above floor, also Sp.449 and Sp.450

Space	Unit	Unit description
449	15160	artifact cluster, 12 vessels
	15180	room fill, 12 vessels
	15343	clay ball cluster
	15362	fill around clay ball cluster
	16942	fill above surface
	16948	artifacts on surface
	16976	fill above plaster floor, also Sp.450 and Sp.452
450	15178	room fill
	15177	room fill, 3 vessels
	15340	room fill, also Sp.452
	15377	pottery + bone cluster
	16976	fill above floor, also Sp.449 and Sp.452

Table 12.3. *Units chosen for a representative pottery sample of Building 98.*

In total the pottery material from Trenches 5-7 is distributed across 118 find crates. Most of the crates contain just diagnostic and/or undiagnostic material, but 23 special crates contain the following pottery categories:

- Vessels and vessel segments (11 crates)
- Unfired pottery incl. badly fired pottery and vitrified pottery (2 crates)
- LATE pottery (wheel-thrown pottery), roof tiles, and fired bricks (3 crates)
- A representative sample of diagnostic and undiagnostic pottery from all units associated with B.98 (2 crates)
- All pottery sherds from floatation (all excavation seasons) (1 crate)
- Pottery sherds with basket impressions, manufacture and repair traces, and used or worked sherds (1 crate)
- Sherds with deposits (1 crate)
- Incised pottery (1 crate)
- Pottery with special decoration patterns, sherds with figurative representations, sherds with special fabrics, and sherds with special morphological elements (1 crate)

A representative pottery sample of Building 98

Due to the large quantity of pottery unearthed during eight excavations seasons in Trenches 5-7 (2006-2013), 20 out of 83 units (24%) from the Building 98 fill units were selected for detailed analysis. It was considered that each space is represented equally with an upper fill unit, a central fill unit and the lowest one above a floor or surface. Also all units containing artifact clusters and ^{14}C-samples were included (Table 12.4).

Space	Unit	Unit description	Space	Unit	Unit description
340	16880	room fill	449	15160	artifact cluster, 12 vessels
	17213	pottery cluster		15180	room fill, 12 vessels
	17225	room fill		15343	clay ball cluster
	15389	artifact cluster		15362	fill around clay ball cluster
	16950	room fill		16942	fill above surface
	16992	fill above floor		16948	artifacts on surface
341	18313	room fill		16976	fill above plaster floor, also Sp.450 and Sp.452
	16980	room fill, 5 vessels and 14C-sample	450	15178	room fill
	16989	unfired pottery cluster		15177	room fill, 3 vessels
452	15340	room fill, also Sp.450		15340	room fill, also Sp.452
	16976	fill above floor, also Sp.449 and Sp.450		15377	pottery + bone cluster
				16976	fill above floor, also Sp.449 and Sp.452

Table 12.4. *Units chosen for a representative pottery sample of Building 98.*

All diagnostic and undiagnostic pottery from the units above (Table 12.4) was laid out and photographed for detailed off-site analysis, which is currently in progress at Kiel University.

Vessel Number	Unit number	Vessel description
V226	15358	square flat bowl
V227	16997	flat miniature bowl
V228	16997	bowl
V229	16967	painted bowl
V230	31233	miniature square bowl
V231	16949	painted bowl
V232	16949	painted angular bowl segment
V233	16949	painted bowl
V234	19912 (Trench 8)	miniature dark-fired carinated bowl segment
V235	15180 + 16942 + 16963 + 16964 + 16976	miniature painted necked jar with lid perforated support
V236	15180	painted necked jar with two handles segment
V237	13700 + 31169 + 31206 + 31207 + 31215	red slipped incised necked jar segment
V238	18321 + 18343	carinated cooking pot with two lugs and special fabric
V239	15359.x4	painted necked jar segment
V240	17280	painted necked jar segment
V241	15160	red slipped incised carinated ring-based bowl segment
V242	15180	painted basket-handled necked jar segment
V243	15180	painted necked jar with two handles segment
V244	15180	painted necked jar with two handles segment
V245	15343	painted necked jar with human representation segment
V246	15343.x13	painted boat-shaped ring-based bowl segment
V247	16896 + 18341	spoon segment
V248	16936.x13	painted basket-handled ring-based carinated bowl segment

Table 12.5. *Vessel Numbers assigned to West Mound pottery in 2015*

Definition and documentation of vessels and vessel segments

Work on improving the definition and documentation of vessels and vessel segments continued during 2015. This season, 23 new vessel numbers (V226 – V248), representing a range of different vessel variants, were assigned to pottery from the West Mound (Table 12.5).

Numerous series of photographs for 3D modeling were taken from a total of 26 defined vessels, in order to obtain vessel body volume and capacity via. digital pottery vessel reconstruction. The weight of each of these fragmented vessels was also recorded to be able to calculate the weight of their original complete versions.

Basket impressions on pottery and on unfired clay balls – 3D documentation

Good examples of pottery sherds and vessel segments, and also unfired clay balls with basket impressions, were photographed for 3D modeling. Primary goal is a classification of these imprints to facilitate the distinction of different basketry techniques.

Clay balls

The Trench 5-7 clay balls, which are almost entirely balls or spheres of unfired clay or fragments of such-like, are numerous, filling eight find crates. Each and every single clay ball was cleaned, registered and weighed. Beside the vast majority of unfired small clay balls, also some examples of unfired small marl balls, a few fragments of larger typical East Mound fired clay balls were recognized. A detailed analysis was carried out on the large clay ball cluster from (15343), Sp.449 in B.98 (Fig. 12.11).

The most important observations and discoveries of this process are the finding of a larger clay “master ball” (which looks more like an amorphous lump of clay consisting of pressed-together clay balls), many clay balls with basket impressions, three different clay composition variants, and generally a high variety of shapes and sizes of balls or spheres (Fig. 12.12). Data processing is currently in progress at Kiel University.

Like for pottery vessels, several photography series were undertaken, to enable the 3D modeling of a number of clay balls. The artefacts were selected to cover the range of types represented from Trenches 5-7. It is hoped that these models will facilitate volume calculations and mass calculations.

Figure 12.11. *One part of the (15343) clay ball cluster laid out in the pottery lab 2015.*

Figure 12.12*. The amorphous unfired clay "master ball" from (15343).*

Potstands and clay objects

The final registration of potstands and all other clay objects (except figurines) was started, but could not be finished this season. Like for pottery and clayballs also representative potstands and potstand segments were photographed for 3D modeling.

Export samples 2015 – clays and pottery with deposits

This season 13 clay samples from (15343), the clayball cluster and 30 pottery sherds with thick calcareous deposits were exported for combined pXRF-MGR-Analyses.The main goals of this is the detection of material compositions, the detection of clay mixing, and a plausible explanation of the nature of the thick calcareous deposits observed on many pottery bowls found in Trenches 5-7.

Chapter 13

Geometric Clay Objects from Çatalhöyük East

Lucy Ebony Bennison-Chapman

Introduction and background

Thousands of clay artefacts have been recovered from Çatalhöyük East South Areaince excavations began. Many are easily recognisable as common artefact types, as such they can be placed into one of the numerous classifications including clay figurines (Chapter 9), pot stands, spindle whorls, stamps (Cassidy 2008; Türkcan 2005, 2015), large Clay Balls (i.e. Atalay 2009, 2012; Atalay and Hastorf 2006). Yet also recovered, less easily identified, and more difficult to differentiate from one another are numerous pieces of structural material, smaller, naturally shaped clay pieces, small un-shaped clay clumps, and small, intentionally shaped, geometric clay objects (spheres, cones discs, etc.). Small geometric clay objects or "tokens" as they are more commonly known (Schmandt-Besserat 1992a, 1992b, 1996) first appear in the archaeological record of the Near East at the start of the Neolithic period. They are present at Çatalhöyük East from the earliest levels, appearing to increase during the site's long occupation sequence (Bennison-Chapman 2014). This much understudied artefact category continues to be found at sites across the region into the first millennium BC. The function of "tokens" within communities is understood from the 4th millennium onwards, where it is largely agreed these objects were used in administration, alongside other technologies (writing, stamp seals and sealings), as a way of keeping track of stored, acquired and exchanged goods and commodities. Research has focused on the role of clay objects from the proto and historic period, with investigation into the form, role of function of small clay objects at Neolithic sites remaining largely ignored.

The Geometric Clay Object assemblage

Figure 13.1. *Selection of Small Geometric Clay Objects studied during the 2015 season. Top left: cylinders (database #'s 3295 and 3357), right: cones (database #' 3335, 3339 and 2987) and bottom left: spheres (find numbers 21101.m101-m125/database #3515-3538).*

(a) Small Geometric Clay Objects

Çatalhöyük's Small Geometric Clay Objects (Fig. 13.1) have been studied under the current strategy since 2009 (Bennison-Chapman 2013, 2014). A total of 1,260 objects have been recorded in detail since this date, 365 alone during the 2015 excavation season (Table 13.1). Current research at Çatalhöyük seeks to investigate the nature, use and function of these enigmatic artefacts (Fig. 13.1). As a category, the study objects are defined as small (i.e. < 5.00cm), intentionally made and geometric shaped objects. They tend to be made of clay, although some comparative examples in stone are found. Previously, such objects have often been classified at Çatalhöyük along with material from "Shaped Clay", "Clay Object", and "Clay Scrap". Others have fallen into the

classification of "Figurine" (though some overlap between the classification of clay objects between the "Small geometric" and "Figurine" categories inevitably remains). According to the classification system above, all artefacts previously designated as "Mini Clay Ball" (e.g. Atalay 2001, 2005, 2013: 247-52) now fall within the "Small Geometric Clay Object" category. All Small Geometrics are studied in detail, with a range of characteristics covering various aspects of appearance (e.g. weight, dimensions, shape in two dimensions from three angles, three dimensional shape) manufacture (e.g. clay colour, fabric, finish, inclusions, impressions, nail and finger impressions), use and post depositional treatment recorded. This is then studied in conjunction with details of the find context of each and every individual Small Geometric Clay Object recovered. Research to date suggests that at Çatalhöyük, Small Geometric Clay Objects were multi-functional tools, likely used in counting, as well as other activities including gaming and ritual (Bennison-Chapman 2013, 2014).

ARTEFACT TYPE	SEASON STUDIED		
	2009-2014	2015	TOTAL
(a) Small Geometric Clay Object	895	365	**1260**
(b) Large Clay Ball	n/a	381	**381**
Combined	**895**	**746**	**1641**

Table 13.1. *Summary of the number of registered and studied geometric clay artefacts from Çatalhöyük East during the 2015 season.*

Figure 13.2. *Selection of Clay Balls (almost all are fragmentary) awaiting to be studied, 2015 season.*

(b) Large Clay Balls

In addition to the work above, this season preliminary work was resumed on the category of artefacts classified as large clay balls (henceforth Clay Balls), previously studied by Sonya Atalay, interpreted as tools used to provide heat during cooking (Atalay 2001, 2005, 2009, 20012, 2013; Atalay and Hastorf 2006). A total of 381 Clay Balls, mostly fragments were studied during the 2015 excavation (Fig. 13.2, Table 13.1). More retrieved during 2015 remain to be studied in the forthcoming seasons. Due to the homogenous nature of this object category, Clay Balls are recorded in slightly less detail than their small, geometric counterparts. Çatalhöyük's Clay Balls are immediately recognisable due to their large size, which can be divided into two broad size groupings, standard (diameter approximately 7.00cm-10.00cm) and the less common smaller version which measure around 6.00cm in diameter (still significantly larger than the largest of the spherical Small Geometric Clay Objects, group (a) above). Çatalhöyük's Clay Balls are crafted from a fine, highly compacted clay, with few visible inclusions. They have an extremely smooth outer surface, which often exhibits shallow fingertip depressions from manufacture. In weight, they are dense, with a small fragment weighting significantly more than a Small Geometric Clay Object or clay figurine of a comparable size. These characteristics combined make Çatalhöyük's Clay Balls, including even small fragments of them, immediately recognisable.

Results

(a) Small Geometric Clay Objects

Of the 365 Small Geometric Clay Objects studied in 2015, many (43%) were excavated during the 2015 field season, yet a number were excavated in previous years. These had been registered, yet not yet studied in detail (Table 13.2). The 2015 study assemblage covers a wide range of three dimensional shapes including discs (27) cones (4), cylinders (2) and cuboids (2). Yet spheres (302) overwhelmingly dominate the assemblage, constituting 83% (Figure 13.3). The Small Geometric Clay Objects of 2015 were mostly recovered in good condition with a low level of fragmentation. Just less than half of all the studied artefacts were recovered completely intact (46%). A further 35% can be described as between 75 and 99% complete (Figure 13.4). In mass the objects are light, ranging from 0.90g to 8.90g (the same maximum and minimum weight remains if only considering the 100% complete objects). In size, the objects rage from a minimum of 0.30cm to a maximum of 6.50cm (Table 13.3). Detailed contextual analysis is to follow, however a basic survey of the find context of the 365 Small Geometrics reveals that the vast majority were recovered from the North Area (300, 82%). A Further 40 (11%) come from TPC Area (mostly excavated in 2014) and 22 (6%) from the South Area (Figure 13.5).

ARTEFACT TYPE	SEASON EXCAVATED				
	2012	2013	2014	2015	TOTAL
(a) Small Geometric Clay Object	16	48	145	156	
(b) Large Clay Ball	2	0	4	375	
TOTAL	**18**	**48**	**149**	**531**	**746**

***Table 13.2**. Break down of the year of excavation, for all Small Geometric Clay Objects and large Clay Balls studied on-site during the 2015 season.*

DIMENSIONS	MAXIMUM (cm)	MINIMUM (cm)
Length	6.5	0.9
Width	4.5	0.9
Height/thickness	8.3	0.3

***Table 13.3.** Maximum and minimum length, width and height for the 365 Small Geometric Clay Objects studied in 2015.*

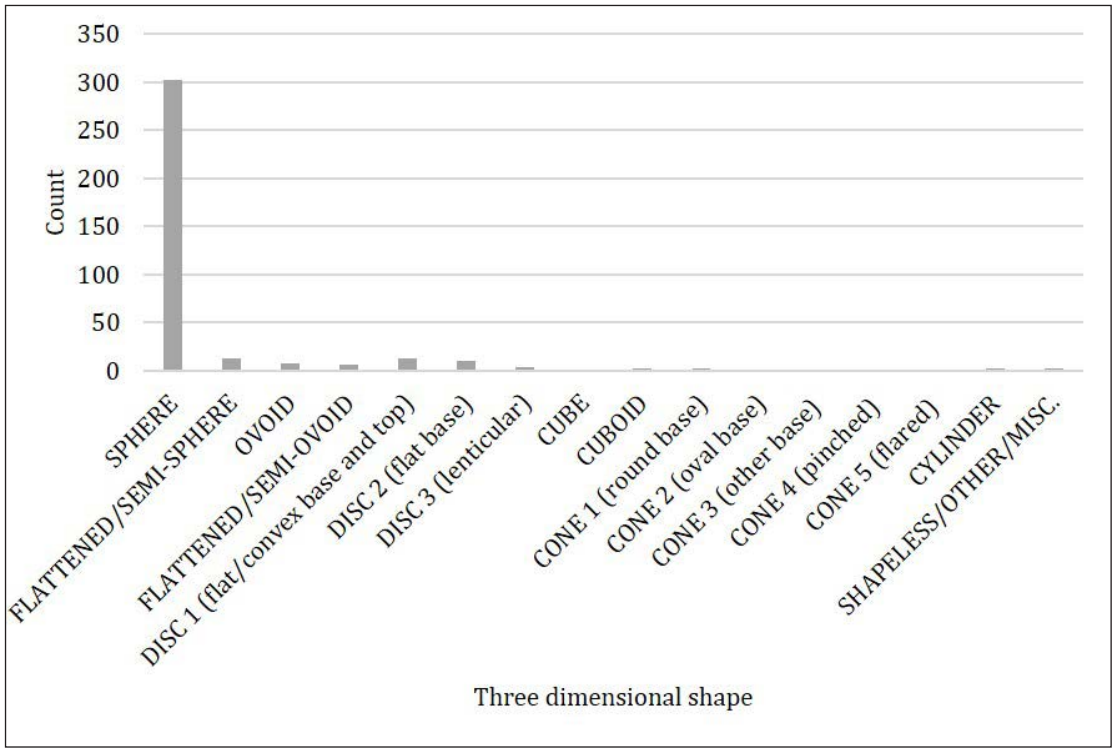


***Figure 13.3.** Range of shapes represented by the 2015 studied Small Geometric Clay Object assemblage, Çatalhöyük East.*

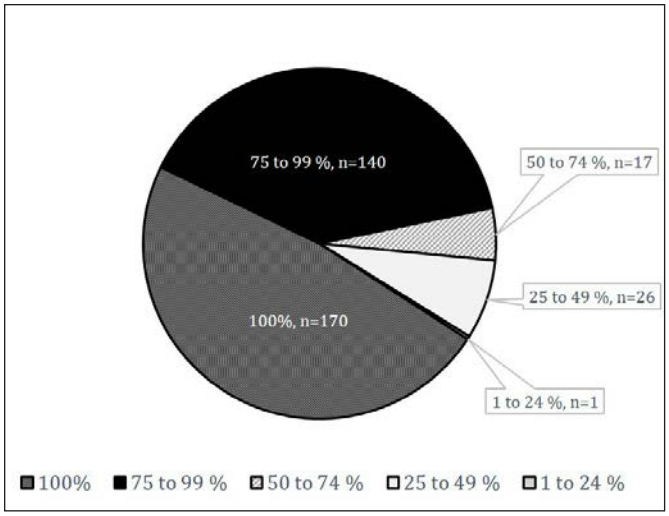


Figure 13.4. *The degree of completeness of the 365 Small Geometric Clay Objects recorded during the 2015 season.*

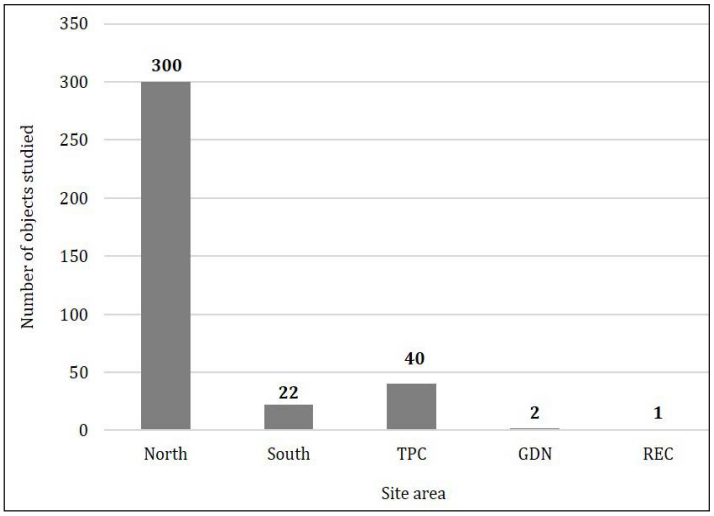


Figure 13.5. *Distribution of the Small Geometric Clay Objects studied in 2015 by area of site.*

Figure 13.6. *The only 100% intact large Clay Ball recovered during 2015 season (22314.x1/ database #3839).*

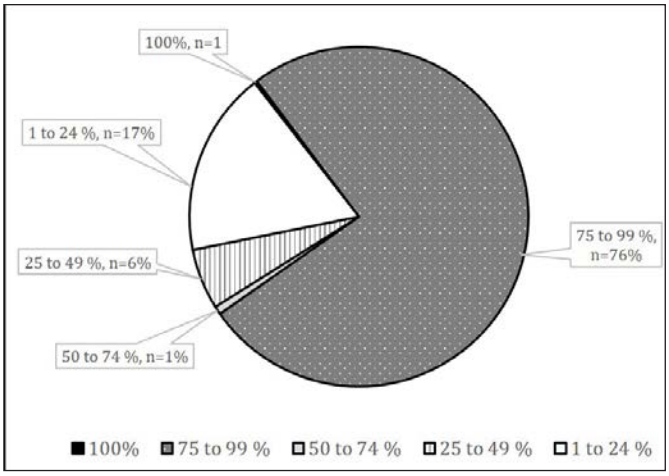


Figure 13.7. *Large Clay Balls: degree of completeness of the 2015 studied examples.*

(b) Clay Balls

Three hundred and eighty-one large Clay Balls (or fragments thereof) were studied during the 2015 season (Table 13.1, Fig. 13.2). All aside for six fragments were excavated during 2015 (Table 13.2). Unlike previous seasons, only one example of a complete Clay Ball was recovered during (22314.x1/database #3839, Fig. 13.6). This was retrieved from the midden in Building 160 (South Area). 22314.m1 has a maximum diameter of 7.33cm, measures 21.40cm in circumference, and weights 381.40g. All other Clay Balls were recovered in fragments; yet the overwhelming majority comprise large fragments of around three quarters of the original sphere shape (288 examples, 76% of 2015 season Clay Balls). Others constitute smaller fragments of the original Clay Ball, comprising just 1 to 24% of the original object (67, 17.59%, Fig. 13.7). Many display blackened surfaces, evidence of heavy burning. Notably some examples are burnt on both the outer and inner, fragmented surfaces, whilst others have evidence of blacking from burning on the outer surface only. Striking among the Clay Ball assemblage were two fragments, one (22314.m106/ database #3840) which displays three, closely spaced, deep fingertip depressions (Fig. 13.8), and a second (22332.m101/ database # 3893) with two flat finger-tip impressions on the surface along with a deep and clear patch displaying the impression of a woven mat, the surface upon which the object was placed whilst wet, perhaps in order to dry (Fig. 13.9). The flat

finger-tip impressions of the latter example are likely a by-product of the manufacture process, yet the deep finger-shaped depressions on the first cannot be explained away as unintentional.

Figure 13.8*. Fragment of a large Clay Ball from Çatalhöyük East displaying three deep and closely spaced finger-shaped depressions (22314.m106/database #3840).*

Figure 13.9. *Fragment of a large Clay Ball (Çatalhöyük East) with two shallow, flat fingertip impressions on the outer surface (left), along with a matting impression (right). 22332.m101 /database # 3893.*

The context of the Large Clay balls has been provisionally studied. The Clay Balls all come from either the North or South Areas, found in almost even distributions (171 and 210 respectively) in each area. A large proportion 247 of the 381 examples come from middens, distributed across two main midden areas, one in the North and a second in the South Area. In the South Area (Table 13.4). 371 Clay Balls come from a single midden (associated with Building 160). This midden contains a combination of both Small Geometric Clay Objects and large Clay Balls (totalling 202 artefacts), although a huge 95% are Clay Balls (Table 13.4).

Future research

The detailed recording of geometric clay objects incorporating analysis of their context will continue in future seasons. Clay Ball research will focus on priority units, due to the large number of artefacts recovered from this category. It is hoped the function of large Clay Balls can be reassessed, via paying close attention to patterning in degree of fragmentation, burning (presence and distribution), find context (especially looking at the proportion found in primary vs. secondary depositions, *in situ* in buildings vs. middens) and associated objects. In previous seasons, a small number of Clay Balls displaying seemingly intentional markings have been recovered. These and any new examples will be re-valuated.

The Small Geometric Clay Objects will also continue to be studied in the same fashion. Research on this category to date has shown patterning in a small, sub-category of this artefact group (those Small Geometric Clay Objects often previously selected and designated as “Mini Balls”). The common deposition of

many small (*c*.1.50cm-2.00cm diameter), unfired marl spheres, together in large clusters of identical objects , and in contexts distinct from all other Small Geometrics, is clear evidence for their utilisation together, performing the same function. The caching of identical spheres together, to the exclusion of other items and in distinctive locations under the floors of domestic buildings is strong evidence pointing towards their use in counting, and simple administration (i.e. of commodities, agricultural supplies foodstuffs, even the tracking of units of time related to agricultural supplies stored, or calendrical events relevant to farming, at a household level (Bennison-Chapman 2014). The role of other Small Geometric Clay Objects at Çatalhöyük, including the other forms of sphere, is less clear and needs further investigation. The common midden context of most, hints at their use inside the home, yet the disposable nature of clay objects at Çatalhöyük, alongside their crude form, ease of craft, and the fact they are made from a most ubiquitous raw material, demonstrates their value was not intrinsic, but imbued upon them. In this light, the role of artefacts may be transient, with one set of objects performing multiple roles within one use group, household or community.

CONTEXT TYPE	UNIT	BUILDING /SPACE NO.	AREA	CLAY BALL COUNT
Dirty floor	(21954)	B. 89	South	1
Floor surface/make up layer	(22326)	B. 160	South	3
In-fill between S. s	(22221)	Sp. 93/480	North	14
In-fill of pit	(21642)	B. 108, Sp. 489 and 490	North	10
In-fill side room	(20890)	B. 96, Sp. 444	South	7
Midden	(22320)	B. 160	South	58
Midden	(22314)	B. 160	South	58
Midden	(21659)	B. 108, Sp. 489 and 490	North	9
Midden	(21658)	B. 108, Sp. 489 and 490	North	1
Midden	(21645)	B. 108, Sp. 489 and 490	North	9
Midden deposit	(21661)	B. 108, Sp. 489	North	94
Midden deposit	(21660)	B. 108, Sp. 489	North	18
Midden layer (Sp. 552)	(22332)	B. 160	South	75
Post-retrieval pit	(22650)	B. 131	North	1
Room fill	(22635)	Sp. 556, B. 131	North	1
Wall/room fill	(22501)	B. 6	South	12
			TOTAL	**371**

Table 13.4. *Context overview, 2015 studied large Clay Balls.*

References

Atalay, S.

2001. BACH Area clay balls, mini balls and geometric objects. In *Çatalhöyük Archive Report 2001*, http: //www. catalhoyuk. com/archive_reports/2001/index. html.

2005. Domesticating clay: the role of clay balls, mini balls and geometric objects. In *Changing Materialities at Çatalhöyük: Reports from the 1995-99 Seasons* (Çatalhöyük Research Project Volume 5), ed. I. Hodder. Cambridge: McDonald Institute for Archaeological Research; London: British Institute at Ankara, 139-168.

2009. Clay balls and fire installations. In *Çatalhöyük Archive Report 2009*, http: //www. catalhoyuk. com/archive_reports/2009/index. html.

2012. Analysis of clay balls from the BACH Area. In *Last House on the Hill: BACH Area Reports from Çatalhöyük, Turkey* (Monumenta Archaeologica 27), eds. R. Tringham and M. Stevanovic. Los Angeles: Cotsen Institute of Archaeology Press, 385-389.

2013. Clay balls, mini balls and geometric objects. In *Substantive Technologies at Çatalhöyük: Reports from the 2000-2008 Seasons* (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology, 247-252.

Atalay, S. and Hastorf, C.A.
2006. Food, meals, and daily activities: food habitus at Neolithic Çatalhöyük. *American Antiquity,* 71(2:) 283-319.

Bennison-Chapman, L.E.
2013. Geometric clay objects. In *Substantive Technologies at Çatalhöyük: Reports from the 2000-2008 Seasons* (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 253-276.

2014. *The Role and Function of "Tokens" and Sealing Practices in the Neolithic of the Near East: The Question of Early Recording Systems, Symbolic Storage, Precursors to Writing, Gaming, or Monitoring Devices in the World's First Villages*. PhD thesis submitted to the Department of Archaeology, Classics and Egyptology; part of the School of Histories, Languages and Cultures, University of Liverpool, 1st July 2014.

Schmandt-Besserat, D.
1992a. *Before Writing, Volume I: From Counting to Cuneiform*. Austin: University of Texas Press.

1992b. *Before Writing, Volume II: A Catalogue of Near Eastern Tokens*. Austin: University of Texas Press.

1996. *How Writing Came About*. Austin: University of Texas Press.

Türkcan, A.U.
2005. Some remarks on Çatalhöyük stamp seals. In *Changing Materialities at Çatalhöyük: reports from the 1995-99 Seasons* (Çatalhöyük Research Project Volume 5), ed. I. Hodder. Cambridge: McDonald Institute for Archaeological Research; London: British Institute at Ankara, 175-185.

2013. Çatalhöyük stamp seals from 2000 to 2008. In *Substantive Technologies at Çatalhöyük: Reports from the 2000-2008 Seasons* (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 235-246.

Support Teams

Chapter 14

Finds

Lisa Guerre, AECOM

A vigorous and structured collections management system is essential for a project as large and multifaceted as the Catalhöyük Research Project. The main responsibility of the Finds Lab is to initiate and maintain this system safeguarding all artifacts and their associated records while also supporting the various research initiatives of onsite specialists.

The Finds Lab functions as a nodal point in the processing of all material recovered during excavation and their registration prior to distribution to relevant onsite specialists. In addition, finds lab staff maintains the physical artifact depots working in collaboration with conservation staff to monitor proper storage conditions for the preservation of project material, manages the digital inventory, and ensures the accessibility of all material kept onsite.

The 2015 season saw the Finds Lab supporting both the excavations of the South, North, and TPC Areas as well as the West Mound – Trench 5 in their post excavation analysis. While there are no clear metrics to gauge the total volume of excavated material at the time of initial registration, it can be noted that a total of 338 X-finds were logged with 63 items selected as Etütlük, a special collection to be housed on site, and 49 items chosen as Envanter for final curation a the Archaeological Museum in Konya.

The Finds Officer, together with the Head of Conservation, monitored environmental data for all three storage depots with both temperature and relative humidity collected via tinytag data loggers (see the Conservation portion of this Archive Report). In addition discussions regarding the issue of available storage space began; all three depots are currently at or near capacity with the potential to not support the full volume of 2016 excavated materials. Solutions to be addressed at the beginning of the 2016 include selective discard policies and full scale reorganization.

Unlike the past three seasons, the Finds Lab was run by the Finds Officer with no support staff. This along with the extended nature of the 2015 season, kept the Finds Lab busy with artifact processing leaving little time to focus on data cleaning and inventory initiatives. It is hoped much of the work in preparation for the final hand off in 2017 can be addressed in 2016. However, the physical work must take priority while on site in 2016 and the data cleaning will, therefore, require its share of attention during the post excavation season.

As always, the Finds Lab Staff, along with the individual labs and specialists, will continue to strive to improve project collection management systems and efficiently and accurately contribute to the building of diverse datasets for current and future research while providing proper stewardship for all material housed on site.

Chapter 15

Conservation

Ashley Lingle, Ian Channell, Olja Mladjenović

Cardiff University

Introduction

2015 season was an exceptional season for the conservation team. The conservation team (Channell, Fairless, Krzewicki, Lingle, Mladjenović, and Parkes) worked closely with the excavation teams and Research teams to assist in the preservation of site materials. Further conservation activities included: carrying out site survey, expansion of environmental monitoring, work with the Experimental Capping Project, additional research of conservation practice for the site, general conservation and maintenance of the exposed archaeological materials in North and South Shelters, treatment of small finds, and condition checking and treatment of glass and metal objects. The following text outlines the work and subsequent research carried out by the conservation team over the course of the season.

Conservation program 2015

Ashley Lingle

Environmental monitoring

At the end 2014 season 3 TinyTag™ environmental dataloggers were placed strategically across the North Area to collect data during the off-season. One logger was placed externally on the north face of the shelter, a second was placed in the northeastern corner of B.5, and the third was placed in the southwestern corner of B.82. Data sets include temperature and relative humidity (RH), which were taken every half hour. All three dataloggers survived the harsh winter, and for the first time there is a complete set of environmental data for the North Area (Fig. 15.1).

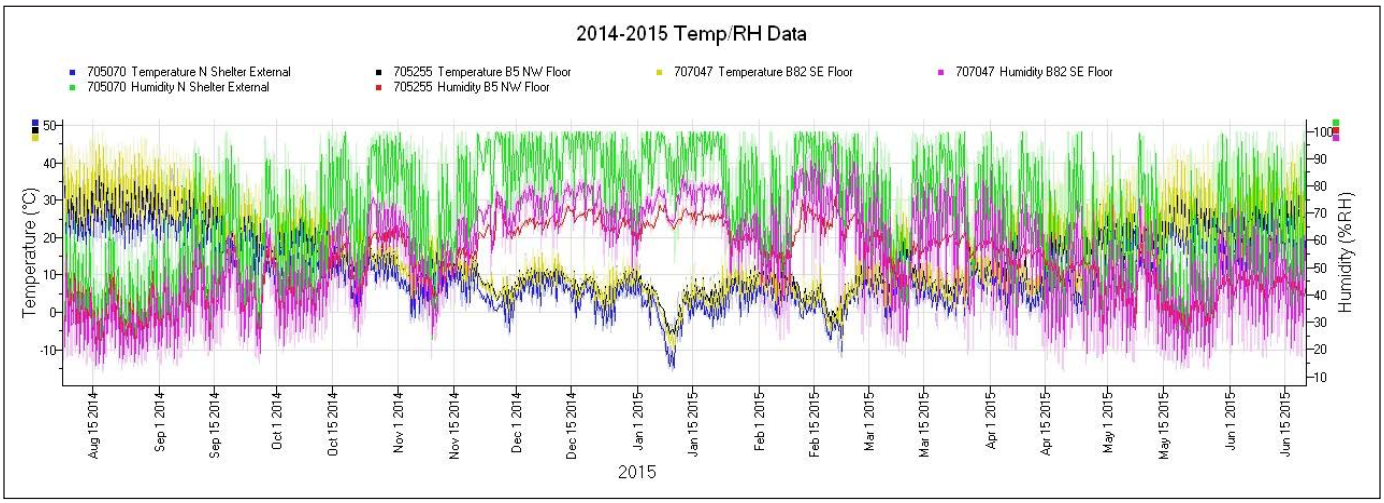


Figure 15.1. *Environmental data.*

The most surprising finding was the severity of the winter conditions; the external logger recorded a minimum reading of -16°C, inside this correlated to a minimum of -11°C in B.82. In fact at several points between November and March the temperature dropped below freezing. Temperatures below 0°C indicate

there are freeze/thaw cycles creating mechanical stress within the mudbricks, which is another factor of deterioration (Warren 1999). The data collected also sheds further light on to the problem of soluble salts at the site; salts identified on site begin to deliquesce around 60% RH, once in this liquid form the salts are drawn through the mudbrick towards the exterior surface crystallize (Goudie and Viles 1997; King 2014). When the RH drops back below 60% the salts re-crystallize, salts that have reached the surface effloresce causing surface powdering, salts still in the mudbrick subfloresce leading to mechanical stress within the mudbrick. Daily cycles of this process can be seen consistently from October through May. The data collected from these loggers indicates much of the deterioration of the site is occurring during the winter months.

Additional data loggers we purchased for the 2015 season. Loggers were placed across both the North and South Areas. The data for 2015-2016 off-season will be collected and reviewed at the start of the 2016 season.

Site condition survey

A site wide condition survey was carried out for the second consecutive season at Çatalhöyük. Each exposed across the North and South Areas were assessed and photographed. The results were tabulated and images evaluated against the decay baseline maps created by Goze Akoglu and Elif Sırt from Middle Eastern Technical University (METU). As this was only the second season for the survey it is difficult to correctly identify trends in the data. Overall buildings scored similarly to the previous year, in instances where there were large discrepancies the area was further investigated and treated as necessary. Admittedly the survey still has issues with subjectivity and its qualitative format. The team is working to address these concerns with the use of 3D modeling and digital technologies, the Çatalhöyük Digital Preservation Project is discussed in a separate chapter in this Archive Report.

Figure 15.2. *Cardiff University conservation students, Ian Channell, Olja Mladjenović, working to repair the Volcano Painting in the South Shelter.*

Conservation and maintenance of the East Mound

Buildings under excavation and those on open display were closely monitored and treated by the conservation team as necessary during the 2015 season. After completion of the survey, site maintenance went under way to removed excesses of debris from the site. Walls were also cleaned and stabilized through the site. Work Primarily took place in the North Area and South Area, however, there were extensive wall paintings found in TPC Sp.562 (discussed below). There were a number of fragile finds, particularly baskets in burials, which the conservation team worked closely with the human remains team to lift. The geometric wall painting (21501) in B.119 was lifted and stabilized, as it begun to show signs of deterioration. The team also took time to clean and repair the replica of the Volcano Painting in the South Shelter (Fig. 15.2), which had become dilapidated over the years.

Experimental capping project

The results of the capping project from the 2014 were inconclusive. Primarily, however, even if the earthen render was still intact it had lifted away from the wall, creating a void between the wall and the render. The

approach of trying to address deterioration of the walls with various renders has been underway since the 2010 season. This project has had limited successes, but again needed a new approach. In 2013 a small number of tests were carried out to create undercutting supports for a few walls Sp.90 and B.5 in the North Area. These supports are first lined with geo-textile, and then rammed earth (pisé) is built up in the void under the wall. These tests have showed that not only does this stop the undercutting, it also slows the deterioration of the wall. The geo-textile barrier helps to control the moisture ingress and mitigates the issue of soluble salts. As this methodology appeared to be successful, it was more broadly applied across the site. B.64 and B.55 and Sp.240, Sp.161 and Sp.162 were all treated in the 2015 season.

Conservation of small finds

The lab processed 96 small finds in the 2015 season. The finds include: shell, painted plaster, lithic material, clay objects, textile, baskets, glass, metal, and work and un-worked faunal material. The high number of small finds this year is in part attributed to a condition survey and re-treatment of glass and metal items from the Etutluk collection. The most notable small finds conservation worked on during the season included: the painted plaster head (21666), plastered bucranium (21968), and flint blade (21630.x5).

Dataloggers were used to monitor the environment in the storage depots for several days following the identification of flooding tide-lines on the floor from water ingress over the winter. While Depots 1 and 3 performed similarly, Depot 2, which is known to have a mildew-like odor, the relative humidity was considerably higher (consistently 60-80% RH). The lack of air circulation in the Depot allows high levels of humidity to be maintained, causing mildew growth and salt efflorescence on the interior walls. At the end of the season the doors around each depot were resealed to prevent water ingress in the off-season. Further research needs to be done into finding an acceptable ventilation system for Depot 2.

Research

The uses and applications of a Lime Putty/Perlite gap-filling agent in 2015

Olja Mladjenovic, Ian Channell

Introduction

During the 2013 field season the use of perlite (amorphous volcanic glass) with Paraloid B-48N (methacrylate methyl methacrylate and butyl acrylate co-polymer) in acetone was tested as a replacement gap filler for deteriorating mudbrick and plaster throughout the site (See 2013 Archive Report). A small research project was carried out in 2014 to further examine its application and use at the site (see 2014 Archive Report). While this program is still used on site, there are issues with its sustainability. An alternative method was tested during the 2015 season, a mixture of lime putty and perlite.

The sustainability of the current perlite/Paraloid mixture was questioned because Paraloid B-48N is not currently available in Turkey, supplies have to be brought in with the team each year, additionally no acrylic resin with a high enough glass transition temperature (Tg) is currently available within the country. The use of solvents on site can be difficult due to the high temperatures and necessary personal protection equipment. Additionally, the performance of the perlite/Paraloid mixture was assessed by the conservation team and showed signs of fatigue due to environmental factors. A new method of gap filling with lime putty, crushed perlite, and soil mix was employed to test its performance in comparison to the perlite/Paraloid and earlier lime/primal mixtures. The lime putty/perlite method shows promising signs due to its ease of application, functional properties and aesthetic affinity to the existing mudbrick and plaster. Considering that the viscosity of the mixture could be adapted as needed and the ability of the agent to adhere to both

plaster and mudbrick it was further tested as a backing for delaminating plaster, fills for lab work, and deep gap fill for vertical cracks in plaster floors.

Lime/Perlite

Lime putty is formed when calcium oxide, formed by the burning of limestone is slaked and reacted with water to form a calcium hydroxide (Elert 2002). During curing, the calcium hydroxide putty absorbs carbon dioxide, forming calcium carbonate, and is therefore kept saturated in water to prevent curing. The quality of the mortar is improved with longer storage periods in water; aging in water has been shown to improve the plasticity, workability and water retention of the putty (Cazalla 2000).

The lime mixture is commonly mixed with an aggregate such as soil, sand or grit, however for the conservation of mudbrick and plaster a porous component was needed to allow the passage of water in order to subdue water degradation. Perlite is a glassy volcanic silicate material formed by the high heating of silicate rock popping or bursting into a lightweight aggregate (Mehmet 1997). Its desirable properties such as its low bulk density and compact resistance make it a preferable material for reducing density of mortar, while also reducing mortar strength and incorporating a water permeable component to gap filling agents (Palomar 2014).

Application on site

The lime putty used on site had been stored in water for a number of years prior to its use, increasing its functional properties and workability. Numerous sample mixtures were shaped and tested to determine the approximate proportions for the mixture with the most desirable properties. The targeted mixture was required to have an amendable working consistency, low shrinkage rate, and calculable color change. Larger portions of lime putty in the mixture showed considerable shrinkage thus forming numerous fractures within the matrix during curing, while higher amounts of perlite in the mixture increased overall color change and tended to crumble during application. After numerous tests it was concluded that a mixture with the addition of one portion of lime putty, two portions of crushed perlite, and one portion of soil or plaster (to match aesthetic of substrate) displayed the required properties necessary for general application. The mixture was mechanically worked until it could be formed into manageable pieces and attached to specific substrates.

Figure 15.3. *Gap fills in B.119, North Shelter. (Left) Plaster filled with Lime/Perlite mixture; (Right) Mudbrick filled with Lime/Perlites mixture.*

As shown in Figure 15.3, the texture and viscosity of the mixture could be amended as needed, allowing for a smooth fill to be applied to smooth plaster surfaces and with the use of larger perlite granules, a textured fill could be applied to a more coarse substrate such as mudbrick or delaminating plaster.

Figure 15.4. *Lime/Perlite fill in B.119 showing the formation of hairline fractures during curing.*

As a gap filling agent the mixture did not offer structural support but rather worked as a barrier to deter further deterioration within the substrate. For delaminating plaster, which is prevalent throughout the site, the mixture was applied within cracks after consolidation, offering structural support to the deteriorating wall by binding to both the plaster and mudbrick substrates. Once applied the agent would be left to dry and was manually smoothed prior to full curing in order to remove any hairline fractures that occurred during drying (Fig. 15.4).

Color change

The color change of the mixture was readily observed throughout the season. After numerous tests, each of the mixtures showed dramatic change during and after curing, high temperatures at the site caused accelerated curing times and more drastic color change. Soil or plaster that matched the tone of the substrate were added to the mixture prior to application, however, it was found that due to the lime putty and perlite components, the fully cured fill would end up drastically lighter than predicted. Darker soils were mixed in to attempt to darken the overall appearance yet there was no determined way to obtain consistent results. Color change was a serious issue with mudbrick fills where the white contrast would cause a promi-

Figure 15.5. *Lime/Perlite backings for delaminating plaster in B.132 (North Shelter). Shows drastic colour change in high heat only one hour after application (right).*

nent visual discontinuity. This problem was resolved by the application of soil to the surface of the fill prior to curing, allowing for the superficial layer to obtain the same color as the substrate (Fig. 15.5).

Final assessment on site

The Paraloid/perlite fills used heavily during the 2014 and 2013 seasons showed a mixed range of performance, however most were found to have lost their adherence to the substrate along with numerous cracks forming and breaking apart the mixture. Additional consistency issues and lack of adequate polymer became apparent as well. The lime putty /perlite mixture showed improved adherence in comparison to earlier treatments, however shrinkage during cracking causing the formation of fractures within the fill may be a cause for concern due to drastic temperature fluctuations of the site. Freeze/thaw cycles as well as salt crystallization within the walls may cause the further deterioration of the site and are likely responsible for the failure of any fills performed on site. The performance of the lime putty/perlite mixture will be assessed in the following seasons to determine a reliable and calculable gap-filling agent appropriate for use on site.

Conservation and observations regarding wall paintings in TPC Area Space 562

Ian Channell and Olja Mladjenović

Introduction

During the 2015 field season, extensive wall paintings were uncovered and conserved in the TPC trenches by the conservation team (Figs. 15.6 and 15.7). Wall painting conservation techniques involved the mechanical removal of thin layers of overlying plaster from the 'painted' surface, consolidation of the artwork with a spray application of 2.5% Paraloid B48N w/v in acetone, covering in Japanese tissue paper, geotextile, and perlite bags to promote preservation off-season. Close examination of the artwork whilst conservation tasks were being performed allowed for observations regarding its technology and production. It is posited that the designs were created by application of a binder and plaster mixture directly onto the plaster wall with a brush or tool. The following report will focus on firstly, a description of the geometric paintings uncovered, followed by an elaboration of the conservation treatments performed on the wall paintings. Lastly, observations as to the paintings manufacture will be provided.

Figure 15.6. *North wall and bench structure of Sp.562.*

Figure 15.7. *Eastern and south facing walls of Sp.562.*

Wall painting description

Wall paintings are located in Sp.562 in the TPC Area trenches. The geometric motifs are comparable to those previously revealed in B.121 in the 2013 season (see 2013 Archive Report). The geometric motifs are prominently featured on the north and east walls of the space, an area that is cited as the most frequent location for wall paintings in buildings at the site (Çamurcuoğlu 2013). In the north wall, the painting envelops a large bench or 'alter' structure, which has two cylindrical white plaster constructions emerging from its eastern and western terminations. These structures appear to be internally hollow and were covered in white, powdery plaster with infrequent reddish, pink detail. It was difficult to discern the entirety of the design, but vertical lines and a diamond pattern could be surmised. On upper areas of the north wall, the painting is composed of vertical lines on the western and eastern corners. The distinctive shape of these features is due to a previous bell-shaped cut into the building. On the back of the upper section of the platform are large angular rhomboidal designs with an extensive border free of detail. Surrounding the rhomboidal designs are a continuation of the vertical lines. On the western section of the wall painting, it was detected that the vertical lines appeared to continue directly on top of the bench surface. After investigations, only intermittent detail was detectable and a slight single borderline was apparent between the bench surface and wall interfaces. A large section midway behind the bench appears to have extensive burrowing damage that has left the artwork in the vicinity in poor condition.

Below the bench are beautiful horizontally elongated lozenges with internal wave-like detail; a thick border that crosses over between every rhomboid shape binds each lozenge. On the eastern wall, vertical lines were found in its northern section, with lines decreasing in size along the length of the wall. It is unknown whether this design was intentional or whether it reflected further burrowing damage.

The building is divided by a platform that extends across the width of the room. On the eastern wall in this demarcated area, is a continuation of the painting uncovered by the conservation team early in the season. Both the above and below paintings reflect a circular pattern surrounding a central ovoid shape. These patterns extend around the corner to the south-facing wall. The upward portion of the painting is located on a protruding layer with the inferior portion on a depressed layer. It is postulated that this painting continues along the length of the south facing wall, however, further conservation and archaeological work will be needed to determine the extent of this feature.

Conservation techniques

The paintings were revealed by mechanically removing layers of plaster from the painting surface. Mechanical removal allowed for detailed and controlled removal of the overlying plaster layers. Due to the three-dimensional and protruding aspect of the plaster/binder designs, most overlying plaster fractured easily from the artwork surface. Vertical lines were easier to uncover as the scalpel could be grazed over the design and the overlying plaster could be readily sheared off. Horizontal detail, such as those located below the bench, were more difficult to remove as the directionality of application of the scalpel made it difficult to remove the overlying plaster without damaging and shearing off the design with the covering plaster layers.

Following mechanical removal, the paintings were consolidated with a spray of 2.5% Paraloid B48N w/v in acetone. Paraloid B48N is an acrylic resin first developed by the Rohm and Haas Company as an alternative to commonly used Paraloid B72 (Horie 2010). Paraloid B48N is composed of a 75: 25 ratio of methyl methacrylate to butyl methacrylate with a high glass transition temperature (Tg) of 50°C which is suitable to the site's hotter summer environment (*ibid*). Paraloid B72 adhesive is frequently utilized within Çatalhöyük's conservation laboratory, but due to its Tg of 40°C, it is most frequently used on important small finds being stored in controlled conditions. Paraloid B48N is regularly utilized as metal coating (Freyer et al 2011) and as an adhesive for ceramics (Paterakis 1997) and stone objects (Jorjani *et al.* 2002; Riccardelli *et al.* 2010). The Paraloid B48N pellets are mixed in acetone in the conservation laboratory and applied to the surface with a spray bottle. It was determined that applying the consolidant spray in the lower portion of the wall increased structural support for the upper sections.

Acetone was utilized as the dispersive solvent for the acrylic resin, firstly, as it efficiently dissolved the Paraloid B48N pellets and, secondly, because it resulted in little color change on the painting. Ethanol was not used in this instance as ethanol frequently results in color alterations on the painting and fails to dissolve the Paraloid pellets effectively. However, acetone evaporates quickly during hotter environments and does not have the penetrative power of ethanol. In this circumstance, it was deemed best to use acetone as the solvent as adhering the plaster designs to the plaster wall was deemed paramount to actively penetrating the wall painting.

As the painting was only finished at the conclusion of the season and the large and curved attributes of the painting would have made removal a long and laborious task, the painting was covered in Japanese tissue paper, geotextile and perlite bags for preservation between the 2015 and 2016 seasons.

Wall painting production techniques

Close examination of the painting during conservation treatments allowed for thorough observations of the painting construction. It became apparent that the design was not constructed through pigmented media, but was created entirely through plaster designs. Removal of the overlying plaster occasionally removed plaster from the design, revealing a yellowish brown and peach shade underneath (Figs. 15.8 and 15.9). It is suggested that this material is a binder or film-forming layer. A binder, possibly egg/yolk, linseed/olive oil, milk, rabbit skin glue (see Çamurcuoğlu 2013), holds and solidifies the material. It is postulated that the

plaster was mixed with the binder media, allowing for drying and setting on the wall surface. Fourier transform infrared (FTIR) analysis (Perkin Elmer Spectrum One) of the material at Cardiff University failed to discern the composition of the binder, most likely do to mixing with plaster or long-term degradation of the binder component. FTIR analysis did confirm the white material as calcium sulphate (gypsum).

Figure 15.8. *Brown colored binder underlying plaster detail.*

Figure 15.9. *Yellow colored binder underlying plaster detail.*

Microscopic evaluation with raking light of the binder reverse located numerous ridges, suggesting the plaster and binder material was applied via a brush, tool or cloth to the wall surface (see Çamurcuoğlu 2013 for discussion of application methods). Mirrored marks were also apparent on the wall when the binder was removed. Microscopy was preformed using Nikon SMZ1000 Stereomicroscope, Intralux 500 fibre optic illuminator, and NIS Elements D 3.0 Microscopic Imaging Software (Figs. 15.10 and 15.11).

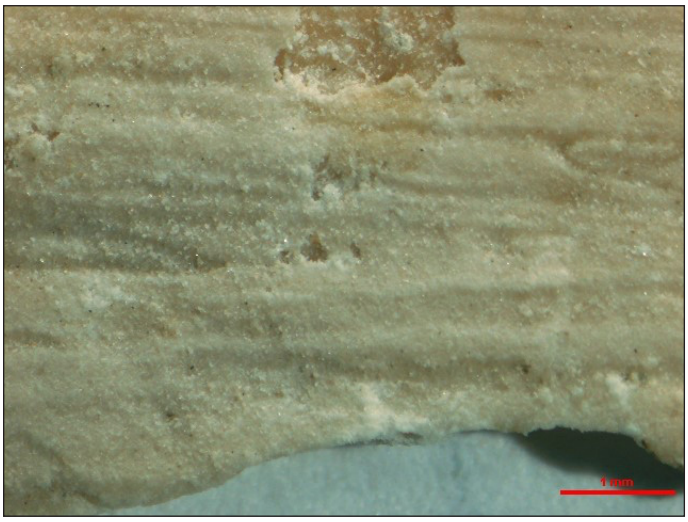


Figure 15.10. *Microscopic evaluation of binder reverse, x15 magnification.*

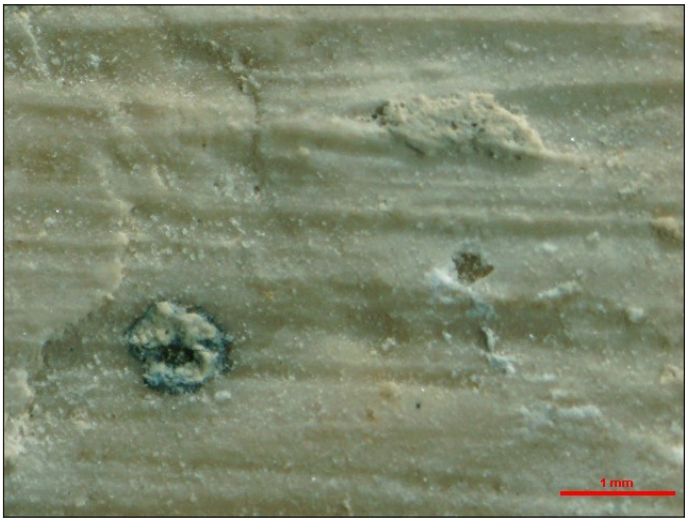


Figure 15.11. *Optical microscopy evaluation of binder reverse, x15 magnification.*

Conclusion

It is suggested that the wall paintings- or better plaster designs- located in Sp.562 in the TPC Area reflect extensive vertical, transverse and rhomboidal motifs and are comparable to those found in earlier excavations in the same vicinity. The wall paintings were mechanically revealed and consolidated by the conservation team. Based on laboratory analysis it is most likely the plaster designs were created by mixing plaster with an organic binder. The material was then applied to the wall with a brush or tool, leaving microscopic detail on the binder reverse and the wall.

Acknowledgements

Thank you to Ian, Olja, Katie, and Marcin for their efforts this year, we accomplished a lot this season. Thanks to Phil for all he does during his short time on site (your time and advice is greatly appreciated). Additional thanks to those who collaborated with the conservation team this year, and helping us to have a successful season.

References

Çamurcuoğlu, D.

2013. Çatalhöyük wall paintings: materials, technologies and artists. In *Substantive Technologies at Çatalhöyük: Reports from the 2000-2008 Seasons* (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute of Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 317-330.

Tung, B. (ed.)

2013. *Çatalhöyük 2013 Archive Report*. http: //www.catalhoyuk.com/downloads/Archive_Report_2013.pdf

Cazalla, O., C. Rodriguez-Navaro, E. Sebastian and G. Cultrone
2000. Aging of lime putty: effects on traditional lime mortar carbonation. *Journal of the American Ceramic Society,* 83(5): 1070-1076.

Elert, K., C. Rodriguez-Navaro E. Sebastian, E. Hansen and O. Cazalla
2002. Lime mortars for the conservation of historic buildings. *Studies in Conservation*, 47(1): 62-75.

Freyer, E., D. Pullen and D. Greenfield
2011. Saving your spangles: the conservation and care of galvanised steel sculptures. In *Metal 2010: Proceedings of the Interim Meeting of the ICOM-CC Metal Working Group* (October 11-15, 2010, Charleston, South Carolina, USA), eds. P. Mardikian, C. Chemello, C. Watters and P. Hull. Clemson: Clemson University Press, 350-357.

Goudie, A. and H. Viles
1997. *Salt Weathering Hazards*. Chichester: Wiley.

Horie, C.V.
2010. *Materials for Conservation*. 2nd Edition. London: Elsevier.

Jorjani, M., G. Wheeler, C. Riccardelli, W. Soboyejo and N. Rahbar
2002. An evaluation of potential adhesives for marble repair. In *Holding It All Together: Ancient and Modern Approaches to Joining, Repair and Consolidation,* eds. J. Ambers, C. Higgitt, L. Harrision and D. Saunders. London: Archetype Publications, 95-107.

King, L.
2014. *The Identification and Analysis of Soluble Salts at Çatalhöyük*. Cardiff University, MSc Dissertation. (unpublished).

Mehmet, D., M. Alkan and U. Cakir
1997. Electrokinetic properties of Perlite. *Journal of Colloid and Interface Science*, 192: 114-118.

Palomar, I. and J. Barluenga
2014. Lime-cement mortars for coatings with improved thermal and acoustic performance. *Construction and Building Materials,* 306-314.

Paterakis, A.B.
1997. An overview of loss compensation in Athenian Agora. *Objects Speciality Groups Postprints of the American Institute for the Conservation of Historic and Artistic Work*, 5: 75-97.

Riccardelli, C., G. Wheeler, C. Muir, G. Scherer and J. Vocaturo
2010. An examination of pinning materials for marble sculpture. *Objects Speciality Group: Postprints of the American Institute for the Conservation of Historic and Artistic Work*, 17: 95-112.

Warren, J.
1999. *Conservation of Earthen Structures*. Oxford: Butterworth Heinemann.

Chapter 16

Heavy Residue

Milena Vasić[1] and Jovana Tripković (with a contribution from Talu E. Tüntas)

[1]Freie Universität Berlin

The heavy residue processing this year started on June 22nd and ended on August 12th, whilst the sorting of the samples ended on August 6th. The sorting team consisted of Şenay Yasli, Hatice Çelik and Fatma Eken. Students were helping with the sieving during the lab hours. Talu Emre Tuntaş was in charge of the heavy residue samples from the West Mound.

As every year, the backlog (comprising 119 samples from the North and South Areas) from 2014 was dealt with first. In addition to this, a number of samples from the TPC Area was also processed.

Once the backlog was finished, the processing of the 2015 samples started. As usual, priority units were processed as soon as possible, whilst the samples from the other Neolithic contexts were processed as they were coming down from the site. The majority of flotation samples taken this year from the North and South Areas have been fully processed. As a result, the backlog for the 2016 season comprises 190 samples, the majority of which was already sieved and sorted.

The presence of ubiquitous materials (bone, obsidian, egg, mollusc, plant, and stone) in the processed samples from this year (105 samples from the North Area and 240 samples from the South Area) corresponds to the general distribution of these materials on site (Fig. 16.1). Similarly to the samples from the previous year, eggshell has a lower presence (42.5%) than usual in the in the South Area.

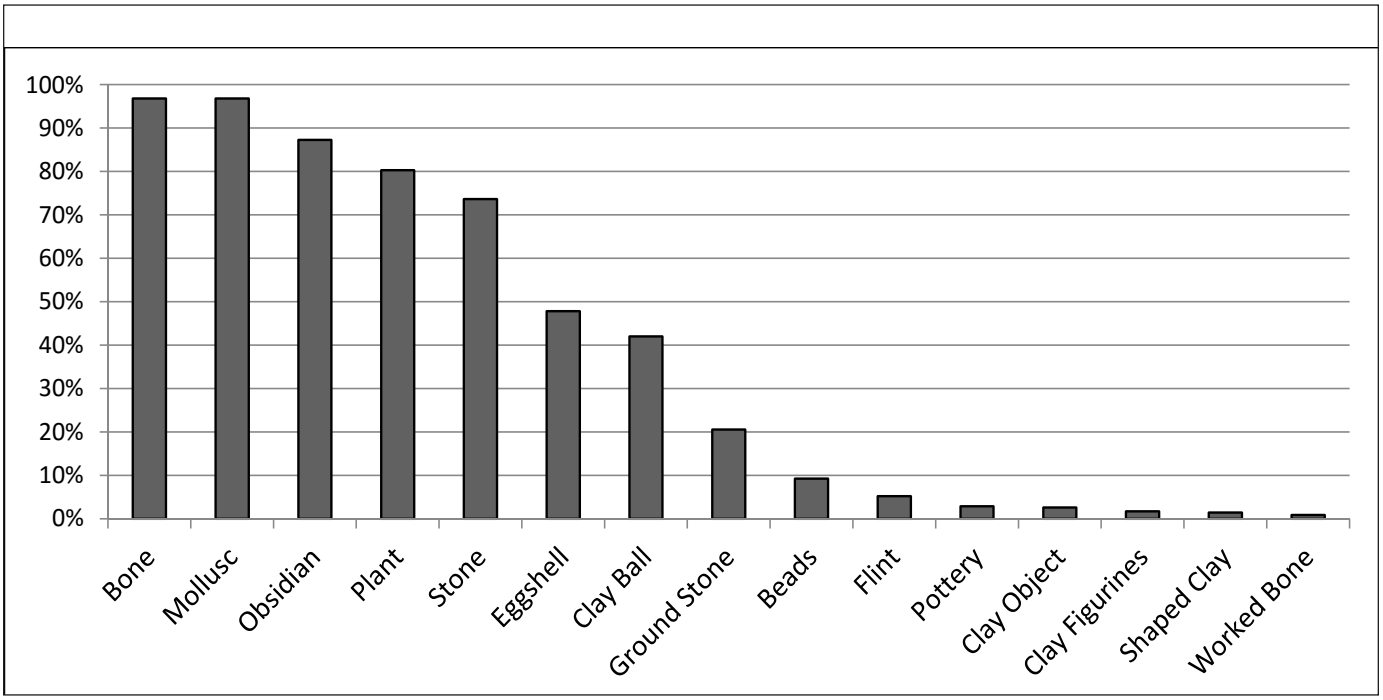


Figure 16.1. *Presence of the materials in the excavated contexts in 2015.*

The median density of mollusc, obsidian, plant and eggshell on the floors of buildings excavated this year (B.52 and B.114 in the North Area and B.80 and B.89 in the South Area) is similar in the two excavation areas. On the other hand, a significant difference is seen in the density of animal bone. Building floors in the North Area, especially floors of building B.114, have a higher density of animal bone than the two buildings in the South Area.

The presence of pottery, clay objects and shaped clay is similar in the two excavation areas. Pottery was retrieved from only ten samples this year. Only six fragments of clay figurines were retrieved from the North Area whilst the flotation samples from the South Area did not contain any figurines. Clay balls are by far more frequent in the South Area than they are in the North Area. A relatively high amount of clay balls (*N*=9) was retrieved from the two contexts in space Sp.490 in the North Area. Similarly, samples from two midden contexts in space Sp.559 in the South Area contained seven fragments of clay balls. Flint was recovered from 18 contexts including three floor deposits in building B.89 whilst fragments of three bone rings were retrieved from the space Sp.490.

Although beads are generally relatively frequent at Çatalhöyük, out of 240 flotation samples from the South Area, only seven contained beads. On the other hand, beads are present in 20% of the samples from the North Area. However, although they have a high presence, beads were not found in large quantities. In total, 28 beads were found in 25 samples from the North Area.

This is just an overview of the samples that were processed from the contexts excavated this year (Fig. 16.2), whilst an in depth analyses will be conducted after the next excavation season.

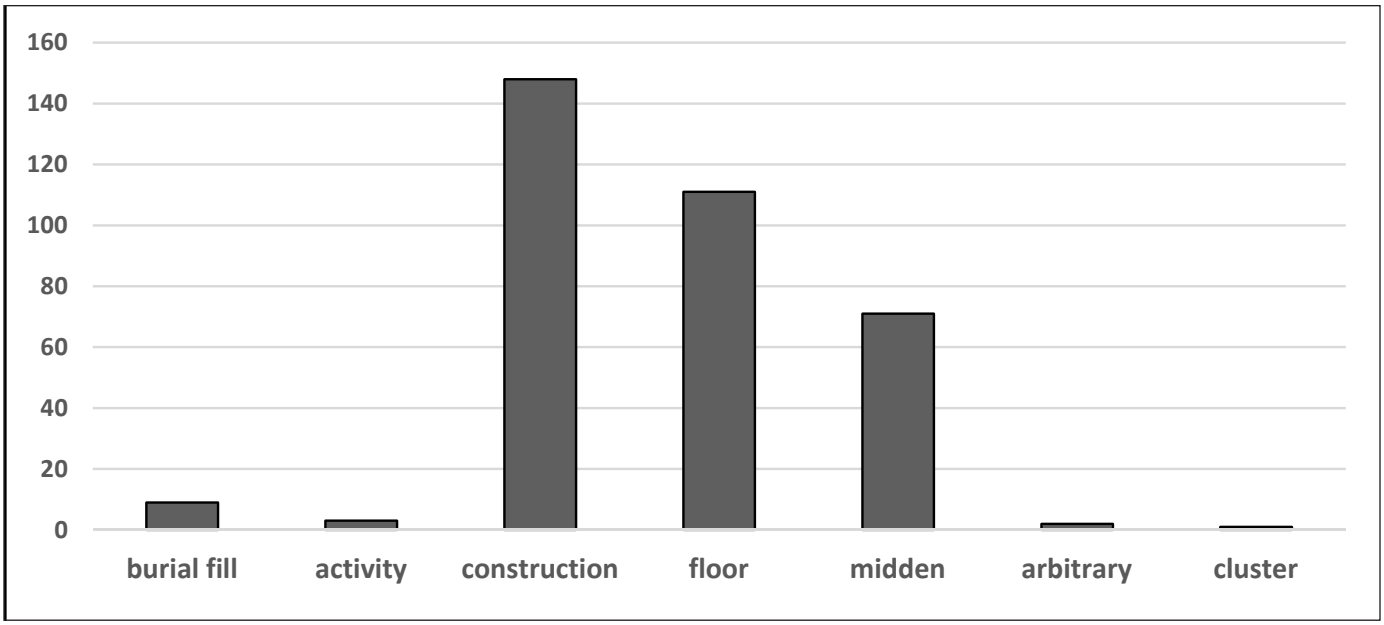


Figure 16.2. *Number of processed samples taken from the contexts excavated in the North and South Areas in 2015.*

West Mound Heavy Residue

Talu E. Tüntas

This season, three crates filled with West Mound heavy residue samples were sorted by the sorting ladies. Those crates included the last unsorted heavy residue samples from the West Mound. Together with Hallvard Bruvoll the sorted samples were weighed and registered. The data was put into the data base. On this basis Talu Emre Tüntas will be conducting a series of statistical analysis and the results of his empirical work

will be published as a Chapter in the West Mound book. After the departure of Jovana Tripkovoic, the bagging and storing of heavy residue samples in general was supervised by Talu Emre Tüntas. Some prioritised TPC samples were picked, sieved and subsampled with the help of Joka, a member of the TPC team. In the end of the season new heavy residue crates were given numbers and they were organised in the heavy residue depot.

Chapter 17

Digital Recording and Reflexive Methodology at Çatalhöyük

James Taylor, Dominik Lukas and Åsa Berggren

Overview

This year the larger goal of the project to go 100% paperless on site was finally realised, as the workflow developed in previous seasons by James Taylor, Justine Issavi, Camilla Mazzucato and Nicolò Dell'Unto, tested in the 2013 field season, was finally implemented across the site. Previously the bulk of this workflow had revolved around the recording of the graphic archive, as the written archive had previously been impossible, due to an inability for excavators to access the projects intranet on site (and therefore conduct data entry in the field). This season that problem was finally eliminated with the installation of a wireless point in each of the excavation areas on site.

Figure 17.1. *The tablets are being prepared for the field by Burcu Tung, James Taylor and Marta Perlinska.*

The hardware used for data entry included the windows-based Microsoft Surface Pro tablet (Fig. 18.1) and the site photography equipment (camera and monopod). Additional cameras and new tablets were requisitioned in order to roll the methodology out. The software used included the full ArcGIS 10.2 suite, as well as Agisoft PhotoScan and Meshlab, for the onsite acquisition of low resolution 3D models and associated orthogonal photograph outputs (experimentation with this technology was the only addition to the previously designed workflow, and proved successful on the newest generation of Microsoft Tablet, although at this stage modelling on site remains an experimental process). Instead of continuing to use Microsoft OneNote, using the program Bamboo Paper (Wacom) has proved less complex and could be used by most excavators without any problems. This software also proved to be useful for drawing the daily sketches.

Digital recording forms

With the extension of the on site local area network to the site, it was also possible to use the Microsoft Access frontend applications for direct recording of all relevant information to the central SQL Server database. Changing the standard workflow from paper recording to on site usage and store all relevant data while excavating, only made some minor modifications to the database forms necessary. Hereby it was generally possible to stick to the existing data model.

Changes made to the paper versions of the recording sheets during the previous years have been motivated by making the recording sheets better fit the flow of excavation and the process of interpretation in the trench as well as to make the recording sheets better correspond to the structure of the database. This

year the adjustments were made to the interface on the database to better fit the situation of recording on tablets on site. To accommodate the overview over current unit sheets wanted by the excavators, and that previously has been provided by the stack of paper sheets in a folder, we made some changes to the digital unit sheet. The database unit sheet interface now has a column to the right of the sheet, with a list of all other units that are assigned to the same space as the current unit and are entered the same year. It is possible to click on any of these units in the list, which will change it to the current sheet. It is also possible to click on a button to open a report of the units in the list. Several reports may be opened as pdf's at the same time and viewed next to each other. A quick round of asking the excavators at the end of the season showed that only a few of them had used this possibility to get an overview of the units and easily change the current sheet between different units. This will probably take some time to get used to. Some suggested this system might be more useful during the post excavation phase of work.

Some changes were also made to accommodate the quality validation checking system. A box was introduced at the bottom of the digital sheet (unit and feature) allowing the sheets to be marked as "in progress", "to be checked" and "checked". All sheets marked with the two latter statuses are visible in tables in the database and provide the starting point for the checking system.

The transition to digital recording forms was gradual during the 2015 season. We started with two buildings (B.52 in the North Area and B.89 in the South Area) and after an initial evaluation and some adjustments the whole site went completely digital around 20 July. However, units opened with a paper record were closed as such, which means we had a successive transition. As a result, the records from this year will be a combination of units with a paper record that has ben entered in the database and units that only have a digital record in the database.

Workflow

Otherwise the workflow remains largely unchanged from that outline in the 2013/2014 Archive reports.

Chapter 18

Site Visualisation and Presentation

Sara Perry[1], Laia Pujol Tost[2], Ian Kirkpatrick, Andrew Henderson[1], Katrina Gargett[1], Jenna Tinning[1], Gamze Meşe[3], Özgür Can Uslu[3] and Burcu Demir[3]

[1]University of York, [2]Universitat Pompeu Fabra, [3]Ege University

2015 stands as the seventh year of contribution of the Visualisation Team to the Çatalhöyük Research Project, and it represents our longest field season yet—nearly four weeks, joined by multiple experts from Turkey, the UK, Greece and Spain. Generously funded by a British Institute at Ankara (BIAA) Project Grant, we continued to experiment with mobile technologies on site, expanding our research to study collaborative interactions between visitors using iPads. The grant also enabled us to host a 'bodystorming' session amongst Çatalhöyük's researchers in an effort to begin rethinking the visitor experience on site. Separately, we completely redesigned the catalhoyuk.com website, creating new written content, imagery and design, including a series of blog posts to be deployed over the next year. We spent two of our weeks on site creating new social media content for the Facebook and Twitter pages, with a focus on highlighting the people who work at Çatalhöyük. We installed a new set of interactive panels in the existing Experimental House. We began to plan for the future installation of four new replica houses on the property in front of the Visitor's Centre. As per below, we also continued with our long-standing visitor research and our evaluation of existing exhibits.

***Figure 18.1**. The Çatalhöyük Visualisation Team (missing Ian Kirkpatrick, Gamze Meşe, Burcu Demir), from left to right: Sara Perry, Özgür Can Uslu, Laia Pujol, Katrina Gargett, Andrew Henderson and Jenna Tinning (Photo: Jason Quinlan).*

We had a core team of nine people: five from the University of York (Sara Perry, Ian Kirkpatrick, Andrew Henderson, Katrina Gargett, Jenna Tinning), one from Universitat Pompeu Fabra (Laia Pujol Tost) and three from Ege University (Gamze Meşe, Burcu Demir and Özgür Can Uslu), assisted by the Çatalhöyük Research Project's Ali Kavas (Fig. 18.1). To facilitate our mobile technology demonstrations and related bodystorming work, several members of this team arrived early (namely Sara and Laia) with a cohort from the European CHESS project (chessexperience.eu), including Akrivi Katifori, Vassilis Kourtis, and Maria Vayanou, accompanied by interaction designer Narcís Parés (Universitat Pompeu Fabra). Together we represent a mixture of lecturers, postdocs, Master's and undergraduate students, recent graduates, and independent graphics and technology specialists. Our practice is grounded in rigorous data collection which provides an empirical foundation for every initiative that we pursue at Çatalhöyük. We are committed not only to such evidence-based work, but to a reflexive, sustainable approach that is defined collaboratively (as opposed to top-down) and in equal partnership between Turkish and foreign team members.

Collaborative visitor experiences delivered by mobile device

As with museums, people typically visit archaeological sites in social groups. These visitors might join together as part of organised tours, or they might make their own way to site with family and friends. At Çatalhöyük, independent visitors are relatively rare: people tend to come with their schoolmates, their tour groups, their partners, children or other known travelling companions. In this way, their visits can be defined as collaborative exercises, almost always realised via some degree of interpersonal cooperation and conversation (Fig. 18.2).

***Figure 18.2**. Video screenshot of two student volunteers testing a collaborative, mobile-delivered digital storytelling experience at the site of Çatalhöyük, Turkey. Funding for this research has generously been provided by the BIAA (Videofootage by Vassilis Kourtis).*

Once on site, however, the extent to which such collaboration continues in a meaningful way is a matter for debate. How do visitors relate to one another while touring the archaeological record? How do they share their learnings amongst themselves, and how does this sharing enhance or detract from the material culture in front of them? How do they use locations like Çatalhöyük—recognised as universally-relevant historical sites—to foster precisely what these sites are meant to foster: that is, real cultural understanding both about people from the past and between people in the present (including fellow tourists)? In other words, how do we ensure that the visitor experience at archaeological sites capitalises on the group dynamic, using the various group members to collectively stimulate thinking, discussion and reflection on the material record, and to create relationships between people in the moment—whilst touring the site itself?

To facilitate such interaction, we have begun to experiment with intertwining computational technologies into the normal visitor tour. Our experiments have been motivated by seven years of qualitative and quantitative data collection about visitor experience, which testify to the site's complicated nature and resultant unintelligibility to many individuals. Here, the archaeology is exposed, relatively uniform in colour, and difficult to differentiate. Visitors cannot choose their own path through the site, cannot get close to any of the artefacts (which are transferred to museum stores upon excavation), and cannot experience the main attraction—the excavated buildings—from within the buildings themselves (only from a ramp overlooking them and via the generic replica (Experimental) house). Yet visitors also tend to arrive on site with mobile phones in hand, and with knowledge derived from researching Çatalhöyük before arrival.

For these reasons, in 2014, funded by the British Institute at Ankara, we collaborated with the international CHESS Project (http: //chessexperience.eu/) to produce mobile-delivered digital stories about Çatalhöyük for visiting audiences. These stories aimed to enrich the on-site experience by connecting the physical remains of an excavated home (Building 52) with the 'biographies' of two hypothetical individuals associated with that home: Abla, a Neolithic woman who once lived in the building, and Archie, a modern-day archaeologist who excavated it. Using CHESS's existing digital platform, we authored Archie and Abla's narratives in collaboration with the Çatalhöyük Research Project, integrated them into the platform, and added further functionality to personalise and offer choice within the user experience. After preliminary evaluations of this experience with a series of users, we concluded that what continued to be most obviously missing was (1) interaction between visitors themselves, and (2) sufficient aids to properly evoke the site as a once lived-in and fully built environment.

Accordingly, this year, with generous BIAA funding, we returned to Çatalhöyük with a larger team comprised of members of CHESS (Akrivi Katifori, Vassilis Kourtis and Maria Vayanou of the University of Athens), plus Laia Pujol of LEAP (https: //www.upf.edu/leap/) and Narcís Parés of Universitat Pompeu Fabra. We sought to extend our previous work by re-structuring it to account for not only the feedback from our users, but also the weaknesses of many mobile apps. In other words, we redesigned Abla and Archie's stories in an effort to promote conversation and collaboration between group members on site. The redesign entailed several rounds of brainstorming and group critique of content, followed by populating the CHESS mobile platform with a variety of interactive points of contact designed to facilitate collaborative learning in a two-person visitor group.

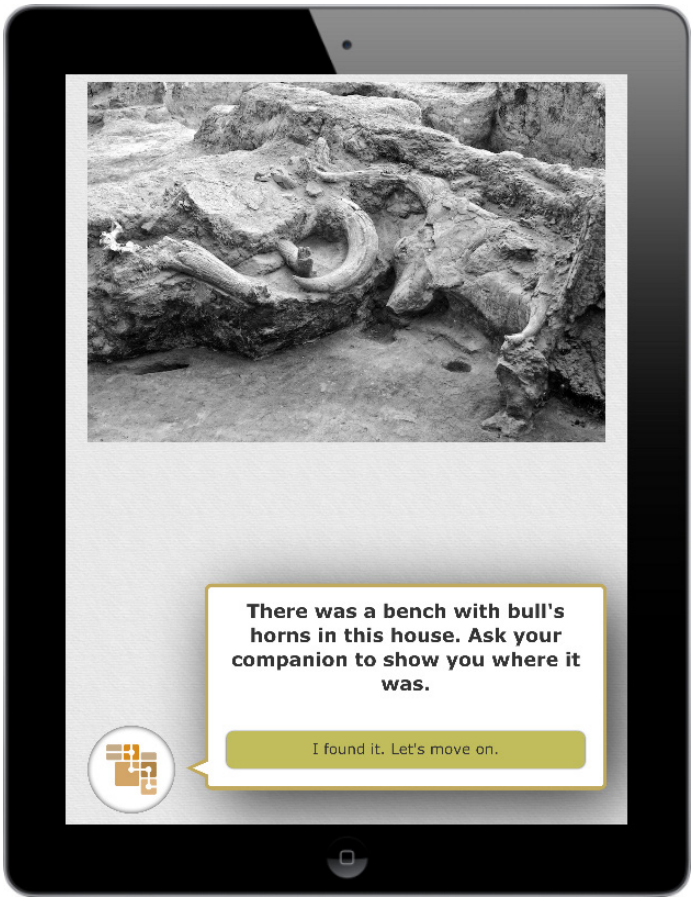


Figure 18.3. *Screenshot of the outcome of 'narrative variation' in the digital story. At this point each user would have been presented with different information on their devices, compelling them to ask their companion for details to fill in the blanks about B.52.*

These interactive experiences between visitors took a variety of forms. Firstly, we experimented with narrative variation – or the practice of supplying different information to each user through their respective mobile devices in order to encourage conversation between them to compile the complete story of Building 52. At multiple points, the digital narrative would split such that one visitor would exclusively follow Archie's story, while the other followed Abla's. A task or question would then be posed to each visitor which could only be resolved by mutual dialogue (Fig. 18.3).

Secondly, we inserted references to current human behaviours, including personal practices and reflections, within the narrative. Visitors were then prompted to share their thoughts with one another before selecting to move along in the storyline. Thirdly, we attempted to integrate playful, comic points of interactivity between users; in particular, by asking visitors to choose objects displayed on the mobile device (and excavated from Building 52) for their companion. The intent here was to nurture not just knowledge sharing, but laughter, fun, rapport and camaraderie amongst the visiting pair, which have been demonstrated as integral components of successful visiting experiences (Figure 18.4).

Finally, we experimented with the notion of creating a "shared screen" between visitors, wherein they were prompted to position their two mobile devices adjacent to one another, each displaying one half of a specific image. In so doing, visitors were then able to see the full picture, and from there collaboratively explore the digital content related to Building 52 (in front of them on site) (Figure 18.5).

We subsequently conducted a handful of preliminary evaluations with non-specialist and specialist visitors, and are now in the process of analysing the resulting data (Figure 18.6). We are already aware, however, that in the future we would like to stretch the interactive experience between visitors much further – not only in terms of types of interactions, but so too in terms of scale: interactions between triads

and even larger groups, as well as interactions between strangers and diverse visiting parties that happen to be on site simultaneously (and perhaps off site too).

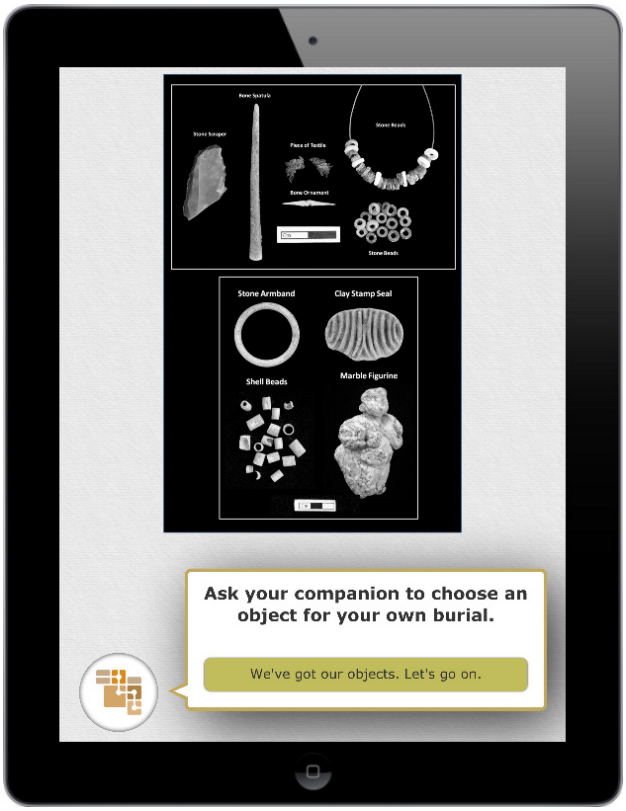


***Figure 18.4**. Screenshot of a playful interactive exercise in the narrative wherein visitors are asked to choose artefacts recovered from B.52 as burial gifts for their companions.*

***Figure 18.5.** Screenshot of a 'shared screen' exercise in the digital story. Users are each given one-half of an annotated plan of B.52 and prompted to place their devices beside one another in order to explore features in concert.*

***Figure 18.6.** Akrivi Katifori and Vassilis Kourtis (far left) recording the mobile storytelling experiences of two users in front of B.52 at Çatalhöyük (Photo: Sara Perry).*

Experimental house

Our visitor research demonstrates that Çatalhöyük's Experimental House is a popular part of the visitor experience at Çatalhöyük: it is critical in assisting visitors to visualise how Neolithic structures on site might have looked. The house and its associated accoutrements provide amongst the only embodied and tactile experiences available for visitors, as there are otherwise no archaeological materials accessible for touching or close-up exploration. However, despite its possibilities, our observational research (see below) suggests that visitors generally enter the house and simply stand in the centre of the room, seemingly unsure of what more they can do. They do not seek to explore the house fully, nor to read the informational sign that was installed several years ago.

To counter such immobility, we settled on a strategy to facilitate and encourage engagement with the building. The aim was not only to reconfigure the visitor experience in the house, but to test its efficacy in

advance of the proposed construction of four new replica houses in 2016. If successful, we would consider expanding the approach to play out across these new structures too next year. We crafted seven small panels which were then installed in spaces across the house. These panels form the narrative of a Neolithic person who invites the visitor into his home and encourages him/her to explore the different areas of the house with his guidance. By way of example, the first sign – affixed next to the entrance on the outside of the house – reads "Come into my home! I wouldn't normally walk in this way. Once inside, try to find my usual entrance" (Figure 18.7). Its intent is, in part, to set visitors off on a trail around the house beginning with its ladder/typical entranceway, and in part, to encourage visitors to enter the experimental house of their own accord, without being prompted by one of the site guards to do so. We aimed especially to correct visitor misconceptions about the standard means of entry into Çatalhöyük homes, accessible only by holes in the roofs.

***Figure 18.7**. The new entrance panel to Çatalhöyük's Experimental House (Design: Ian Kirkpatrick).*

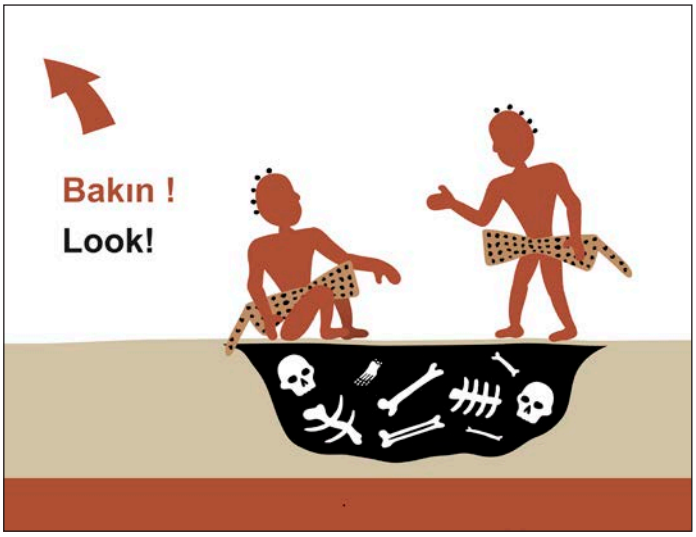


***Figure 18.8.** New panel installed on platform, which can be flipped over to reveal further information about house burials (Design: Ian Kirkpatrick).*

Additional signs were placed by the house's ladder, in the oven, in a basket, on one of the platforms and in the storage area (Fig. 18.8). We aimed to keep the visual impact of this signage to a minimum, creating panels that were generally no bigger than A5 size. We also attempted to encourage exploration, making the signs small enough that they could be hidden out of sight (e.g. in the house's oven and its basket), where visitors could discover them (Figs. 18.9 and 18.10). An icon was designed by Ian Kirkpatrick for display on each sign, representing a Çatalhöyük resident and adhering to the same 'follow me' model used in the Visitor's Centre. A further sign, which aimed to encourage visitors to draw their own iconography to add to the walls of the house, was prepared but not installed owing to difficulties in sourcing appropriate drawing materials. We will explore the potential for adding this into the display in 2016.

Figure 18.9. *Visualisation Team member Katrina Gargett prepares new signage (affixed in basket) for display in the Experimental House (Photo: Jenna Tinning).*

Figure 18.10. *Visualisation Team members Katrina Gargett, Jenna Tinning and Andrew Henderson admire new panel installed into the Experimental House's oven (Photo: Ian Kirkpatrick).*

Website

Our team's principle goal this year was to regenerate the existing Çatalhöyük Research Project website. The aims of this redesign were to:

- Update content in order to make it more representative of the current work conducted by the project
- To redesign both the layout and design elements of the website in order to make it both more visually appealing and easier to navigate
- To make the website more public facing and engaging for non-expert audiences
- To provide a research section which gathered all of the specialist-orientated elements of the project's web presence (i.e. the database) into one identifiable section
- To create a website which can be easily produced and maintained in the future

Context of production

The initial analysis of the existing website and preliminary planning was conducted by York MSc student Andrew Henderson-Schwartz as part of a university work placement opportunity in the spring of 2015. Several areas of improvement were identified in the existing web presence of the Çatalhöyük Research Project. This process helped to define the aims of the new website and its proposed content. That content was then grouped under a series of headers to form the main navigation bar for the new website (Figure 18.11), including:

The Site*: A public facing section which aimed to provide information on what is known about* Çatalhöyük *from the archaeology, with subsections:*

Architecture: *Information on the architecture of* Çatalhöyük

Life at Çatalhöyük*: Information on daily life at* Çatalhöyük

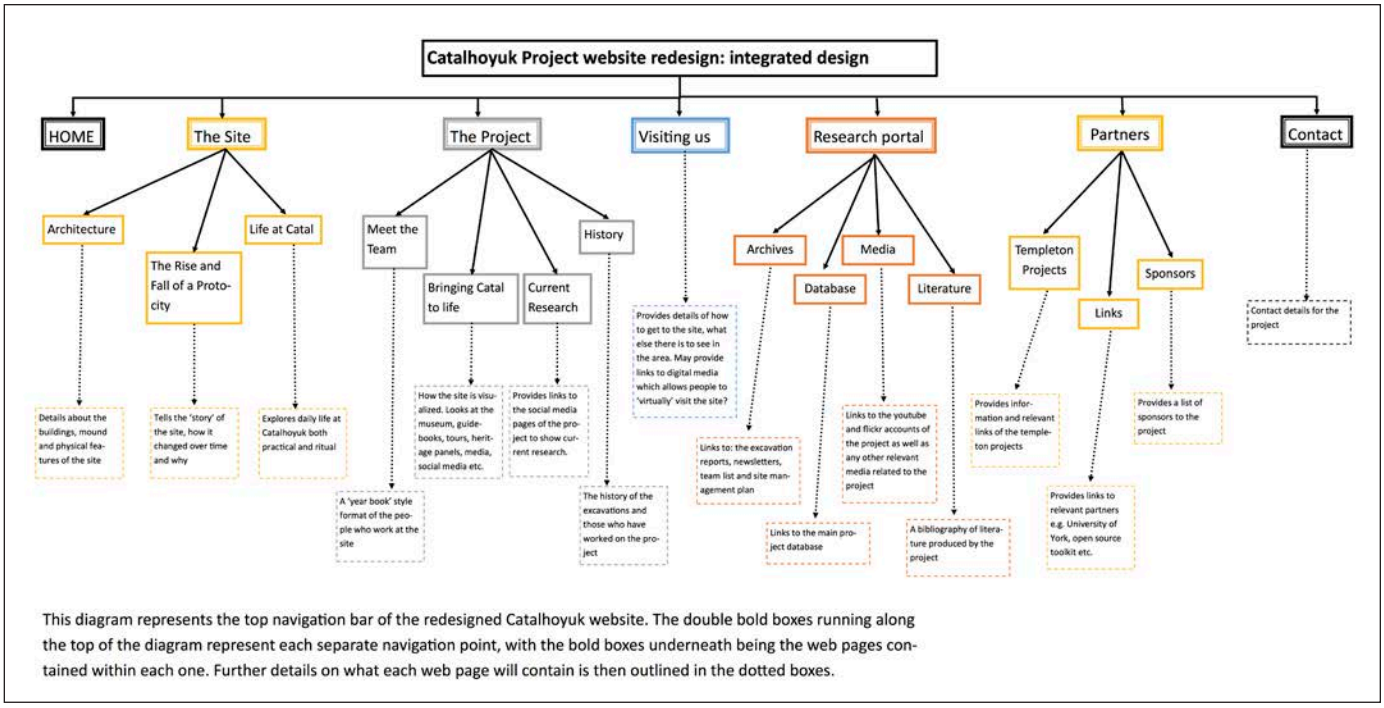


Figure 18.11. *Initial concept map for the redesigned Çatalhöyük website (Prepared by Andrew Henderson).*

> ***The Rise and Fall of an Early City****: A section telling the story of* Çatalhöyük *from settlement to abandonment*

The Project*: A public facing section of the website which aimed to provide information on the* Çatalhöyük *Research Project's past and present, with subsections:*

> ***History of the Excavations****: A timeline detailing the history of work at* Çatalhöyük
>
> ***Meet the Team****: A yearbook style page showing the research team's past and present*
>
> ***Bringing Catal to Life****: A section on the visualisation of* Çatalhöyük
>
> ***Newsletter****: Links to the project's newsletters*

Research Portal*: An expert-oriented section for those interested in conducting research on the site, with subsections:*

> ***Archives****: Links to the project's archives*
>
> ***Database****: Links to the project's databases*
>
> ***Photographs****: Links to external photograph databases*
>
> ***Videos****: Videos produced by the project as well as links to* Çatalhöyük's *YouTube page*

Partners: *Provides all the information relating to project sponsors and partners, with subsections:*

> ***Templeton Projects:*** *Provides information and links to the Templeton Project pages.*
>
> ***Sponsors:*** *Provides a list and links to* Çatalhöyük's *sponsors*
>
> ***Connections:*** *Provides details and links to partner organisations (e.g. University of Cardiff, etc.)*

An additional navigation bar was added to the top left hand corner of the page, containing:

***Visiting us**: The purpose of this section aims to encourage people to come and visit the site. Equally it aims to provide information to help facilitate a visit such as information on cost, getting to site and opening times.*

***Contact Us**: Information on how to contact the project and some of its key members.*

***Search**: Allows the website to be searched.*

***TY/EN**: Translation of the site from Turkish to English and visa-versa.*

The design of the new website works to tie the online presence of the project into Çatalhöyük's existing branding. We have reused the colour scheme and design elements composed by Ian Kirkpatrick for all of our on-site resources. The home page has been prepared in a minimalistic fashion, seeking to showcase latest news and up-to-date information via the project's blog and Twitter feeds. Prior to arriving at Çatalhöyük this season we discussed details with Ian Hodder, Jason Quinlan and Dominik Lukas, and agreed to build the webpages using Drupal, working towards a simple and intuitive system that could be easily maintained in the future.

***Figure 18.12.** Jenna Tinning and Ian Kirkpatrick collaborate on graphic design (Photo: Sara Perry).*

On-site work

Given significant prior planning, we arrived at Çatalhöyük in a position to draft the full textual and pictorial content of the website in approximately one week's time. This content was informed both by previous exhibition materials and by collaborative discussion with on-site specialists. Images were sourced from the project's photographic and illustrative portfolios and project archives. The layout of each webpage was then drafted using Microsoft Publisher. Each webpage was initially drafted by a different team member. From here it was discussed by the full team, edited, proofread and then finalised by the team leader, before being sent for translation into Turkish. (Note that only a small portion of the text has yet been translated.) The icons and design elements of the website were sketched by Jenna Tinning and then vectorised by graphic artist Ian Kirkpatrick (Fig. 18.12). The overall design was then finalised and example pages created by Ian. The files have now been turned over to Dominik for integration into Drupal. We anticipate that the new website will launch before the end of the year, creating an online presence for the project which is engaging, dynamic and reflects the exciting variety of research at Çatalhöyük (Fig. 18.13).

Figure 18.13. *Mock-up of the redesigned www.catahoyuk.com home page (Design: Ian Kirkpatrick).*

Social media

One of our priorities for our time on site this year was to employ a new media plan, over the course of a week, to regenerate the project's social media sites. These media can offer quick and immediate connectivity to both public and professional audiences. However, to date, the content presented through them has generally been specialist and academic in tone, and participation rates among users have been variable.

With this in mind, Jenna Tinning and Andrew Henderson drafted 12 Facebook and 10 Twitter posts, with a focus upon employing a more conversational tone in order to open up dialogue and create engagement between specialist and non-specialist audiences. We aimed to create posts that would showcase the human aspect of the Çatalhöyük Research Project, concentrating on its researchers, staff and students. We prepared posts in a number of informal styles. Short interviews were arranged with a variety of different people working at the site in order to collect content. These interviews employed a general pattern of questions including:

- Can you describe your role at Çatalhöyük?
- How long have you been here/what brought you here?
- What is your favourite part of working at Çatalhöyük?
- What are you doing right now?
- What defines Çatalhöyük for you?
- Are there any particularly difficult parts of your job?

The responses to such queries were then scanned for captivating and accessible content to populate the Facebook and Twitter posts. Following best practice, we compiled more specialist-oriented posts for Twitter's audiences, and more general, all-audiences posts for Facebook. Photographs were taken to complement the messages. Some posts included direct quotes (Fig. 18.14), while others explained what different specialists were doing at that moment in time, or how they were drawn to Çatalhöyük (Fig. 18.15).

Interestingly, all received positive feedback in some form, and shares and retweets for our period of managing these social media feeds were comparably higher than in many previous weeks (Fig. 18.16). Indeed, the number of visits to Çatalhöyük's Twitter profile during our tenure as administrators became the highest on record since September 2014 (Fig. 18.17). This point is particularly meaningful given that our

quantity of tweets has not been as high as previous months, indicating perhaps that the content and more accessible tone that we have aimed to cultivate has increased engagement. We hope that this style of posting will be deployed in the future, leading to further online participation and positive attention for Çatalhöyük.

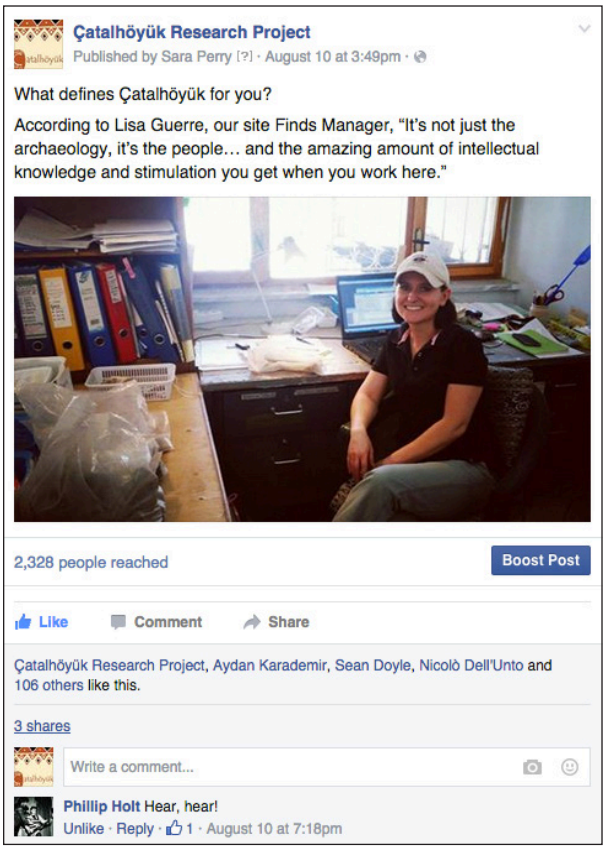


Figure 18.14. *One of our first posts to Çatalhöyük's social media feeds, featuring Finds Manager Lisa Guerre.*

Figure 18.15. *Experimenting with style and tone of post, here we showcase the work of West Mound team members, namely Jana Rogasch and Chelsea Wiseman.*

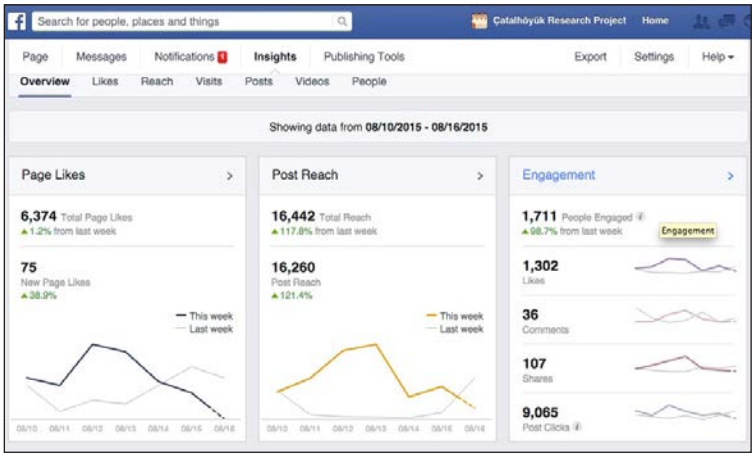


Figure 18.16. *Screenshot of Facebook analytics hinting at the Visualisation Team's impact upon this social media feed over a period of one week (in comparison to the previous week).*

Figure 18.17. *Analytics showing the highest number of profile views for Çatalhöyük's Twitter site in recorded history.*

Visitor demographic

Since 2002, Çatalhöyük's guards have been recording the number of international and national visitors to site in a series of handwritten notebooks. Each year our team takes on the laborious task of collating these data, entering them into spreadsheets, analysing them and creating digital copies of each page of the original data entries. This work began two seasons ago with the efforts of Erica Emond, and was taken over in 2015 by Katrina Gargett, who has worked with all figures entered up until July 2015.

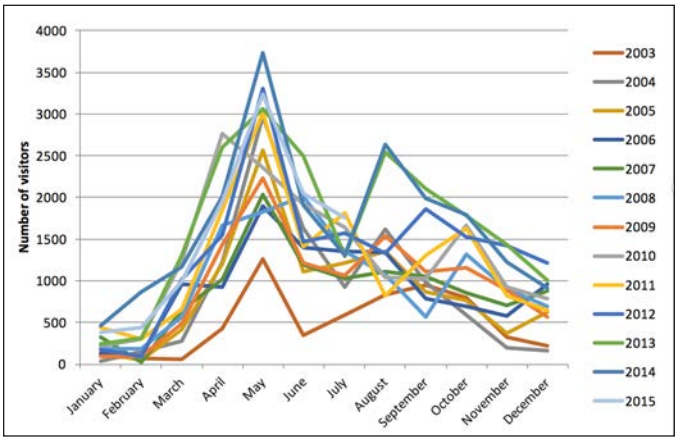


Fig. 18.18. *Çatalhöyük total visitor counts by month, 2002-2015 (Data compiled by Katrina Gargett).*

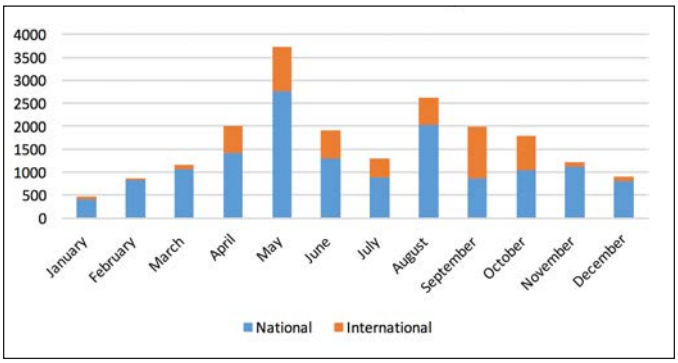


Figure 18.19. *National and international visitor counts by month, 2014 (Data compiled by Katrina Gargett).*

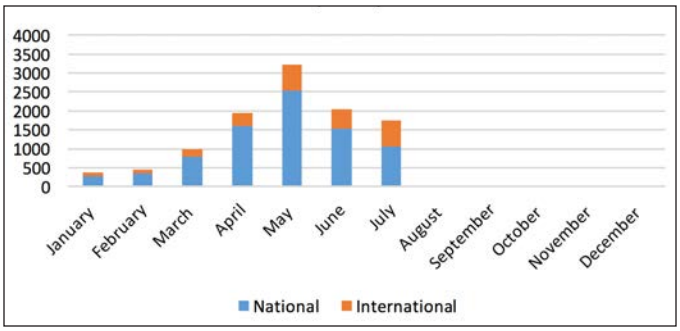


Figure 18.20. *National and international visitor counts by month, 2015 (Data compiled by Katrina Gargett).*

As found in previous years, there are a number of inconsistencies between the visitor totals counted by the guards and the totals counted by our team. In most cases, our totals of visitor numbers tend to be around 200 individuals higher than the site guards' totals. There is no clear explanation for such inconsistencies beyond perhaps mathematical miscalculation, but it does call into question the accuracy of the recording process. It has also been noted this year that, if a group of visitors are Turkish but live abroad, or vice versa, then that number of visitors is often written in both the 'National' and 'International' columns resulting in a doubling of numbers. Language barriers may similarly be contributors to these inconsistencies, as the written counts (e.g. the legibility of the numbers) and names of the countries are often unclear. We would suggest that a review of the recording system is now necessary.

As a result of such disparities, it was decided that a re-checking of data should be undertaken in order to verify visitor counts. Unfortunately, due to time constraints, this has not been possible in 2015, but will be a priority for the 2016 field season. All data previous to June 2014, compiled by Erica Emond, must be checked. All data from July 2014-2015 has been compiled by Katrina Gargett, and would also benefit from double checking. An improved and consistent system should ideally be established for the coming season.

Despite these problems, the existing records give us some sense of touristic trends and types of people who visit Çatalhöyük. 2014 has shown a consistency in visits with 2013, with numbers hovering around the 20,000 mark (Fig. 18.18).

As previously seen, seasonality has remained consistent, with most people visiting the site during May and June. Overall, numbers have not reached above the 3,500 per month mark, as was seen in May 2013, and otherwise generally seem to be falling (Figs. 18.19 and 18.20). Worryingly, 2015 has witnessed approximately 1000 less visitors in its first half (Jan-

uary-July) in comparison to the same period in 2014. We are now monitoring whether the numbers will remain consistent with 2013 and 2014, or will drop to numbers seen prior to Çatalhöyük's UNESCO World Heritage inscription in 2012. Our efforts this year to better engage the potential touristic audience via our website redesign, blogging and Facebook and Twitter posts may have an impact in the future, but other factors out of our control may interfere with these attempts.

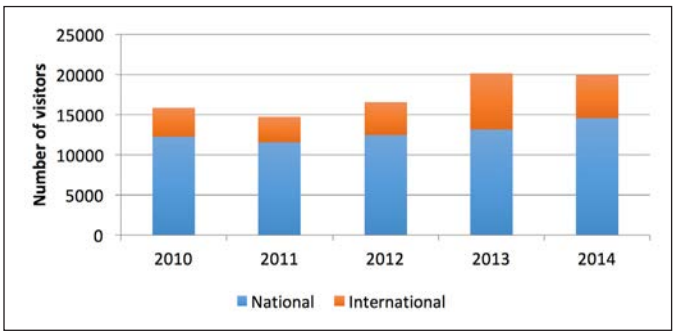


Figure 18.21. *Breakdown of international and national visitor counts, 2010-2014 (Data compiled by Katrina Gargett).*

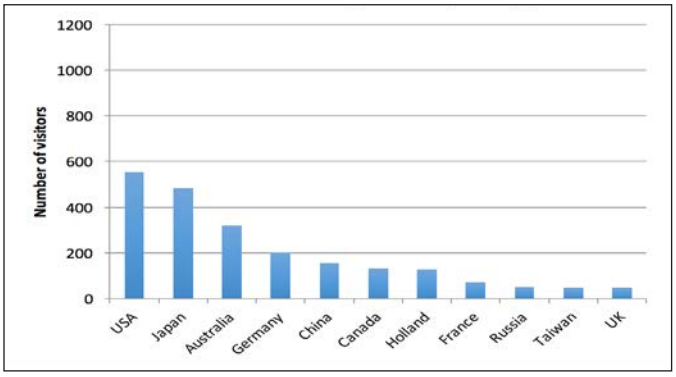


Figure 18.22*. International visitor demographic for 2015, January to July (Data compiled by Katrina Gargett).*

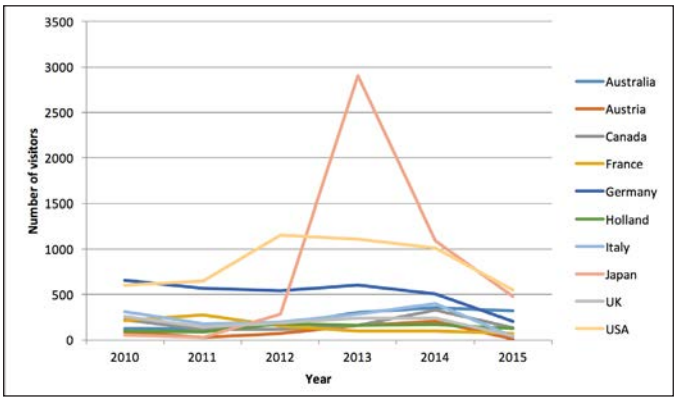


Figure 18.23. *Top international visitor groups from 2010 to July 2015 (Data compiled by Katrina Gargett).*

Yet again, national tourists significantly outnumbered international tourists, with Konya providing the highest frequency and largest groups of domestic tourists (Fig. 18.21). Data from 2015 seem to suggest the proportion of 75-80% national to 25-30% international remains consistent, with the numbers of international and national tourists not converging as we previously suggested they might. The international visitor demographic for 2015 mirrors, to a large extent, those found in previous years (Fig. 18.22). Australia, Germany, Japan and the USA remain amongst the top 5 nationalities. Interestingly, the top nationality for 2015 is set to be the USA, overtaking Japan as the country with the most visitors since 2013. The peak in Japanese tourists resulting from the 2012 UNESCO inscription seems to have fallen back to previous numbers (Fig. 18.23). The Netherlands, Canada and the UK also remain in the top 10 for 2015. The only demographic shift seems to be a relatively significant increase in the number of tourists from Russia, China and Taiwan.

Visitor research

As per previous years, this season we carried out visitor observations in order to assess how visitors move around and interact with the site. Over the course of two weeks in August, Andrew Henderson and Katrina Gargett accompanied four tour groups, which included tourists from Turkey, France, New Zealand, Sweden and Italy. We started by making ourselves known to the visitors and then joined them on their tour, recording dwell times (in the Experimental House and North and South Shelters), questions asked and general visitor behaviour. In line with past findings, there appears to be a series of predictable trends in terms of on-site experience, including:

- A varying interaction with signage, with many not interacting with signs at all, and some only briefly glancing at them
- People coming to Çatalhöyük with previous knowledge of the site, often derived from their own

personal research

- Four main areas of interest expressed by visitors about the site, namely concerning (1) the architecture of the houses, (2) what daily life was like for the people who lived at Çatalhöyük, (3) the history of the site/previous excavations and (4) the ongoing excavations/current work of the archaeologists
- It was observed on all tours that there was an overall lack of physical interaction within the Experimental House, with people generally standing and listening to the tour guide rather than looking around
- Average tour time was 40.25 minutes

The main questions asked by visitors to their tour guides concerned the everyday tasks and difficulties of the people of Çatalhöyük, with questions centring on the occupation of the houses and features such as wall paintings. Interestingly, on all the tours except one, the visitors asked about the burials under the platforms. This subject, in particular, seems to be a key area of interest for visitors. The architecture of the buildings similarly attracted enquiry, with three out of the four tours asking about the demolition of the houses and why it occurred. The position of Çatalhöyük within the landscape in relation to other sites, as well as the environment and reasons for building here, were often asked about. This potentially indicates that visitors are trying to visualise Çatalhöyük within its wider environs and that there is a concern for the bigger picture, moving away from the houses themselves.

Other frequently asked questions centred on the ongoing excavations, particularly around the Polish team's trenches. This was due to the fact that, when the visitor observations were carried out, excavations on site had ended. Only the Polish trench to the north of the South Area was still active. It is interesting that as soon as visitors arrived at the active trenches, the nature of their questions switched from a concern for Çatalhöyük in the Neolithic to an interest in Çatalhöyük today. This was often reinforced when visitors observed the excavation trenches from the south end of the South Area. Interestingly, on three of the four tours, when leaving the South Area visitors frequently asked about Mellaart's spoil heap which then prompted discussion regarding the history of the excavations.

The average tour time was, as expected, approximately 40 minutes. The dwell times in each shelter averaged at 7.75 minutes and 6.5 minutes for the North and South Areas respectively.

Overall, it would have been preferable this season to have carried out more observations. However, the information gained seems to reflect the trends seen in previous years. We have been able to observe how people are interacting with the signage installed in 2014 and critically reflect on this (although, as above, it seems the signs are highly underused). Visitor observations remain a positive contribution to our visitor studies and, as shown with the Experimental House this season, allow us to continually improve the visitor experience at Çatalhöyük.

Bodystorming

Over the past seven years, our work at Çatalhöyük has primarily focused on standard means of public interpretation and display: the production of signs, brochures, maps, guidebooks, etc., all of which generally conform to normalised expectations about the visitor experience. As we have been keen not only to raise our profile amongst the specialist community on site, but so too to actually invest in interpretation-related research (as opposed to performing and evaluating production alone), we have begun to initiate cooperative activities focused on exploring the potential of interpretation to further intellectual change at Çatalhöyük. In 2014, this took the form of story authoring with the site's researchers, which we subsequently published as part of Museums and the Web (Roussou *et al.* 2015: http: //mw2015.museumsandtheweb.com/paper/

the-museum-as-digital-storyteller-collaborative-participatory-creation-of-interactive-digital-experiences/). In 2015, we aimed to go beyond narrative alone, considering the ways we engage our bodies in interpreting (both for academic purposes and for public dissemination) the archaeological record.

To this end, we worked with Narcís Parés to design and host a bodystorming session (cf. brainstorming) with *c.*20 members of the Çatalhöyük Research Project. Growing out of the field of interaction design, and increasingly used as a creative tool, bodystorming aims to imagine scenarios through the body, employing gestures and movements (as opposed to words and writing) as means of communication. The original intent of hosting such a session was to assist our team in designing more engaged, immersive on-site experiences that would help visitors to think through precisely how it might feel to live at this site. Our aim was to push away from using language as the primary means of delivering information about the past to visitors. Our hope was that Çatalhöyük's specialists, as the only individuals in the world who have the privilege to experience the site from the ground level – from within the buildings themselves, where they can crouch, touch, peer into different spaces, and otherwise handle the archaeological record – might provide insight into how that experience could be translated or enacted for visitors themselves.

Figure 18.24. *Çatalhöyük specialists and Visualisation Team members participating in the first phase of the bodystorming activity: brainstorming concepts associated with 'Çatalhöyükness' (Photo by Maria Vayanou).*

Figure 18.25. *Still frame from video footage of bodystorming warm-up activity with Çatalhöyük's specialists.*

We therefore organised an evening bodystorming event to which we invited a comprehensive range of specialists, from those involved in education and tour guiding, to excavators, lab heads, and associated specialists. The event was arranged in multi-part format, beginning with a welcome by Narcís and Sara, where a very general description of the project was offered, and the team introduced. From there, we moved into a brainstorming activity (Fig. 18.24), where participants were given stickie notes on which they were asked to write abstract concepts they felt related to the notion of 'Çatalhöyükness'—or what it meant to be and to dwell in Çatalhöyük in the past.

These concepts were grouped into overarching thematic categories by the Visualisation Team while participants left the room to begin a bodystorming warm-up with Narcís. Here, in the entranceway to the site, participants were led through somatic activities to build rapport and confidence amongst everyone, to get their bodies activated and to make them aware of their body parts and bodies in space. The aim was to encourage them to use their bodies as protagonists in the subsequent activity where the concepts of Çatalhöyükness would be enacted physically by participants (Fig. 18.25).

At this point, participants were split into two groups, one heading up into the North Area which was bathed in darkness and required lighting via artificial means; the other remaining in the poorly-lit driveway. Once settled, each group was asked to improvise the concepts articulated in the brainstorming session, focusing on enacting the concepts from the

point of view of an archaeologist and of a previous inhabitant of Çatalhöyük. Narcís encouraged participants to avoid talking or explaining their ideas, but to rather jump straight into acting with the body, moving in relation to both the available space and the other people around them (Fig. 18.26).

Figure 18.26. *Still frame from video footage of bodystorming practice in the North Area of the site. (Footage by Vassilis Kourtis).*

Following this work, we returned to the Visitor's Centre for a short debrief on the experience. Laia and Sara subsequently interviewed approximately half of the contributors to the session for their impressions of the event, and Sara prepared a substantial written critique. The resulting data will be analysed in depth over the coming year, but impressions of the session were mixed, and its orchestration was problematic on a variety of levels. Issues with lack of clarity around objectives, our overly vague concern for abstract concepts as opposed to concrete actions, the too-large group sizes, a chaotic initial brainstorming session, a curtailed and ineffectual final debrief, alongside associated logistical problems (lack of lighting, gaps between activities, etc.), suggest that the session was a failure. However, interview data indicate that a not insignificant number of contributors recognised the potential of the endeavour and could envision it as a productive exercise subject to its rethinking. We await full analysis before proposing next steps with this methodology.

Acknowledgements

Our work depends on the support of many people, so much so that we are indebted to almost all of the members of the Çatalhöyük Research Project for their time, assistance, ideas and encouragement. Ours is a complex, cooperative form of practice that depends upon the good will and interest of others, and we are particularly grateful to the following individuals for going above and beyond in terms of their contributions: Bilge Küçükdoğan, Ali Kavas, Levent Özer, Jason Quinlan, Katy Killackey, Dominik Lukas, Scott Haddow, Sophie Moore, Michelle Gamble, Jana Rogasch, Burcu Tung, James Taylor and especially the site guards İbrahim Eken, Mustafa Tokyağsun, and Hasan Tokyağsun.

Chapter 19

Depicting Çatalhöyükness: Preliminary Fieldwork Report for the {LEAP] Project

Laia Pujol Tost, Universitat Pompeu Fabra

Introduction

From July 25 to August 6, 2015 Dr Laia Pujol-Tost, Marie Curie Researcher at Pompeu Fabra University of Barcelona, conducted field work at the Neolithic site of Çatalhöyük (Turkey), in collaboration with the Visualization Team of the Çatalhöyük Research Project. The stage was part of the EU-funded project LEAP (www.upf.edu/leap). The aim of this two-year research endeavour is to establish a theoretical and methodological framework for archaeological virtual reconstructions, based on the concept of Cultural Presence. Cultural Presence could be defined as the subjective feeling that one is immersed in another, past culture. This culture has agency, in the sense that it has its own, specific features, and it is possible to see it and interact with it as an inhabited place. Defining what these features are and how they should be implemented is one of the main goals of the LEAP project. The specific features of Çatalhöyük and the archaeological approach adopted to investigate it make it the most suitable case to achieve LEAP's goals.

Goals

The fieldwork conducted at Çatalhöyük aimed to refine the notion of Cultural Presence and its implementation through a characterization (1) of the defining elements of Çatalhöyük as a culture, and (2) of the features to be included in an ideal reconstruction of the Neolithic settlement.

Methodology

To this end, Laia sought the collaboration amongst the Çatalhöyük team of nine archaeologists representing the major specializations involved in the study of this site: human remains, scientific illustration, chipped stone, field archaeology, post-Chalcolithic occupations, conservation, faunal remains, and heritage interpretation.

To obtain a characterization of Cultural Presence and its implementation, Laia used a combination of objective and subjective approaches. In the first case, she analysed the video recordings of the experts describing Çatalhöyük 9,000 years ago, under three different conditions: at the archaeological site, at a reconstructed house, and by means of two different illustrations. The observations, which lasted around 15 minutes for each participant, were triangulated by means of the questionnaire (subjective approach), which contained questions related to the way the different media had contributed to their explanations, the defining elements of Çatalhöyük as a culture, and the way to depict them in a virtual reconstruction.

VR applications of Çatalhöyük can share features of the original site (through the raw data), the site's experimental house (in the sense of their immersiveness), and the site's other images (in the sense of containing, for instance, the presence or absence of humans). On the other hand, VR has some capacities (dynamism and simulation) that cannot be found in these other media/forms because they come from VR's computational virtuality. Laia wanted to see which ones were spontaneously used or considered important by experts in order to describe verbally and/or visually a past culture.

The field work collected nine questionnaires. The observations were transformed into a database for

discourse analysis, which contained 478 observation entries. A general hypothesis was formulated that the three different conditions or media (site, house and images) would trigger significantly different gestures, approaches, and especially topics and emphases. Yet, it was clear that the human factor may also be playing a role. Therefore, to test the aforementioned hypotheses a series of Chi-square tests—Correspondence Analyses—were conducted.

Results

The analysis of the data collected on site is still ongoing. The full work will be published in academic journals and conferences in the following months. It is already known, however, that there was no contradiction between the experts' behaviours (observations) and opinions (answers to the questionnaires) neither in the case of the defining elements of Çatalhöyük as a culture nor of the best way to depict them.

Based on my findings, it seems that the defining elements of Çatalhöyük can be divided into architecture and settlement, food production, social organization, symbolism, and temporal perspective. On the other hand, the ideal virtual world should be mostly like the Experimental House (immersive, multi-sensorial, interactive with the full body, rich in affordances). But it should also depict people, be surrounded by the site and environment, and include spatial and temporal variability, dynamism and autonomy.

Conclusion

Future work will entail evaluations with real users in experimental situations in order to assess if a virtual reconstruction of Çatalhöyük including the characteristics defined in this study will produce higher levels of Cultural Presence (in comparison with empty static versions of the same world) and foster better learning of the defining elements of Çatalhöyük as a culture.

Acknowledgements

To the Çatalhöyük Research Project and Prof. Ian Hodder, for hosting the LEAP project. Dr Sara Perry for her close collaboration, availability, enthusiasm, and useful insights. The members of the Çatalhöyük Visualization Team, who helped refine the goals and methodology. Finally, the participants of the experience (Barbara Betz, Sean Doyle, Cumhur Ertüzün, Kathryn Killackey, Ashley Lingle, Sophie Moore, James Taylor, Burcu Tung, Özgür Can Uslu, Jesse Wolfhagen) for their time and for their beautiful and evocative descriptions about Çatalhöyük. I was lost in "the Virtual" and they reminded me why I have always loved archaeology. This project has received funding from the EU's 7 FP, under grant agreement n. 625537.

Research Projects

Chapter 20

Building 89 and 3D Digging Project

Maurizio Forte[1], Nevio Danelon[1], Elisa Biancifiori[2], Nicolo' dell'Unto[3], Nicola Lercari[4]

[1]Duke University, [2]University La Sapienza, [3]Lund University, [4]UC Merced

Integrated technologies and 3D Digging

The 3D Digging Project, started in 2009 with its first experiment on site, is completed. Çatalhöyük is a fully digital project and the archeological documentation is paperless. The introduction of 3D technologies (image modeling and laser scanning) has changed the methodological approach to the on site archaeological documentation and introduced new research questions. The affordability of image modeling and 3D data acquisition has meaningfully increased the amount of models available for archaeological interpretation and digital archiving. Models can be integrated in GIS, virtual reality systems and in the future, in on line repositories.

The season 2015 was characterized by new tests of data capturing and simulation and, first of all, by the systematic use of UAVs at site and landscape scale. A hexacopter and a quadricopter, in fact, because of their different equipment, can involve a wide range of different photogrammetric and remote sensing applications.

The digital workflow introduced and tested in the last three years was very successful; in fact the documentation of the B.89 was entirely paperless: tablet, laser scanning, image modeling and photogrammetry. This innovative approach raises new questions about the scientific publication of the excavation in the light of the general plans of archaeological interpretation and data dissemination.

How can the scientific publication involve textual narrative and data query? How can we approach 3D data sharing for on line interaction? How can we design 3D repositories for archaeological data? Digital repositories and 3D libraries are a very challenging research topic but we are still far away from successful data standardization. The main issue is that we deal currently with "big data", a growing amount of 3D information to process, store and share.

Figure 20.1. *Oculus Rift for immersive virtual reality.*

Duke University is developing a specific application for Unity 3D, Dig@IT, which could be the final digital repository for the B.89 by using a 3D platform of visualization and virtual simulation in conjunction with the database of excavation (Fig. 20.1).

In this case the workflow involves: implementation of obj files for Unity 3D; creation of a digital elevation model for the entire area of excavation (South shelter); generation of virtual stratigraphic units according to size, volume and shape of the excavation maps; georeferencing and integration of the B89 in the general context of excavation (by image modeling and laser scanning); 3D models integration in the virtual scenario; connection with the database; 3D puzzling and simulation of five years of excavation in a virtual scenario. Dig@IT runs on several immersive devices such as Oculus Rift, Z-space (a holographic

screen) and the DiVE (Duke Immersive Virtual Environment), a six-sided cave for virtual reality. In the future it will be possible to integrate a platform of simulation on site, with the ability to link empirical observation and virtual simulation during the excavation process.

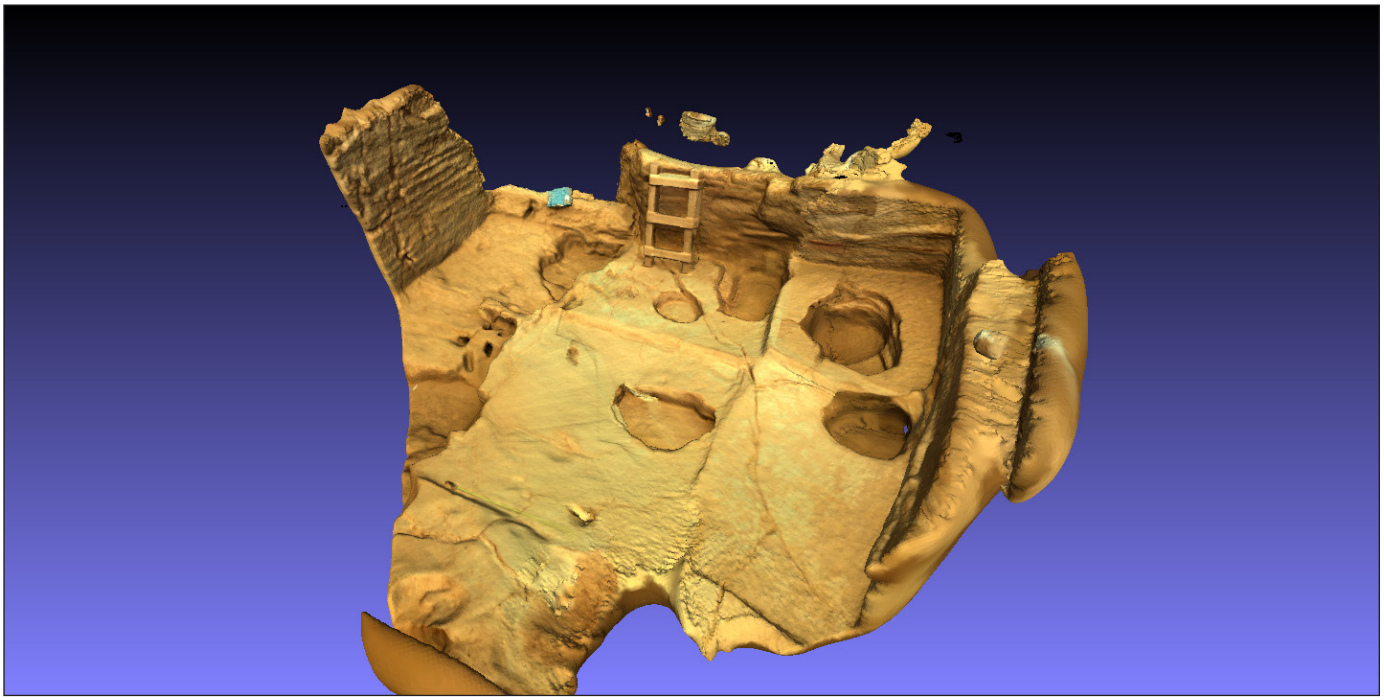


Figure 20.2. *3D model of B.89 made by optical scanner (Structure sensor), in a few minutes of processing.*

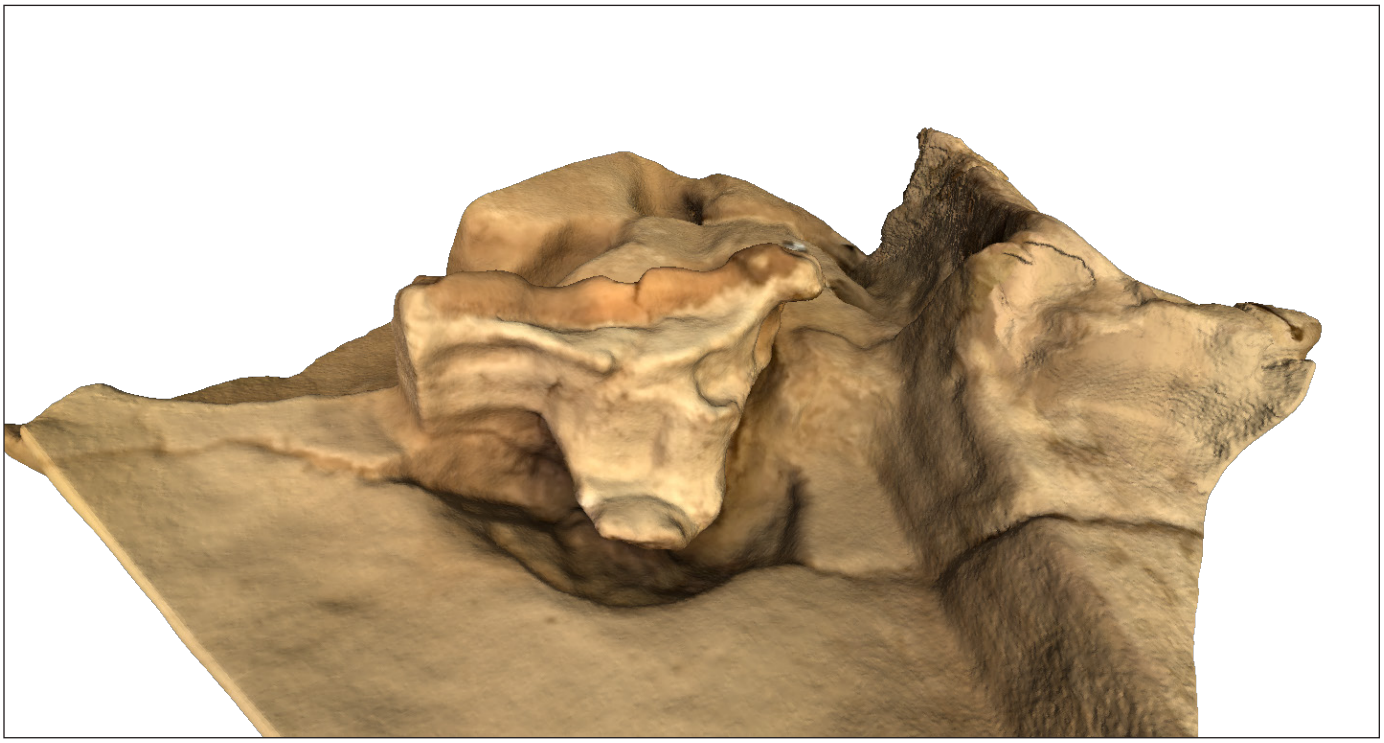


Figure 20.3. *3D model of a residual bucranium in B.89 made by optical scanner in real time (Structure sensor).*

An interesting experiment concerned the use of a new and portable optical scanner, the Structure sensor, connected with an Ipad and used in combination with the Sensor app (for Ipad) and the software Skanect for Mac OS (Fig. 20.2). The device generates meshes in real-time in a range of 8x8m and it could be used in the future for making stratigraphic models in real time (Fig. 20.3). The first results are quite impressive with an accuracy of 2-3cm and a few minutes of post-processing. The system allows a quasi-instantaneous visualization of 3D models *in situ* and during the excavation. This multiplies the archaeological ability to interpret empirical data and digital models in the field and during the documentation process.

Figure 20.4. *UAV DJI S-900 used for the aerial survey.*

UAV photogrammetry (Duke University)

UAV, unmanned aerial vehicle, known as a drone, is an aircraft without a human pilot. Its flight is either controlled autonomously by computers or under the remote control of a pilot on the ground. UAVs are becoming very popular in archaeology because they can be entirely managed by archaeologists and they can create high-resolution photogrammetric models of sites and landscapes in a very short time. In our case we have used the DJI S-900 (Fig. 20.4), a hexacopter equipped with an 18mp camera. This kind of drone is fully customizable and because of the payload it will be able to hold a lidar or a multispectral camera.

The 2015 season involved the use of drones in micro and macro scale: low flights for each area of excavation; high flights for the landscape (East and West Mounds) and some of the surrounding regions. Over 1000 aerial photos have been captured during the summer season. An additional experiment, requested by the Konya museum, regarded the digital photogrammetry and mapping of the Hellenistic-Roman archaeological site of Isaura (Isaura Vetus), never mapped and documented before.

The digital outcome of these aerial surveys is 2D and 3D and, more specifically includes: a digital georeferenced photoplan of the site (2cm of accuracy); a Digital Surface Model and a Digital Terrain Model of the site and of the surrounding landscape; an unsupervised classification of the imagery; a feature tracking of soil and crop marks related to artificial structures; over 900 georeferenced photos. The use of a Differential GPS with a real time Omnistar correction has produced maps with 15-20cm of accuracy, in UTM coordinates. We can say that it is the most accurate existing map of the site.

Aerial survey and data collection

More in detail, the final products of the drone survey consisted in:

a) a large **orthophoto** featuring the entire archaeological area, generated at a ground resolution of about 0.25 meters per pixel;
b) a series of **digital elevation models** in Geo-TIFF raster format;
c) a **3D point cloud** in PLY format.

All these data have been georeferenced both in local and global (WGS84 – UTM 36N) coordinates using a total station in the first case, and a differential GPS antenna in the latter. This report also includes an exploratory survey carried out in the archaeological site of Zengibar Kalesi (Isaura Vetus).

In order to collect all the photos needed for the aerial photogrammetric survey, we used a Panasonic GH4 camera mounted on a FJI S900 high-power hexacopter. The decision to acquire a large drone was mainly due to the prospect of being able to carry heavier devices such as DSLR, multispectral cameras or even a LiDAR system. Unlike most consumer drones, all parts are customizable and replaceable but it requires mechanical work including soldering and wiring as well as programming. Another disadvantage that arose immediately after our purchase was related to the new IATA regulations concerning transport of LiPo batteries. The original supplied 16000mAh batteries are no longer allowed on board of any aircraft, even for shipping. We had to build parallel-wired packs of four separable 3300mAh batteries each, still legal to transport but resulting in a little shorter flight-time (8-10 minutes instead of 12-14). The Panasonic GH4 camera is a small form-factor mirrorless micro-four-thirds system with fixed lenses. Its photo quality, flexibility, and design equate any DSLR at a lower weight.

The first stage of the work consisted in an accurate topographic planning that involved placing a number of Ground Control Points (GCPs) on the site for georeferencing the model. We created a shapefile in ArcGIS with 19 points evenly distributed over the entire area to control their spatial density and to avoid unwanted alignments. We printed 19 checkerboard targets on A3 format paper sheets that must be clearly visible in photos of 4608 x 2592 pixels taken from a distance of 75 m above the ground. To retrieve the location of the planned GCPs on the ground we relied on the support of an Archer2 GPS handheld device running ArcPad.

The GCPs position was accurately measured in the following days, regardless of the flight planning. To this end we used the Archer2 handheld device running ArcPad in conjunction with SX Blue II device. We took advantage of a subscription for a GPS service (OMNI Star) which uses real time differential correction based on a triangulation from a multitude of different satellite networks. This real time correction allowed us to receive GPS coordinates in the field with an average accuracy of 10 to 20cm, compared to the average of 1.5m accuracy we would have received without any differential correction. GPS readings were recorded in a shapefile using the datum WGS 1984, projected into WGS 1984, UTM 36 North. The GCPs position was also measured by triangulation with the support of a total station with an accuracy of 2 to 4cm. Since the total station survey was based on the local coordinate system, we provided data both in the local and global systems.

For the flight planning we relied on DJI Ground Station software. Even working offline, it allows visualizing Google Earth imagery as a base map as long as it has been previously loaded. Ground Station generates a route for the drone given some input parameters and a rectangular shape directly drawn on Google Earth base map. Considering an average flight-time of about 8-10 minutes, we divided the entire area of interest in seven longitudinal rectangles for each flight (Fig. 20.5). Then the software calculated the route and the waypoints according to the flight parameters entered. The flight altitude was set to 75 meters (Fig. 20.6), the forward velocity to 10-12 meters per second and the photo overlap to 75%. Due to a defect in one axis of the gimbal, the overlap percentage was not always precise. Since to recharge each batteries pack it took up to 40 minutes, we needed to concentrate the flights in the central part of the day, avoiding too sharp changes in light conditions and shadows between one flight and the other that could prevent the photos from being aligned in PhotoScan.

Figure 20.5. *Mission planning for the UAV.*

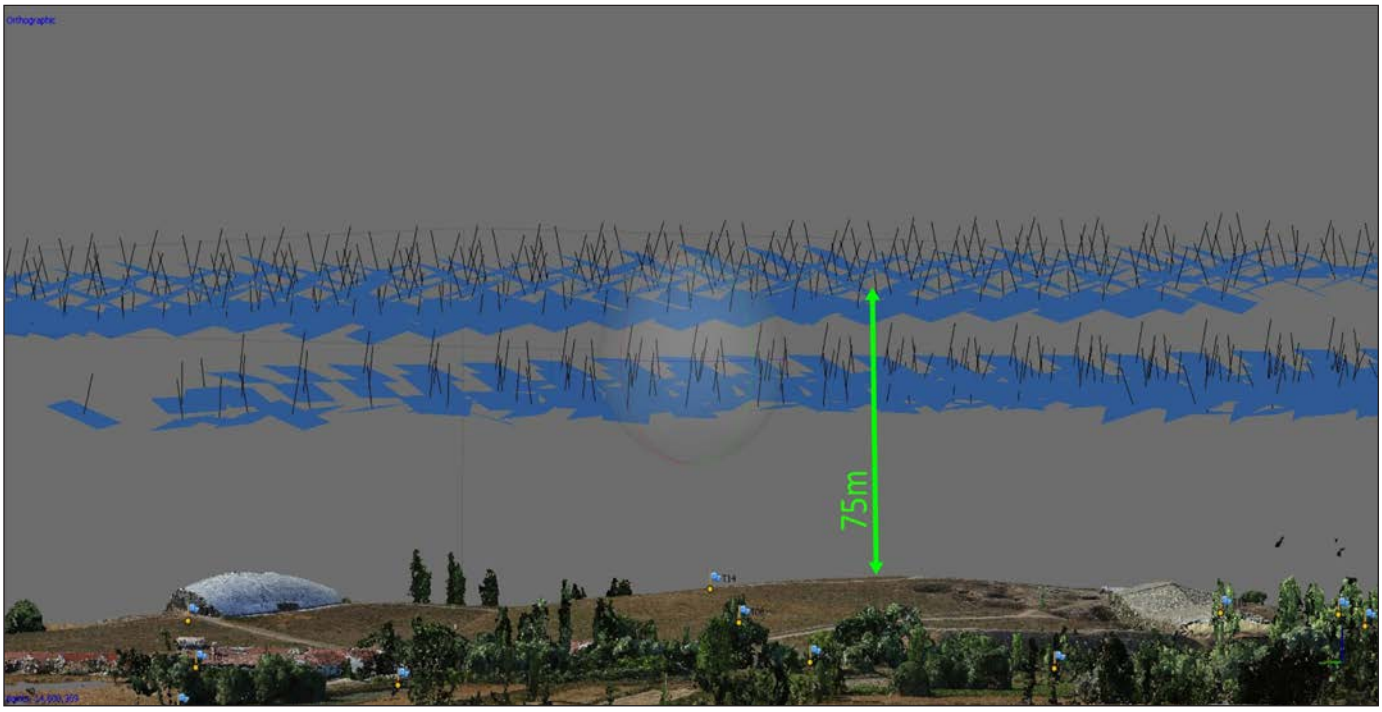


Figure 20.6. *Data processing of drone's photo by Photoscan.*

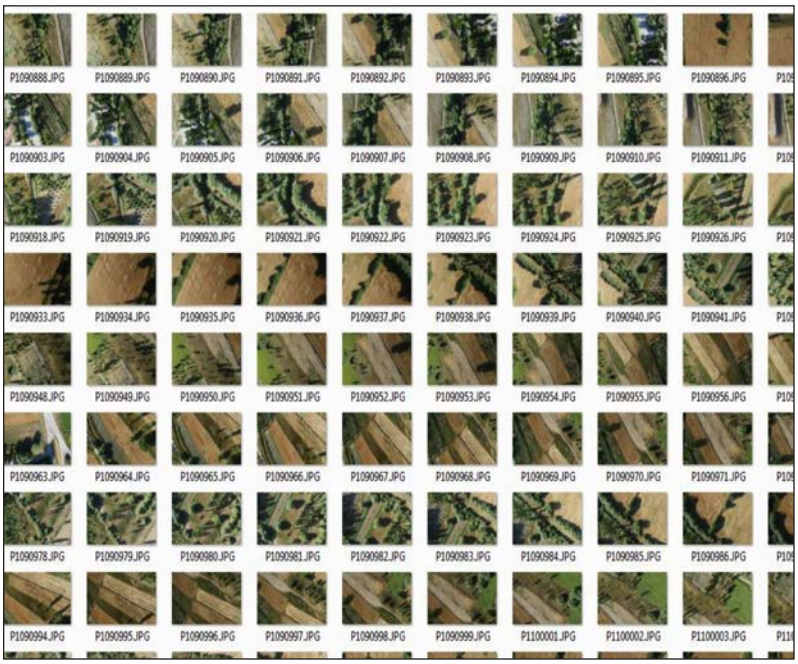


Figure 20.7. *UAV photo collection.*

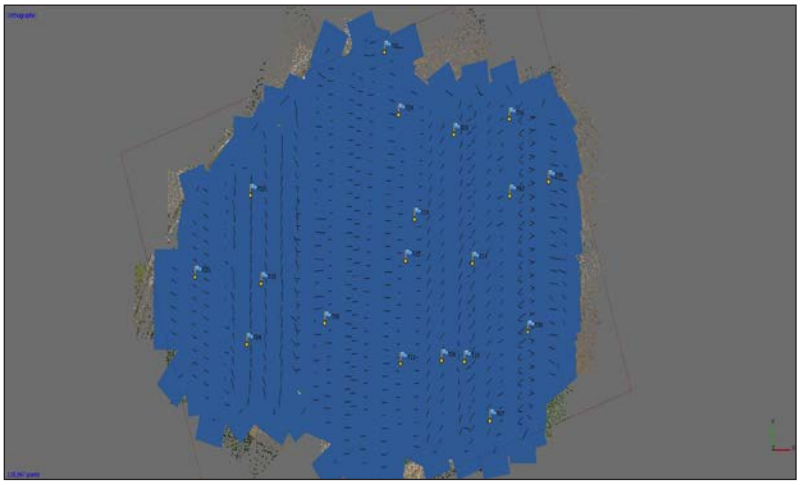


Figure 20.8. *Aerial photos camera alignment by Photoscan.*

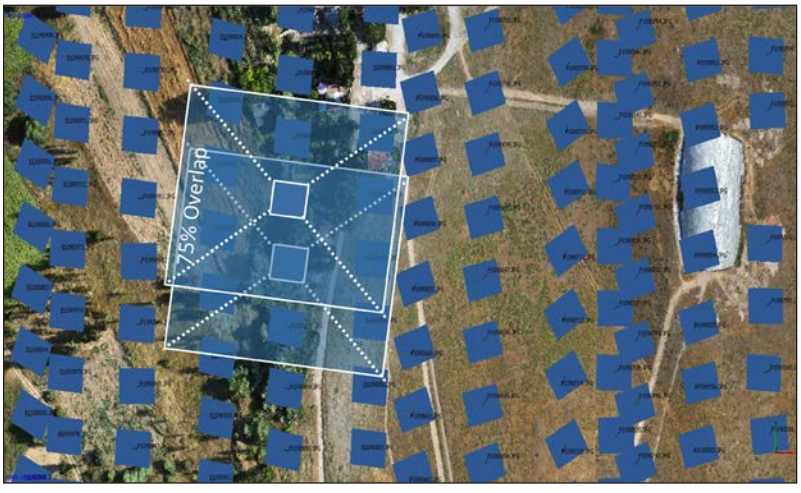


Figure 20.9. *Aerial photos camera alignment by Photoscan.*

Data processing

We collected a total of 729 vertical photos taken from the drone at a resolution of 4608 x 2592 pixels (Fig. 20.7). The images were selected and processed in Agisoft PhotoScan. After a first alignment (Fig. 20.8) and the generation of a rough 3D model, we placed markers in correspondence of the targets visible on the texture model and we entered the coordinate's values for each of them with the support of the GIS. After this step we adjusted their position, image by image, centering the markers on the target and launched a new adjustment process. In this way the model was georeferenced according to the coordinate's system while the reprojection error was minimized. A dense point cloud was generated and subsequently classified in order to separate the ground from the vegetation and the low-points (noise). Two different geometric models were generated depending on whether we wanted to obtain a Digital Surface Model (DSM, Figs. 20.10-20.11) – including vegetation and buildings – or a bare Digital Terrain Model (DTM, Fig. 20.12). Data processing was performed on the site using laptops with 12GB of RAM. Better results in terms of processing time and accuracy have been achieved using our laboratory workstations provided with 32GB of RAM and more powerful CPUs.

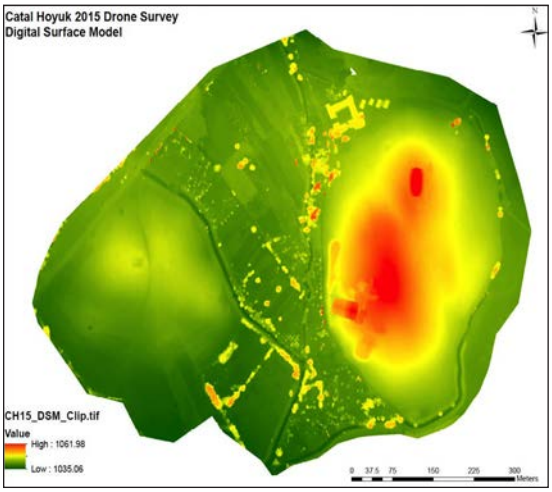


Figure 20.10. *Digital Surface Model of Çatalhöyük, East Mound.*

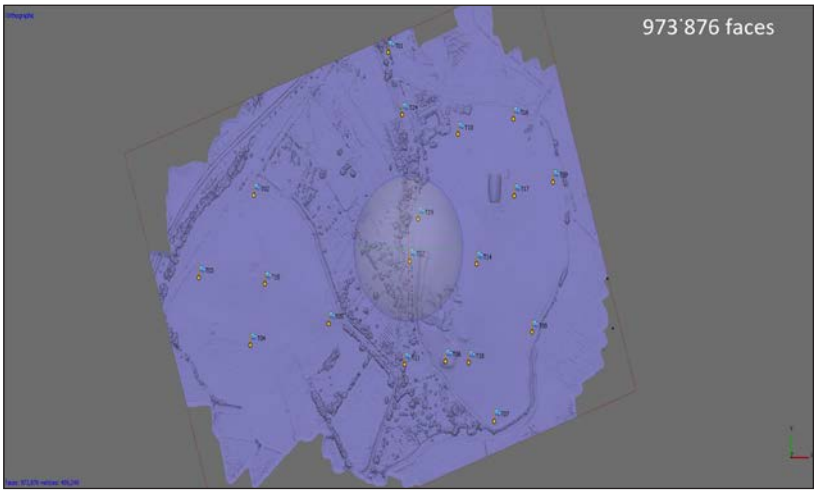


Figure 20.11. *Digital Surface Model of Çatalhöyük, East Mound.*

Figure 20.12. *Digital Terrain Model of Çatalhöyük, East Mound*

Data products and preliminary interpretation

After processing the data in PhotoScan we exported different kinds of georeferenced imagery for the GIS and 3D models in different formats, both in local and global coordinates:

CH15_Ortho_Local.tif
CH15_Ortho_WGS84UTM36N.tif

CH15_DSM_Local.tif
CH15_DSM_WGS84UTM36N.tif

CH15_DTM_Local.tif
CH15_DTM_WGS84UTM36N.tif

CH15_DSM_Local.ply
CH15_DSM_WGS84UTM36N.ply

CH15_DTM_Local.ply
CH15_DTM_WGS84UTM36N.ply

In parallel, we carried out two detailed survey on specific areas that could reveal predictable geomorphological and archaeological features. The first was located on the eastern side of the East mound were the drone flew at a lower height of 35 meters above the ground in order to detect more geometric detail of the ground surface. The second area was located in the surrounding countryside, just north of the site. Here we sought to detect any possible clue of a possible paleo-channel of the local river, slightly visible in some satellite imagery. Unfortunately the surrounding landscape is cultivated and was covered with high vegetation that prevented us to investigate the ground surface.

The digital terrain model of the site was uploaded in ERDAS Image, a remote sensing application for geospatial spatial data processing. Imagery can be processed by manipulating shaders and lighting parameters in the viewer, in order to enhance the visibility of features that would not normally be detected. The raster graphics editor is provided with automatic or semiautomatic feature extraction algorithms that provide the capability of vectorizing and mapping the interpreted features. After a preliminary elaboration, Çatalhöyük elevation data revealed interesting features related to the ground micromorphology such the

presence of the so called “third mound”, slightly visible (Figs. 20.13-20.14), and the shallow squared notches related to the previous archaeological prospections carried out by James Mellaart. Other morphological features could be revealed after a more thorough analysis.

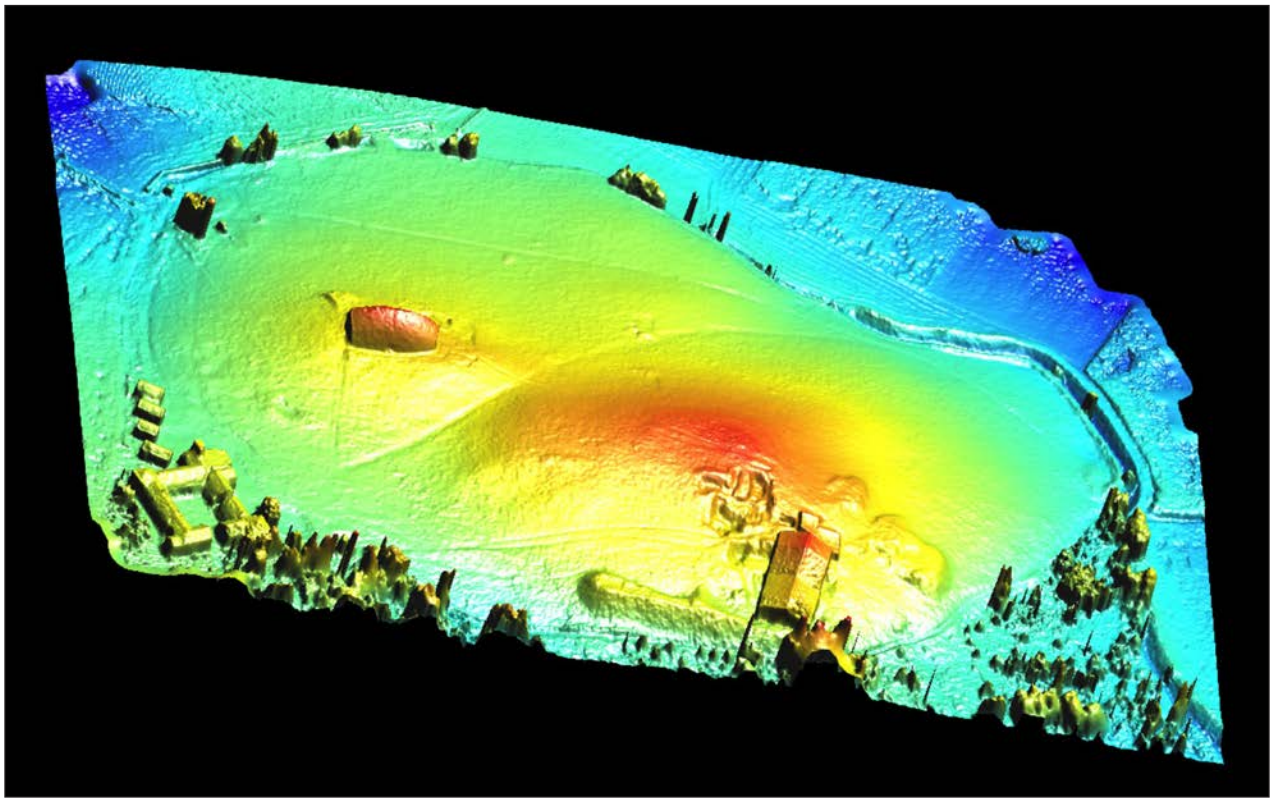


Figure 20.13. *3D visualization of the DTM of the East Mound (software Er Mapper).*

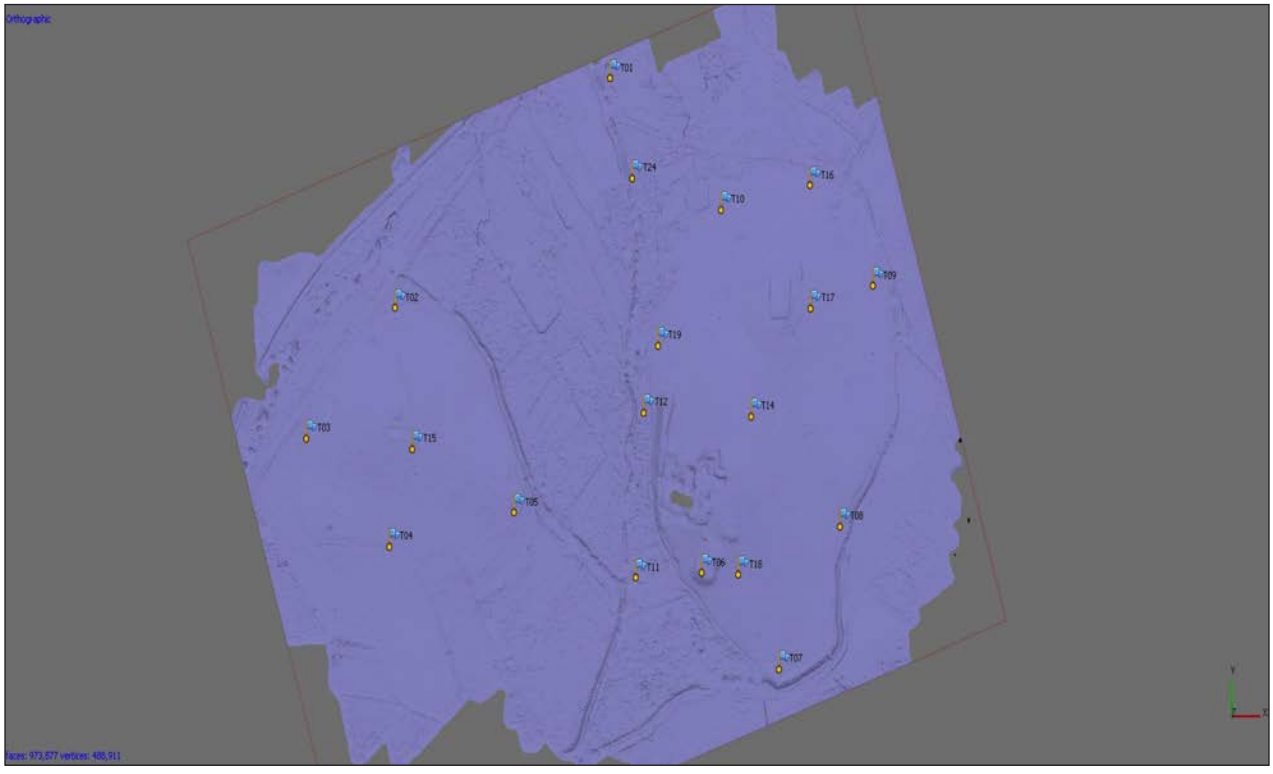


Figure 20.14. *Digital Terrain Model of Çatalhöyük (sunshade processing).*

Isaura

The ancient city of Isaura Palaia (or Vetus) was located on a mountain (Zengibar Kalesi) near Ulu Pinar, 10km east of Boskir (Silistat). It was the main fortress of Isauria until Perdiccas took it in 322 B.C. In 75 B.C. was destroyed by Servilius Isauricus, and later restored by Amyntas of Galatia. No plans of Isaura's ruins are known except for a very rough map published by Edwin John Davis in 1879.

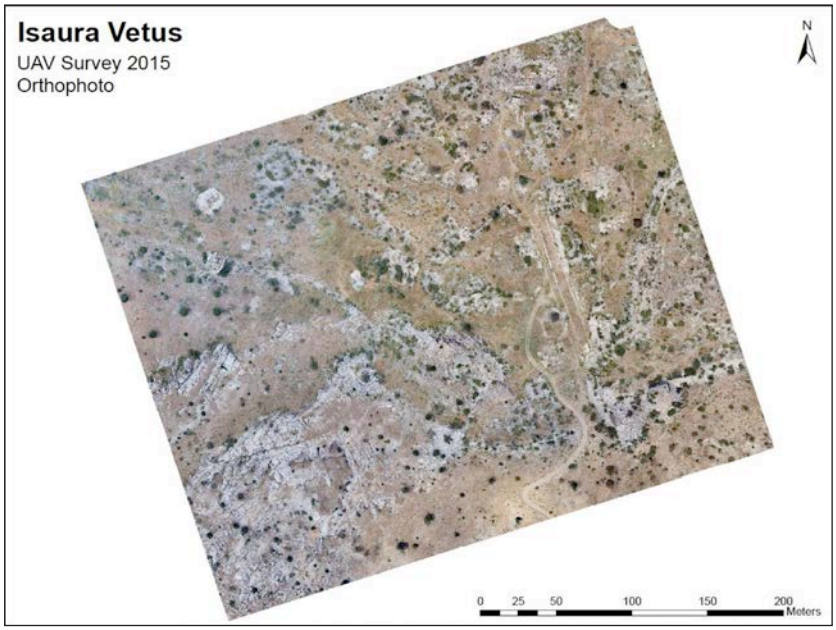


Figure 20.15. *Digital Orthophoto by UAV of Isaura Vetus.*

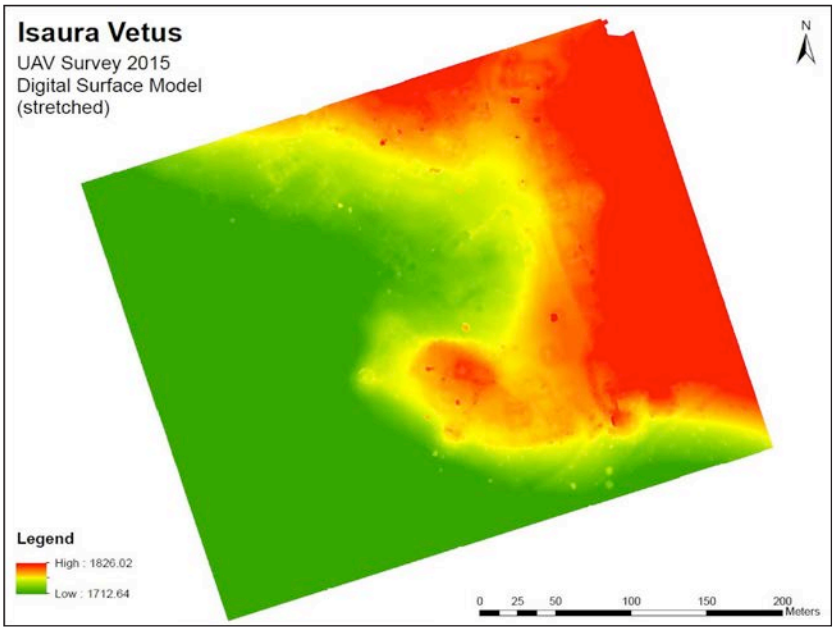


Figure 20.16. *Digital Surface Model of Isaura Vetus.*

The exploratory survey was carried out over an area of about 500m^2 centered on the southern part of the city. We selected 582 photos after a number of trial flights in the attempt to identify the city extent. Unfortunately Google Earth imagery did not allow a better planning of the flights and so we had to fly mostly blindfold. After processing the images we got a 3D model of the site (Fig. 20.15) that allowed us to investigate the topography of Isaura from an overall point of view. With the exception of few remains still standing (the arches of Hadrian, Marcus Aurelius, and Severus Alexander), the area within the walls looks like a monotonous expanse of ruins dotted with stone blocks and elegant architectural fragments, broken down. The wall around the mountain is *c*.3.8km long, built in pseudo-isodomic masonry. Parts of it are well preserved, including two well-fortified gates and 13 polygonal towers of which six are octagonal, seven are semi-octagonal in shape. The small acropolis is on a rise at the southeast end of the city. Few other buildings are readable in plan from the ground – mostly churches with apses – but after importing the DEM in ERDAS Image almost the entire topography of Isaura became visible (Fig. 20.16). A series of rectangular buildings (possibly private houses) appears along the main road leading to the southern gate, and a large cavea would indicate the presence of a theater.

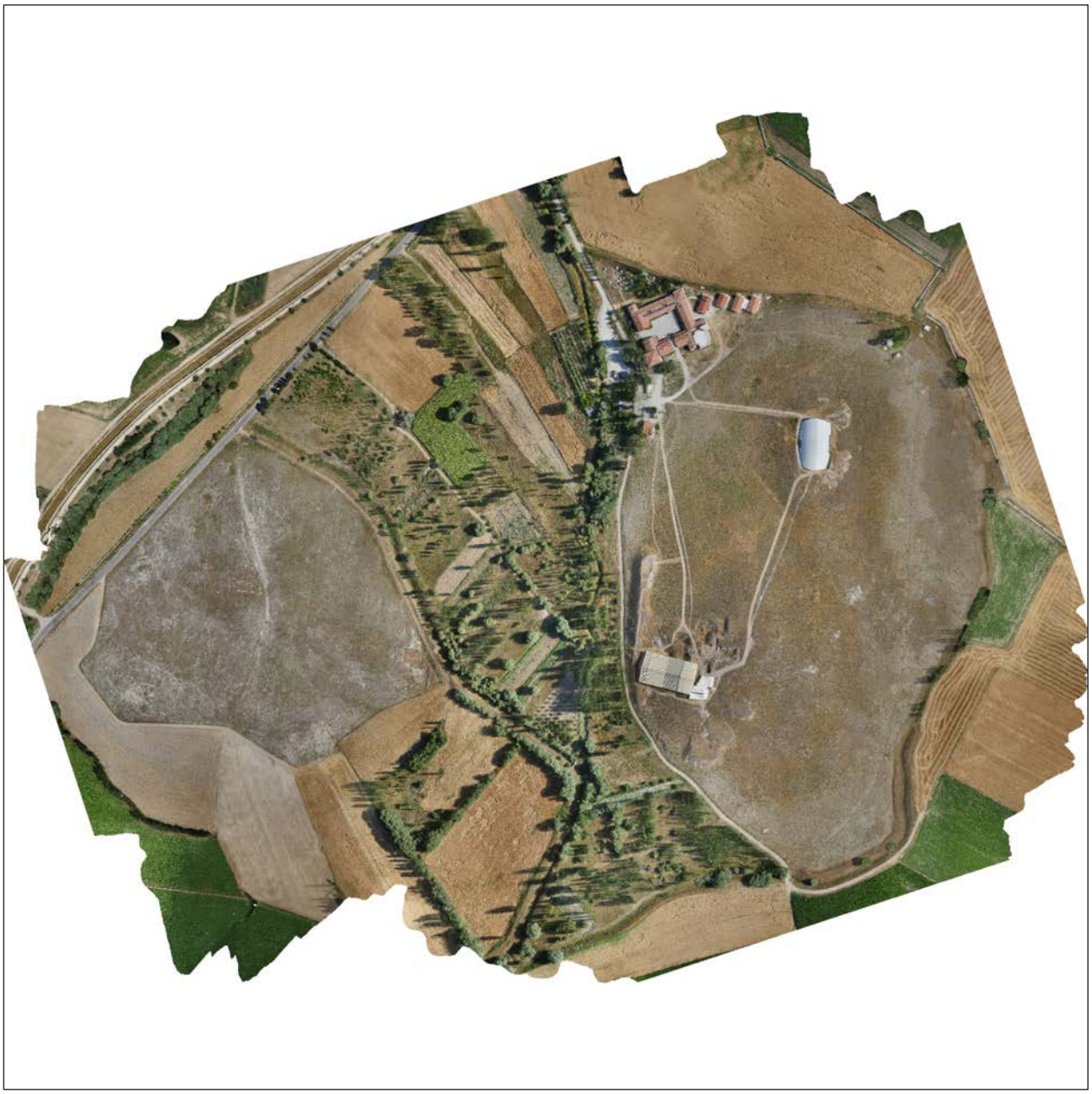
APPENDIX

CH15 Local Coordinates

Agisoft PhotoScan Processing Report

CH15 WGS84 UTM36N

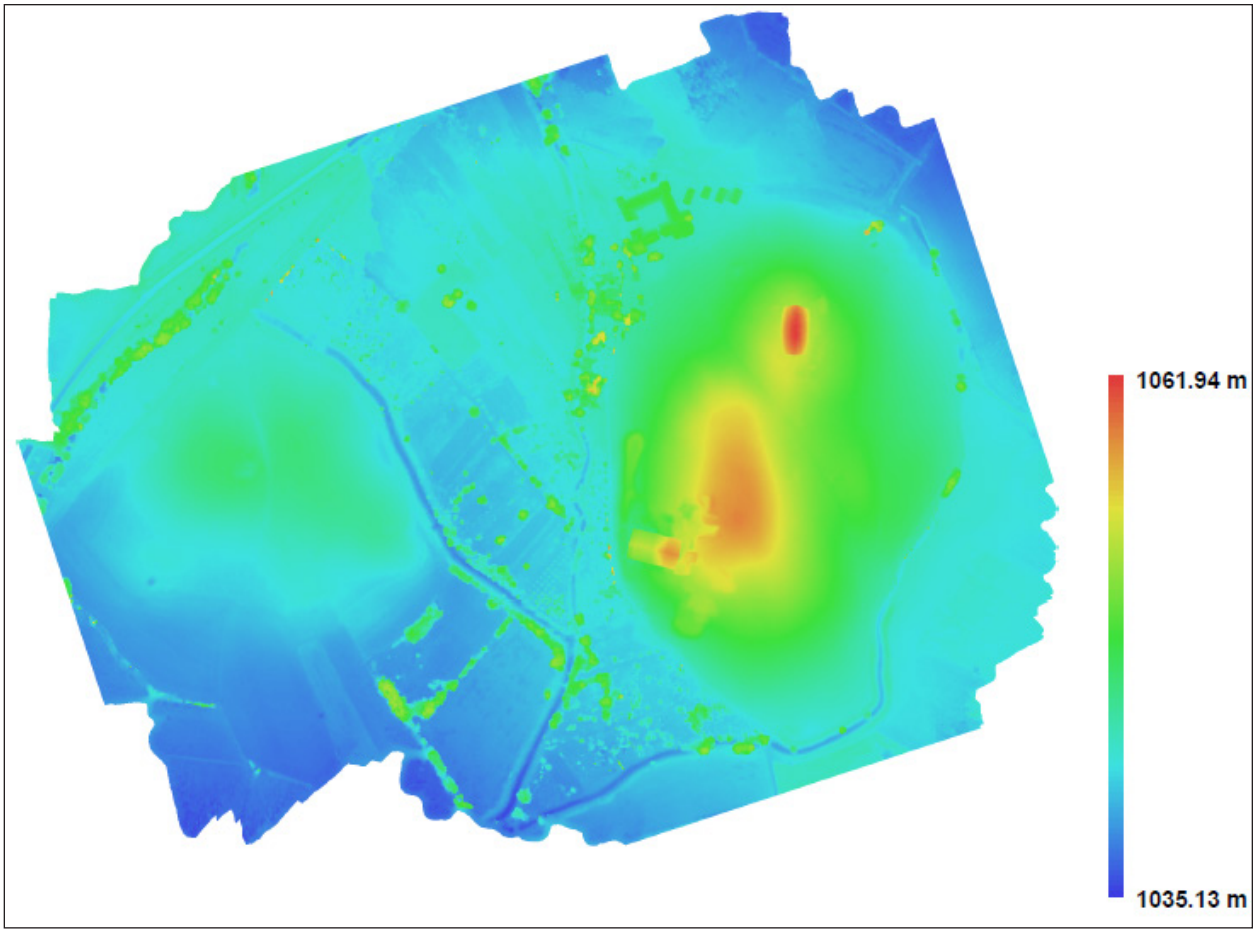
Agisoft PhotoScan Processing Report



CH15WGS84UTM36N Ortho photo.

Ortho photo

Resolution: 0.0259827 m/pix

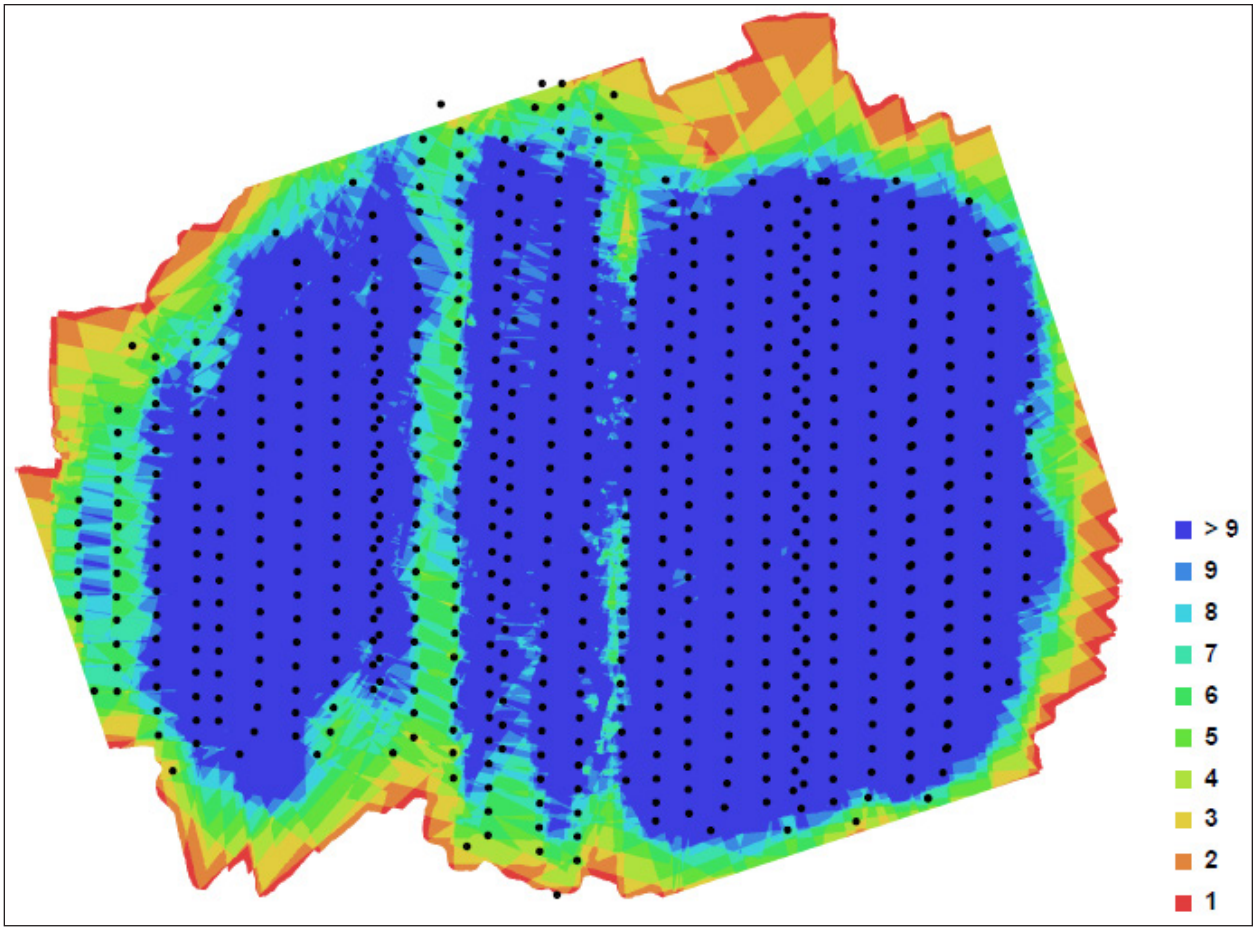


CH15WGS84UTM36N Digital Elevation Model.

Digital Elevation Model

Resolution: 0.207862 m/pix

Point density: 23.1447 points per sq m



Camera locations and image overlap.

Survey Data

Number of images:	729
Flying altitude:	92.2328 m
Ground resolution:	0.0259827 m/pix
Coverage area:	0.551867 sq km
Camera stations:	729
Tie-points:	118518
Projections:	637733
Error:	2.32009 pix
Camera Model	DMC-GH4 (12 mm)
Resolution	4608 x 2592
Focal Length	12 mm
Pixel Size	3.77706 x 3.77706 um
Precalibrated	No

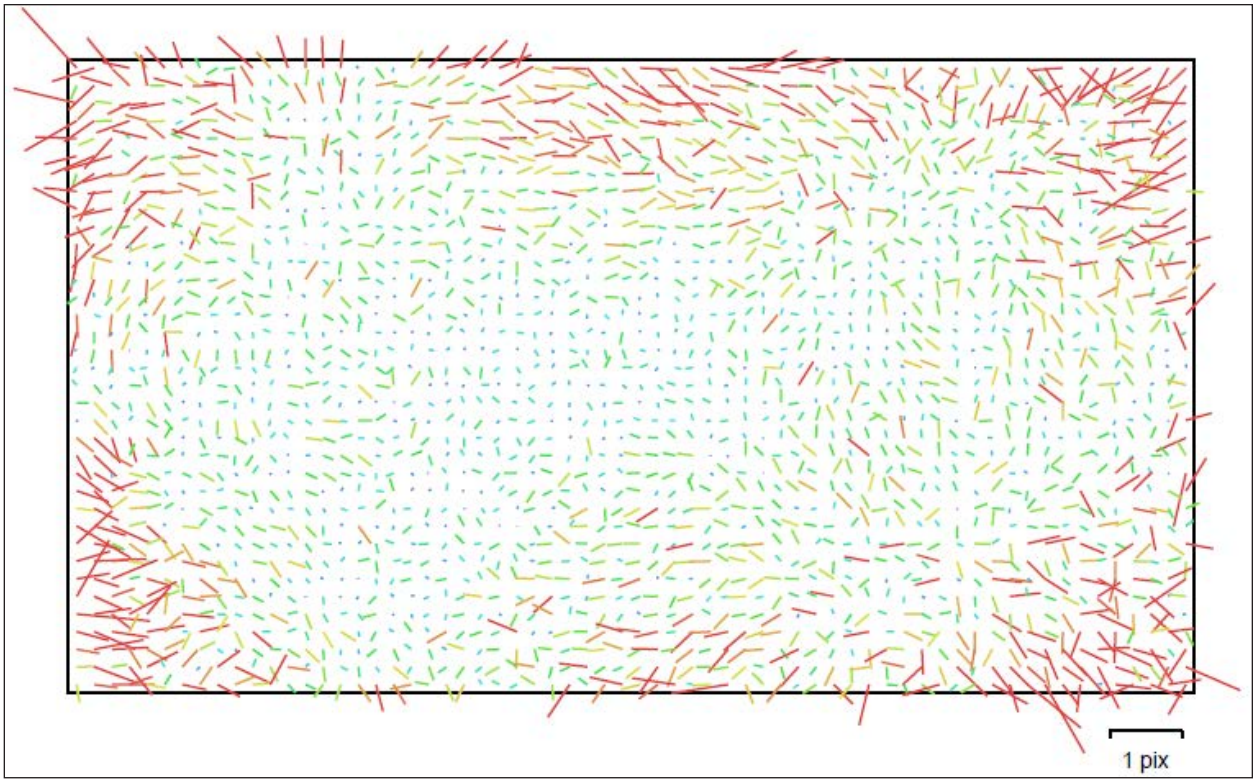


Image residuals for DMC-GH4 (12 mm).

Camera calibration

DMC-GH4 (12 mm)

Type: Frame

Fx: 3336.11

Fy: 3331.23

Cx: 2330.18

Cy: 1245.79

Skew: -9.33987

K1: -0.0163925

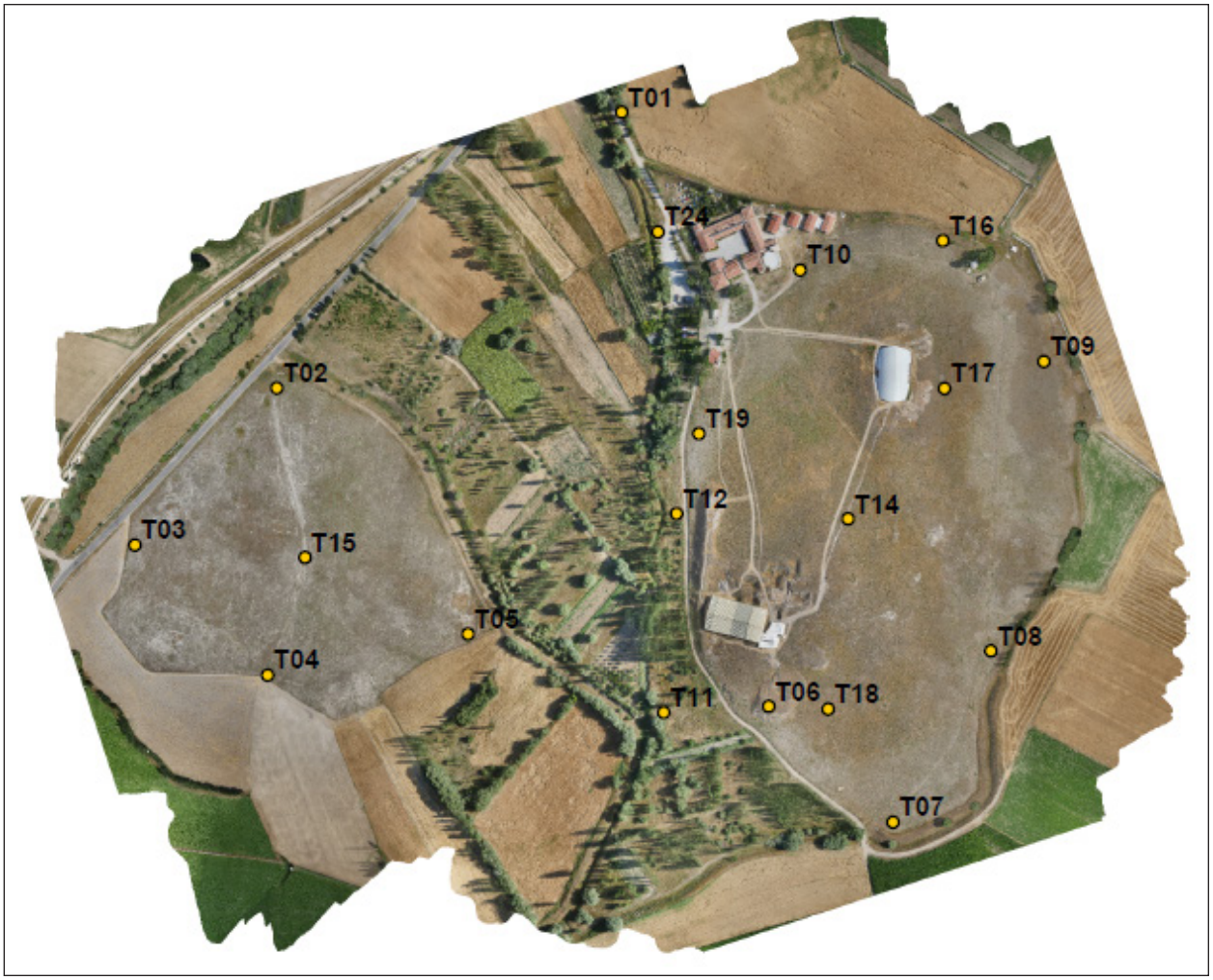
K2: 0.000808195

K3: 0.0112232

K4: -0.010692

P1: -0.00185797

P2: 0.000727376



GCPs locations.

Ground Control Points

Label	X error (m)	Y error (m)	Z error (m)	Error (m)	Projections	Error (pix)
T01	0.076653	0.121114	0.011504	0.143794	6	0.254225
T02	0.141875	0.054452	-0.013232	0.152541	14	0.159117
T03	-0.322485	-0.149815	0.004501	0.355614	6	0.290508
T04	0.251790	0.584365	-0.011834	0.636412	18	0.416458
T05	0.065056	-0.283022	0.031210	0.292075	6	0.339927
T06	-0.309493	-0.280747	0.292643	0.510142	20	0.589305
T07	0.258637	0.069982	0.016472	0.268444	14	0.199796
T08	0.066957	-0.087720	-0.014361	0.111285	19	0.201090
T09	-0.422653	-0.100992	0.108297	0.447843	17	0.358244
T10	1.012031	0.558339	-0.061216	1.157452	22	0.622686
T11	0.284061	0.336481	-0.115342	0.455208	10	0.616369
T12	-0.305975	-0.096466	0.027630	0.322008	14	0.342699
T14	0.037493	-0.445226	0.084997	0.454814	17	0.269989
T15	-0.214360	-0.306480	-0.008525	0.374103	19	0.348774
T16	-0.090749	0.280188	0.138161	0.325314	15	0.363977
T17	-0.081421	0.303402	-0.309488	0.440982	20	0.556832
T18	-0.414228	0.163640	-0.203207	0.489547	19	0.618023
T19	0.311486	-0.039521	0.063223	0.320286	17	0.304186
T24	-0.377169	-0.701638	-0.023037	0.796922	6	0.778786
Total	**0.341439**	**0.322889**	**0.122494**	**0.485637**	**279**	**0.438717**

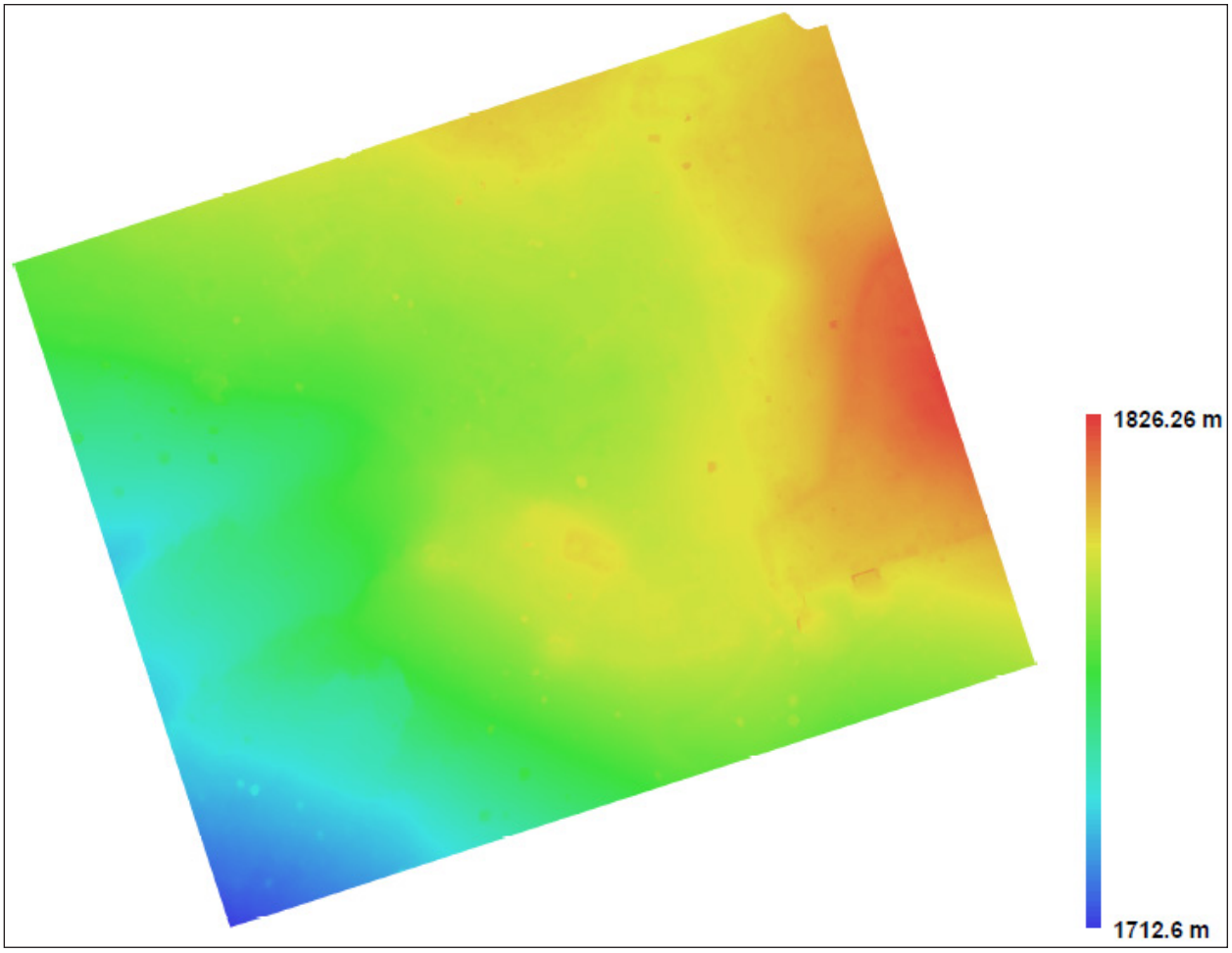
Isaura15 WGS84 UTM36N

Agisoft PhotoScan Processing Report

Isaura15WGS84UTM36N Ortho photo.

Ortho photo:

Resolution: 0.0174585 m/pix

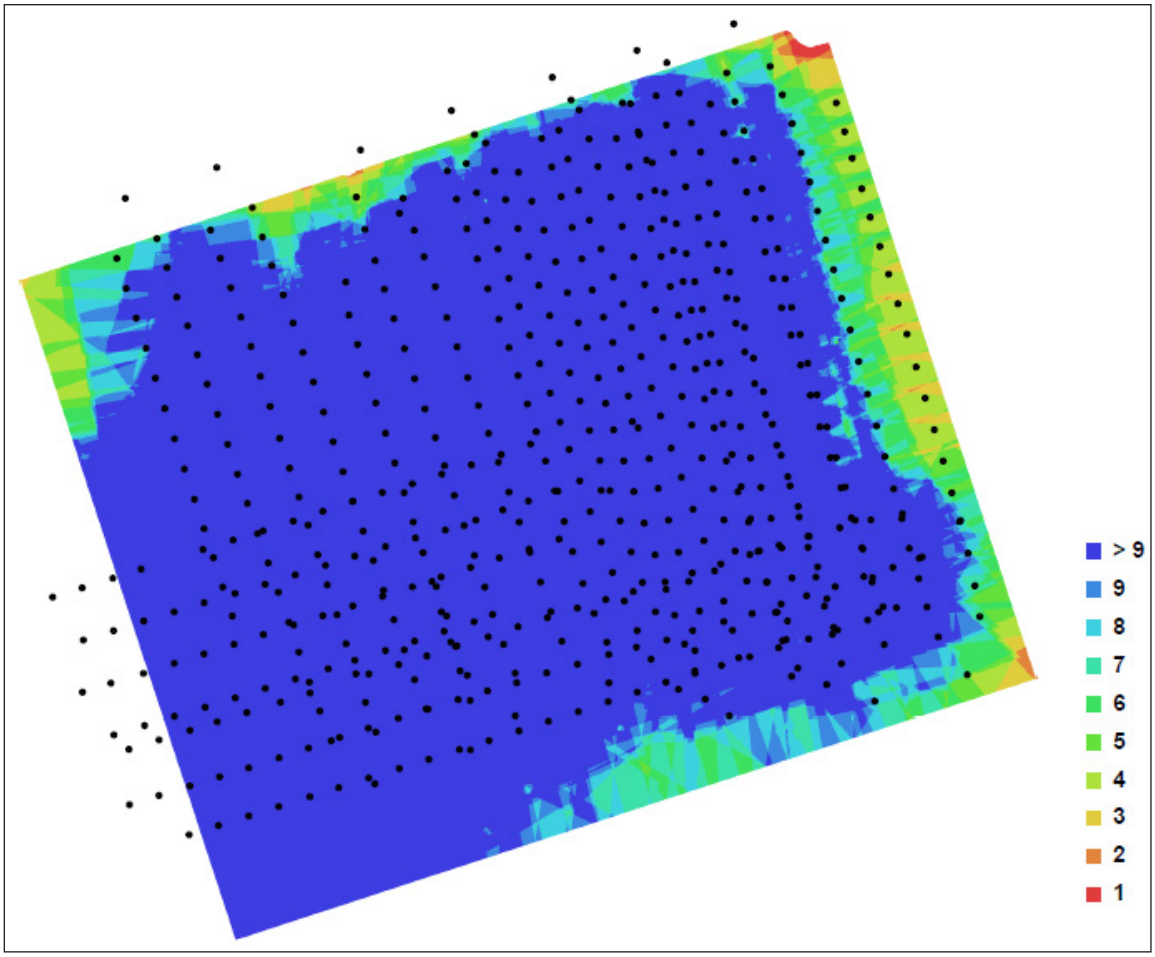


Isaura15 Digital Elevation Model.

Digital Elevation Model

Resolution: 0.139668 m/pix

Point density: 51.2632 points per sq m



Camera locations and image overlap.

Survey Data

Number of images:	582
Flying altitude:	63.6912 m
Ground resolution:	0.0174585 m/pix
Coverage area:	0.118336 sq km
Camera stations:	582
Tie-points:	64223
Projections:	465882
Error:	3.83835 pix
Camera Model	DMC-GH4 (12 mm)
Resolution	4608 x 2592
Focal Length	12 mm
Pixel Size	3.77706 x 3.77706 um
Precalibrated	No

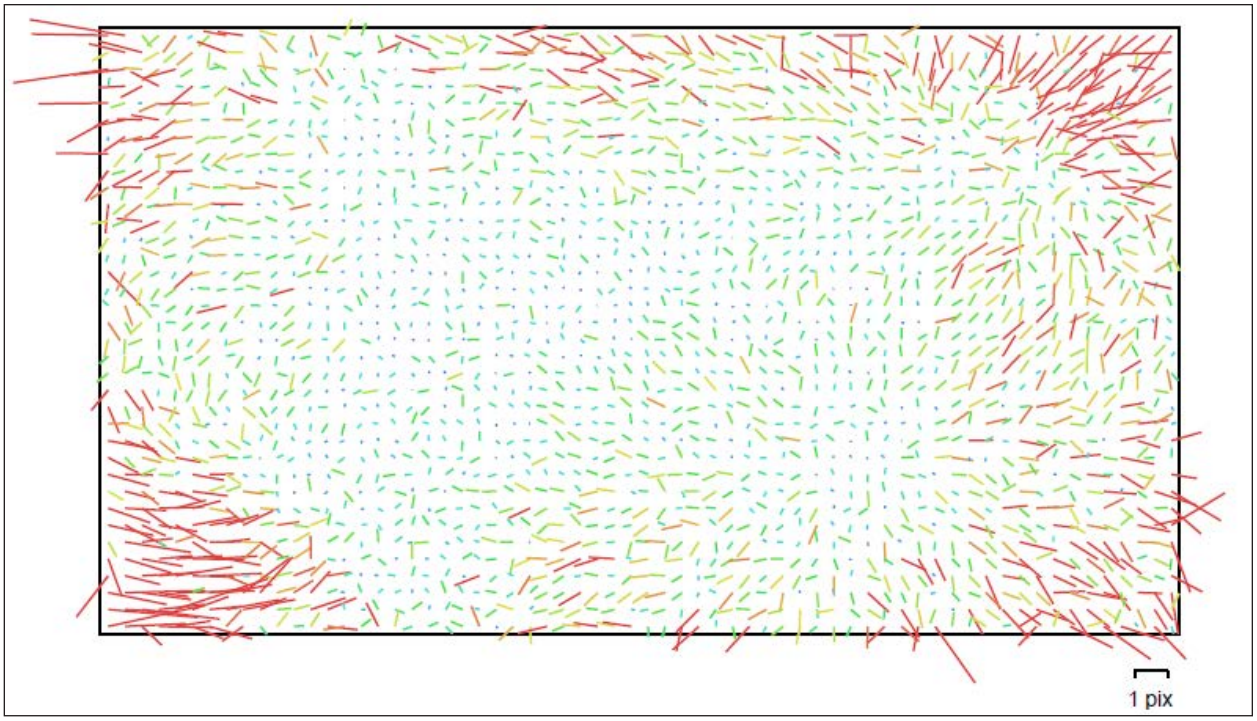
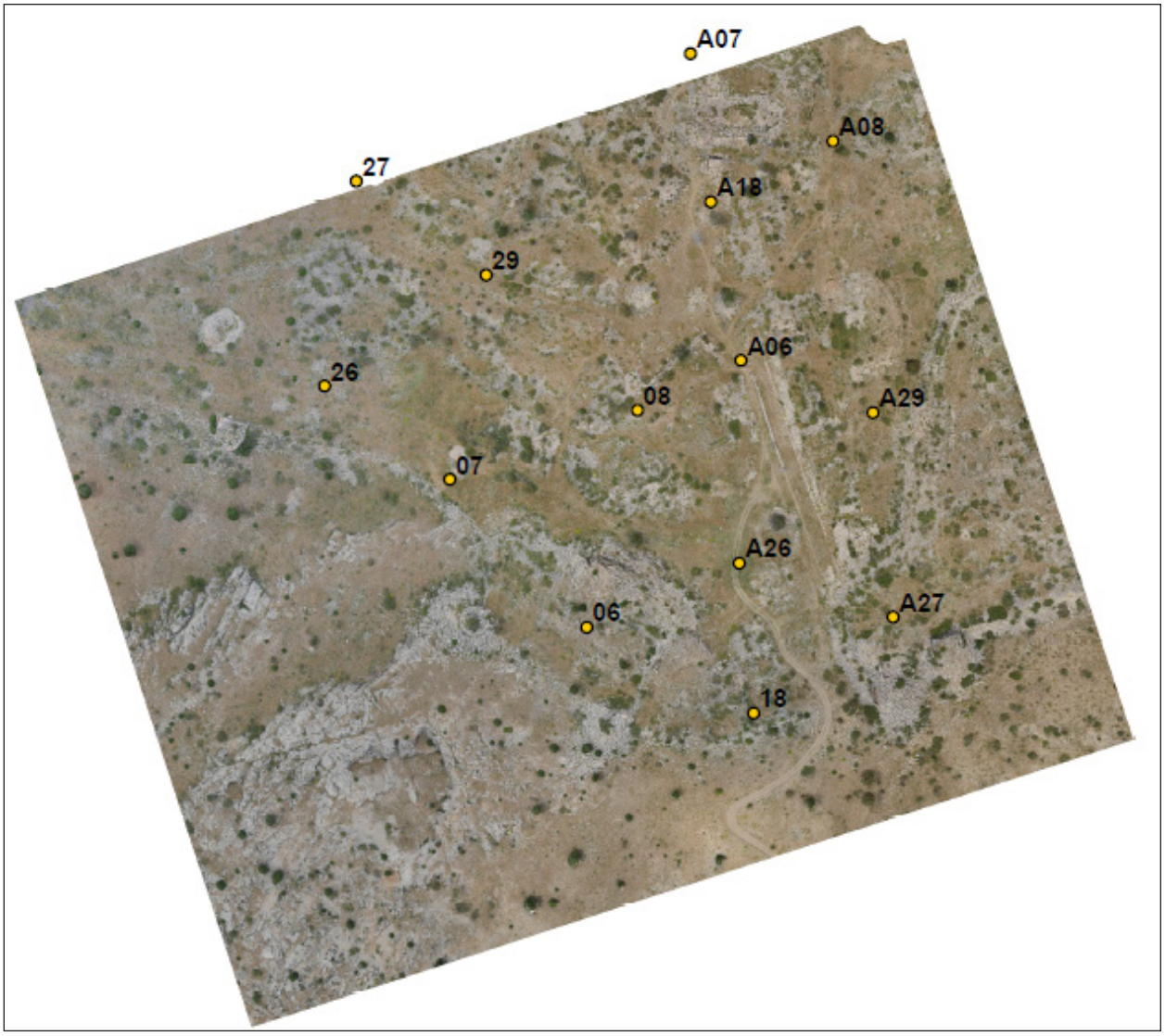


Image residuals for DMC-GH4 (12 mm).

Camera calibration

DMC-GH4 (12 mm)

Type:	Frame
Fx:	3339.68
Fy:	3335.39
Cx:	2317.73
Cy:	1248.53
Skew:	-6.36763
K1:	-0.0129775
K2:	-0.0445241
K3:	0.0945371
K4:	-0.0612625
P1:	-0.00190617
P2:	0.00148266



GCP locations.

Ground Control Points

Label	X error (m)	Y error (m)	Z error (m)	Error (m)	Projections	Error (pix)
A26	-0.840611	-0.576538	-0.522205	1.145304	24	0.537146
18	-0.123003	-0.891668	0.504916	1.032057	3	0.206490
A27	-0.226036	1.026302	-0.053123	1.052240	13	0.335440
A29	-0.941490	1.116591	-0.778180	1.654914	13	0.717058
06	-0.182237	0.080275	-0.260644	0.328009	22	0.377431
~~A06~~	~~1.643765~~	~~-2.214990~~	~~1.343461~~	~~3.068066~~	~~23~~	~~0.894451~~
A18	0.954008	1.285760	-0.535388	1.688179	20	0.726220
08	-0.317143	0.727443	-0.219443	0.823352	23	0.469023
A08	0.012378	0.351053	0.394604	0.528303	10	0.692070
07	-0.125266	0.274022	0.594985	0.666923	24	0.534144
26	-0.129236	-0.665307	-0.416232	0.795351	19	0.380354
29	0.641181	-0.077415	0.200866	0.676353	17	0.382992
A07	-0.312188	-0.310914	-0.035235	0.442007	5	0.535500
27	-0.094036	-0.160179	-0.027851	0.187818	3	0.315720
Total	**0.500241**	**0.700857**	**0.417325**	**0.956871**	**196**	**0.517812**

Terrestrial laser scanning

Similarly to field seasons 2012-14, a terrestrial laser scanning (TLS) survey was conducted in 2015 using a FARO Focus 3D S120 phase-shift laser scanner. This instrument performs high accuracy non-contact measurement of buildings, features, and landscape located in its surroundings. The FARO Focus 3D S120 delivers millions of extremely accurate measurements (up to 4mm) in a matter of minutes that can be later transformed in measured drawings, vector maps, and orthomaps using CAD software. The digital documentation protocols used at Çatalhöyük imply that a TLS survey is conducted both at the area-wide level and at building: the first one being conducted in 2015 in all the four areas currently excavated (North, South, TPC, and GDN Areas), the latter specifically focusing on B.89 for stratigraphic digital documentation purpose and on B.5 for conservation purpose (see Figs. 20.17 and 20.18).

Figure 20.17. *Laser scanning of B.5 (point clouds).*

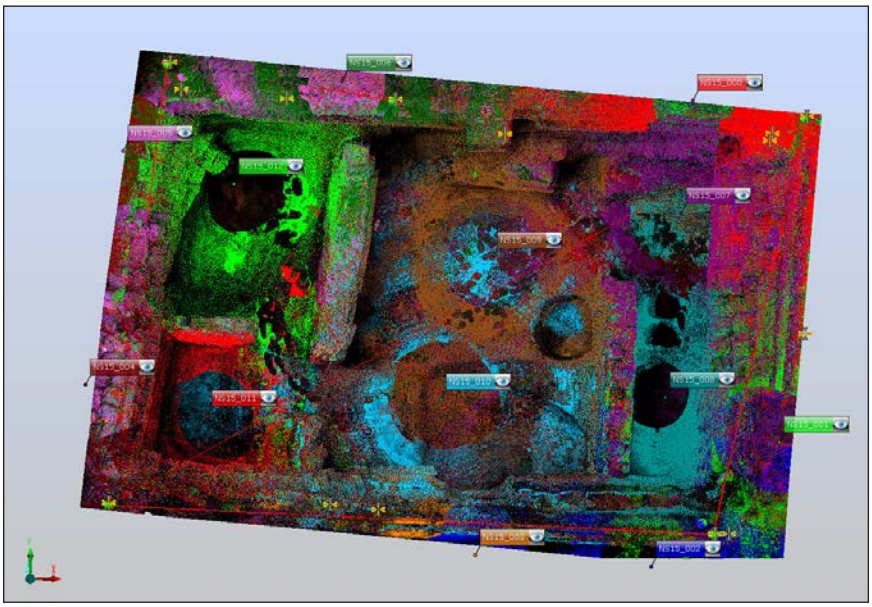


Figure 20.18. *Laser scanning of B.5 (point clouds).*

The settings used for the area-wide terrestrial laser scanning are the same as the ones used in previous years, being the Quality 1/4; Resolution 11.2 million points each scan; the time needed to record each scan increased to 5: 50 minutes due to a different setting for color balance in the 2-megapixel color camera that is coaxial with the laser. The FARO Focus 3D's camera produces a 70-megapixel color overlay using 84 photos to cover the entire field of view of the scan (the profile employed at Çatalhöyük covers approximately a 360 x 300 degree field of view). The registration and geo-referencing of the point clouds was performed using FARO Scene 5.4.4 software. This software carries algorithms for the automatic recognition of sphere targets (to be used for georeferencing the TLS data) and, most importantly, for the automatic top-view and cloud to cloud scan registration functions that provides minimal standard deviation (see Fig. 20.18) and a higher resolution of the final project point cloud (approximately 60% of the TLS measurements collected at Çatalhöyük are closer than 4mm among them, once the post-processing is completed).Additional details on the terrestrial laser scanning survey at Çatalhöyük in the period 2010-2015 can be found in Table 20.1.

Workflow	Season 2010	Season 2011	Season 2012	Season 2013	Season 2014	Season 2015
Micro-scale survey	X	X	X	X	X	X
Area-Wide Survey North Area			X	X	X	X
Area-Wide Survey South Area			X	X	X	X
Area-Wide Survey TPC Area				X	X	X
Area-Wide Survey Gdansk Area					X	X
Landscape Survey			X		X	
Sphere Targets		X	X	X	X	X
Ground Control Points			X	X	X	X
Textures recorded by operator	X	X	X	X	X	X
Textures recorded by scanner			X	X	X	X
Next Engine	X	X	X			
Minolta Vivid 910	X					
Trimble GX	X					
Trimble FX laser scanner		X				
FARO Focus 3D laser scanner			X	X	X	X
Trimble VX					X	

Table 20.1. *Laser scanning workflow at Çatalhöyük in 2010-2015.*

Infra-site landscape survey using mini Unmanned Aerial Vehicles (UC Merced)

During the 2015 field season the UC Merced team performed a 3D digital mapping of the landscape of Çatalhöyük and its environs with the goal to provide further understanding of the site's relationship with other Neolithic settlements in the Konya Plain. Multiple drone flights were conducted to perform low altitude aerial photographic surveys of the landscape and waterways in proximity of Çatalhöyük and Boncuklu Höyük. The Unmanned Aerial Vehicle (UAV) of choice was a Phantom 3 Pro manufactured by DJI Technologies. The light weight (1.28kg) and small dimensions (diagonal size of 590mm) make this quad-rotor drone qualify in the category of mini UAVs (see Fig. 20.19).

Figure 20.19. *DJI quad-rotor Phantom 3 Pro mini UAV.*

The Phantom 3 Pro has been selected among similar systems because its portability (the drone and all accessories fit in a small backpack), speed (16m/s), battery life (20 minutes per battery), and for its Vision Positioning system that, along with a powerful GPS/GLONASS sensor, allows this quad rotor to maintain great stability and quick attitude even when performing medium-range airborne surveys at higher elevations (Çatalhöyük is located at about 1000 meters above sea level) and in adverse wind conditions. Such mini UAV was employed at Çatalhöyük to document

the whole area included in the UNESCO dossier (East Mound and West Mound, Fig. 20.20).

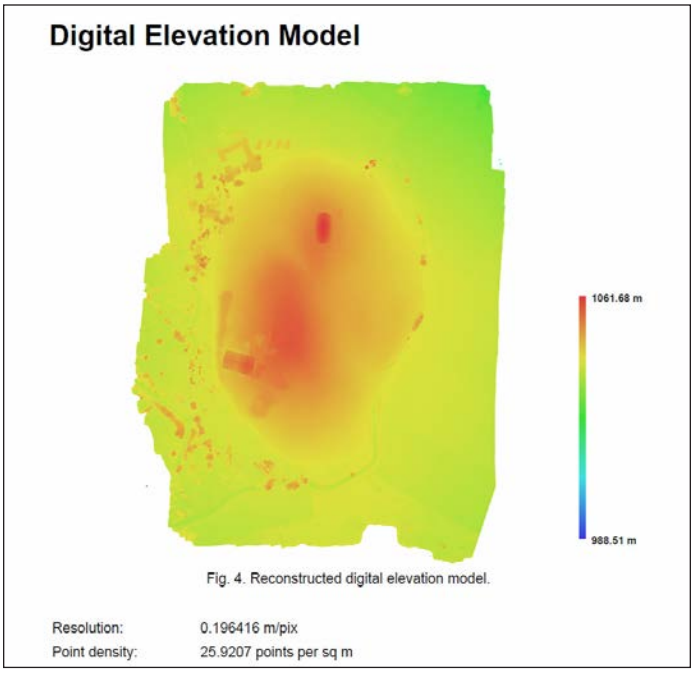


Figure 20.20. *East Mound digital elevation model (produced with Phantom 3 Pro and Photoscan).*

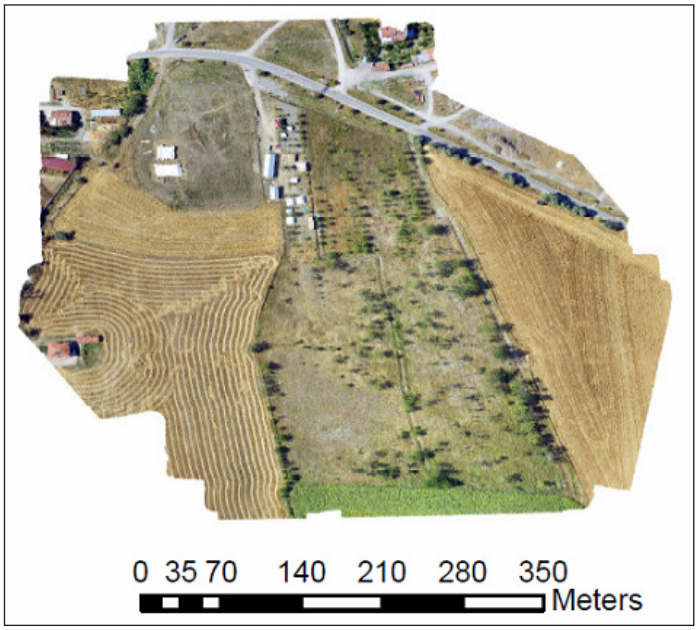


Figure 20.21. *3D orthophoto for Boncuku Höyük.*

The Phantom 3 Pro was able to complete the survey of the entire site in 12 flights. It covered approximately 210 acres with 1,784 photographs taken from an elevation of about 50 meters with a true resolution of 4000x3000 pixels. The collected photographs were then post-processed in Agisoft Photoscan and georeferenced using ground control points provided by the total station survey team. The results are 3D models, digital elevation models (see Fig. 20.4), and orthomaps of the entire site with a ground resolution of about 20cm/pixel that largely exceed the resolution of 1m of the Digital Terrain Model of Çatalhöyük created using survey data from the late 1990s.

The Phantom 3 Pro was also employed to survey the entire mound of Boncuklu Höyük (Fig. 20.21) and its surroundings covering an area of about 35 acres in a total of two flights that captured 386 photos. Such a relatively quick survey will produce preliminary data to be utilized for the planning of a more comprehensive remote sensing investigation to be carried in the country between Çatalhöyük and Boncuklu Höyük in the following years.

During the field season 2015, preliminary post-processing operations were also conducted by the UC Merced team. Such operation produced interesting results in the form of accurate 3D reconstructions of the contemporary landscape of Çatalhöyük and Boncuklu Höyük along with orthomaps, digital elevation models, and digital surface models to be used for future spatial analysis and classification in a GIS platform, such as ESRI ArcGIS (Fig. 20.21).

In addition, an intra-site survey of the Çatalhöyük North and South Areas using micro UAVs has also been completed in the season 2015 for conservation purposes. More details on the Çatalhöyük Digital Preservation Project initiative can be found in Chapter 21 of this report.

Excavations in Building 89

The 2015 season saw the continuation of the excavation of the occupation sequence in B.89, Sp.379 (work has been ongoing since 2011); at the end of the season, the stratigraphic deposit of the house remains unexcavated, although important progress were made in the central-eastern part of the building (the rest of the structure is missing because truncated by the long cut (19863), probably connected to an action of retrieval of construction material, subsequent to the abandonment of the building).

In particular, this season was focused on the investigation of three main phases of the house, each one marked by the action of laying a unique level of plaster on the system of features directly placed against the eastern wall (F.3482) and composed by F.3473, the highest platform on the north-eastern corner, F.3477, the lowest central platform, and F.3476, the southern bench. Within these main phases, it was possible to recognize a sequence of subphases, defined by several remaking of single features, especially in the southern area of the house, characterized by a thick sediment of dirty floors and by a structured hearth.

Partially excavated in the 2014 season, the later phase of the building investigated this year is defined by the layer (21910), composed by a double sequence of plaster and make up, stretching from the north-eastern platform (F.3473) to the southern bench (F.3476). Below this layer, the units (21917) and (21984) can be easily interpreted as an outcome of structural work, aimed at raising the level of the two platforms of the building (F.3477 and F.3473): even though devoid of physical continuity ((21917) is part of the F.3477, whereas (21984) is part of F.3473), both units present a considerable thickness (around 8cm) and the same color and composition, thus being comparable to roomfill layers or middens found on site. These specific characteristics make us interpret the units as levels purposely functional to create a kind of firm and durable base at the bottom of the level (21910). The layers related to the life of this phase are identifiable with several clean and dirty floors, excavated during the 2014 season (see 2014 Archive Report).

In the earlier phase, the building seems to keep the same feature system: on the eastern side, the lowest central platform and the bench (F.3477 and F.3476) are covered by (21934), composed by a sequence of plaster and make up. On the northern side, where the plaster bears unclear painted red stripes, the (21934) is immediately above the (21987), composed by a sequence of plaster and make up as well, and laid on the highest platform (F.3473). In the central part, the layer is markedly concave, while in the southern side it is modeled as a kind of raised rim. This 'raised rim' has a curvilinear shape approximately in its center: considering this unusual outline, it is likely that, in this part, the plaster and its makeup have been modeled following the curve of a preexisting architectural element, removed in antiquity and today identifiable only by the particular shape of the plaster and by a darker patch on the surface of the lateral reinforcement (21978). This layer is above the (21988), easily interpreted as the first make up of the highest platform: its composition is heterogeneous (very similar to the layers (21917) and (21984)) and it seems to resemble the typical deposit found as roomfills or middens.

During the same phase the use of the platform F.3492 continues. It is directly located against the northern wall and in this phase it undergoes to several makeovers: as an example, during a subphase, the north-western corner of the platform is occupied by a bin (F.3498), found in fairly poor condition (just 3 cm of thickness) because truncated both horizontally and on the western side by a post retrieval pit F.3470, already excavated in the 2013 season. Immediately underneath the bin, the (21974) is composed by a thin floor and by a very thick layer of heterogeneous make up, presumably used to raise up and to build the northern platform (F.3492); the construction of this feature is consequential to the burial F.8153, belonging to a child, with only the upper body preserved. Regarding the skeleton, the presence of phytolith near hands makes us to suppose the existence of a wrapping, used to bind or contain the bones. It is therefore very likely that the (21974) and, in general, the northern platform are functional to seal the burial sequence.

In the southern area of the building, the hearth F.3497 (truncated by the later hearth F. 3472, investigated during the 2014 season) undergoes to several remaking: during one of the later subphase, a kind of pisé structure (21930) with a square shape is built around the hearth, which lends a more quadrangular outline to the fire installation. This pisé structure is related to the working platform F.3499, located on the western side of the south area and characterized by an internal framework, composed by an L-shaped structure of plaster, bricks and make up (21953). Above this structure, there is a thick sequence of working floors (21943), (21945), (21948), (21950) and (21952) and the grinding installation F.8154, excavated during the 2014 season.

In the south-eastern corner of the building, between the hearth (F.3497) and the bench (F.3476), there is a layered deposit of dirty floors, composed by ashes, charcoals, burned clay and animal bones, originated by cooking activities.

In the previous phase, the arrangement of the domestic space undergoes to considerable modifications: on the eastern side, the highest and the lowest platforms (F.3473 and F.3477) disappear, replaced by a sequence of two floors of plaster and make up (21989) and (21990), laid more or less on the same level and stretching from the north-eastern corner to the bench.

Also the northern platform (F.3492) disappears and the division between this area and the north-eastern corner of the building (later occupied by the F.3473) is marked by a small structure, a kind of partition wall, made by just one line of brick, plastered (21991) and (21992), not yet excavated.

From the north side to the center of the building there is a unique and flat floor (21999), covered by the dirty floors ((21997), (21998) and (21995) hearth infill) to the south and toward east by the plaster floors (21993) and (21994) to the east, not yet excavated.

On the western side of the building, in the section of the long cut (19863), we found a bucranium (21968), looking towards the central part of the house, perhaps *in situ* and probably attached to some feature (bench or wall?) truncated in antiquity by the long cut (19863): even if the bucranium was not properly in phase with the features excavated this year, we decided to remove the decorative elements for preservation reasons through a small stratigraphic trench around the bucranium.

3D GIS and archaeobotany (Lund University)

During the excavation season 2015, Lund University, in the frame of the 3D digging project, developed collaboration with the archaeobotany team, in order to test the use of the 3D Geographic Information Systems for the spatial visualization of data retrieved by flotation and phytoliths analysis. Goal of this project is assessing the possibility to spatially and visually cross match archaeobotany data in a virtual simulation environment. Through this experiment we hope to bridge and visualize with more accuracy the contexts identified by the excavators in the field together with the information retrieved in laboratory. During the excavation season, a pilot experiment has been developed using the B.131 (North Area) as test case. Due to its characteristics (the several burned layers detected in the infill and its large size), this structure seemed to be the most suitable for this test.

During the experiment several models of the building have been generated in order to display the structure in phase (Fig. 20.22). Shapefiles, reporting preliminary analysis from the laboratory, together with the documentation performed on site by the excavators, have been imported and interlinked into the system. Once analyzed, the data sets will be implemented into the database developed for this experiment, and a data structure will be defined in order to query the system by cross matching a large number of different information.

Figure 20.22. *North Area 3D building models.*

In the frame of the same experiment, the 3D models of the B.131 have been employed to study the micro morphological characteristics of the floors in order to assess the possibility of the 3D models to detect cuts and eventually burials. This methodology is based on the use of surface analysis tools such as hillshade and slope to analyze very high resolute Digital Elevation Models (DEMs) of the buildings' floors.

During the season 2015, experiments of digital simulation have been conducted in the B.132 (North Area), in order to reconstruct the original location of the feature 21666.x1. By using 3D modeling tools such as Meshlab and Photoscan Pro, it has been possible to re-establish the spatial relation among the features and the rest of the building at different stages of the investigation. The results of this experiment have been used by the Çatalhöyük research project to interpret the building.

Chapter 21

Çatalhöyük Digital Preservation Project

Nicola Lercari[1] and Ashley M. Lingle[2]

[1]UC Merced, [2]Cardiff University

The number of natural and cultural heritage sites that represent the uniqueness of our planet's nature and the cultural legacy of the human past is almost uncountable. Yet natural and cultural resources are not unlimited and their preservation and conservation is one of the biggest challenges of the 21st century. This powerful argument is one of the main reasons that brought the University of California Merced World Heritage program to establish a new collaboration with the Çatalhöyük Research Project and the Çatalhöyük Conservation Team with the goal to develop new knowledge on heritage preservation that will have an impact on the way people understand, define, and protect their heritage.

Large-scale heritage sites are inherently difficult to monitor and objectively interpret. The Çatalhöyük Digital Preservation Project (CDPP) proposes to utilize digital technologies in conjunction with current monitoring strategies to build a comprehensive view of the site in its current state, as well as to create informed insight into the future. At Çatalhöyük current survey methods are based on subjective monitoring due to the complexity of the site and due to difficulties with limited annual conservation team continuity. As a result, the data is qualitative and in preservation terms can only be employed in a reactionary manner. This methodology is also time consuming as each feature at the site is individually assessed, however, having to interact with the archaeology in this direct manner provides information about the condition of the material that is not available form a digital scan or 3D model. Integrating the digital methods with the current methodology would allow for a comprehensive assessment of both qualitative and quantitative data. The blending of the two methodologies will also make the survey process more efficient, and provides the opportunity for in depth analysis in the off-season.

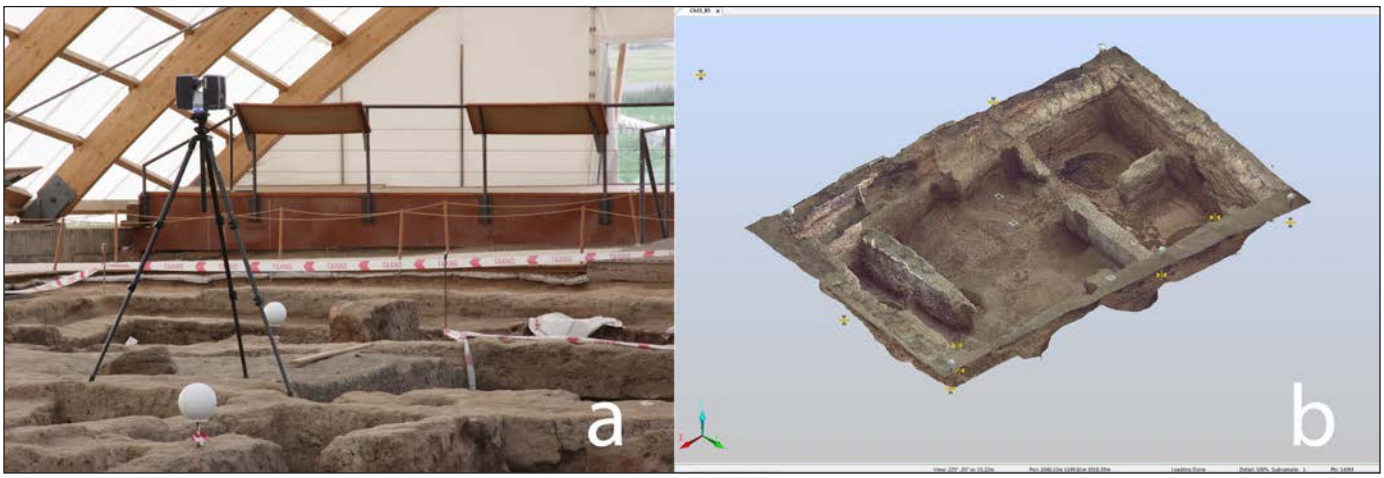


Fig. 21.1. *View of (a) FARO Focus 3D S120 unit scanning the North area in 2012 and (b) post processed point cloud of B.5 in 2015.*

The work conducted on the East Mound at Çatalhöyük in 2015 served as a preliminary survey phase for the Çatalhöyük Digital Preservation Project, a new research initiative in the field of heritage conservation that relies on digital technologies of data capture, analysis, and visualization. Tools and methods employed in 2015 span environmental data loggers, terrestrial laser scanning (Fig. 21.1), micro unmanned aerial vehicles (micro UAVs), depth cameras, 3D geographic information systems (GIS) and virtual simulation.

For instance, multiple drone flights were conducted inside the North Shelter in July 2015 to capture ultra-low altitude aerial photographic records of the built environment and archaeological features in the North Area (Fig. 21.2). The UAV of choice was a DJI Phantom 3 Pro. Such an ultra-light multi-rotor copter (total weight including propellers and camera is 1,280 grams) was selected for its small dimensions (diagonal size of 590mm) and limited amount of lift force that guarantees higher safety conditions for the archaeological material. Equipped with a Vision Positioning system and a powerful GPS/GLONASS sensor, the Phantom 3 Pro is able to maintain great stability even in indoor flight conditions where fully manual or GPS-assisted flight operations are recommended.

Fig. 21.2. *Orthomap of the North Area in 2015 generated using UAV imagery georeferenced using Ground Control Points from the Çatalhöyük survey team.*

This multirotor UAV carries a small electro-optical payload (a 12 Megapixel RGB camera) capable of recording sharp photographs and Ultra-HD videos to be used for documentation purpose and for creating accurate 3D models, orthomaps, and Digital Elevation Models of the surveyed area (Fig. 21.3). In the summer 2015, a total of three flights were flown inside the permanent shelter of the North Area collecting 711 photographs (in both RAW and JPEG formats) and nine 4K videos of buildings and archaeological features, while four flights were flown inside the South Shelter recording 1,082 photos (in both RAW and JPEG formats) and twenty one 4K videos. The imagery captured from an average altitude of five meters, just beneath the shelter's cover, was then post-processed in Agisoft Photoscan Pro and georeferenced using ground control points provided by the total station survey team. The results of the preliminary drone survey inside the permanent shelters are ultra-accurate 3D models, digital elevation models, and orthomaps of both North Area and South Area with a ground resolution of 0.00206018 m/pix and 0.0020858 m/pix respectively. The short data capture time in relation to the survey area and the impressive sub-centimeter resolution makes the UAV survey data particularly relevant to the CDPP.

The CDPP draws from of a vast amount of digital data collected between 2010 and 2015 that captured the surface, topology, and texture of Çatalhöyük buildings, features, and areas. Particularly relevant is a historical series of terrestrial laser scanning data that show the progression of the decay of the North and South Areas over a period of four years (2012-2015) (Fig. 21.4).

The significance of the Çatalhöyük Digital Preservation Project derives from the fact that the conservation of this nine thousand-year old pre-historic city is constantly threatened by the fragile composition of its ancient architecture and the harsh continental climate of its environs. The decay of Çatalöyük Neolithic

buildings is accelerated by the erosion caused by high levels of soluble salts and unstable environment within the permanent shelters that result in wall undercutting, plaster delamination, surface erosion, collapse, and significantly affect the statics of the excavated buildings and vertical sections (Fig. 21.5). While the two shelters protect the archaeological structures from direct climatic effects, the site is still venerable to fluctuations in microclimate leding to salt efflorescence and freeze/thaw cycles. The extreme fluctuations in climate between the winter and summer months leads to mechanical stress on exposed archaeological materials. There is an additional difficulty as some buildings were burnt in antiquity, leaving the brick and plaster exceptionally friable.

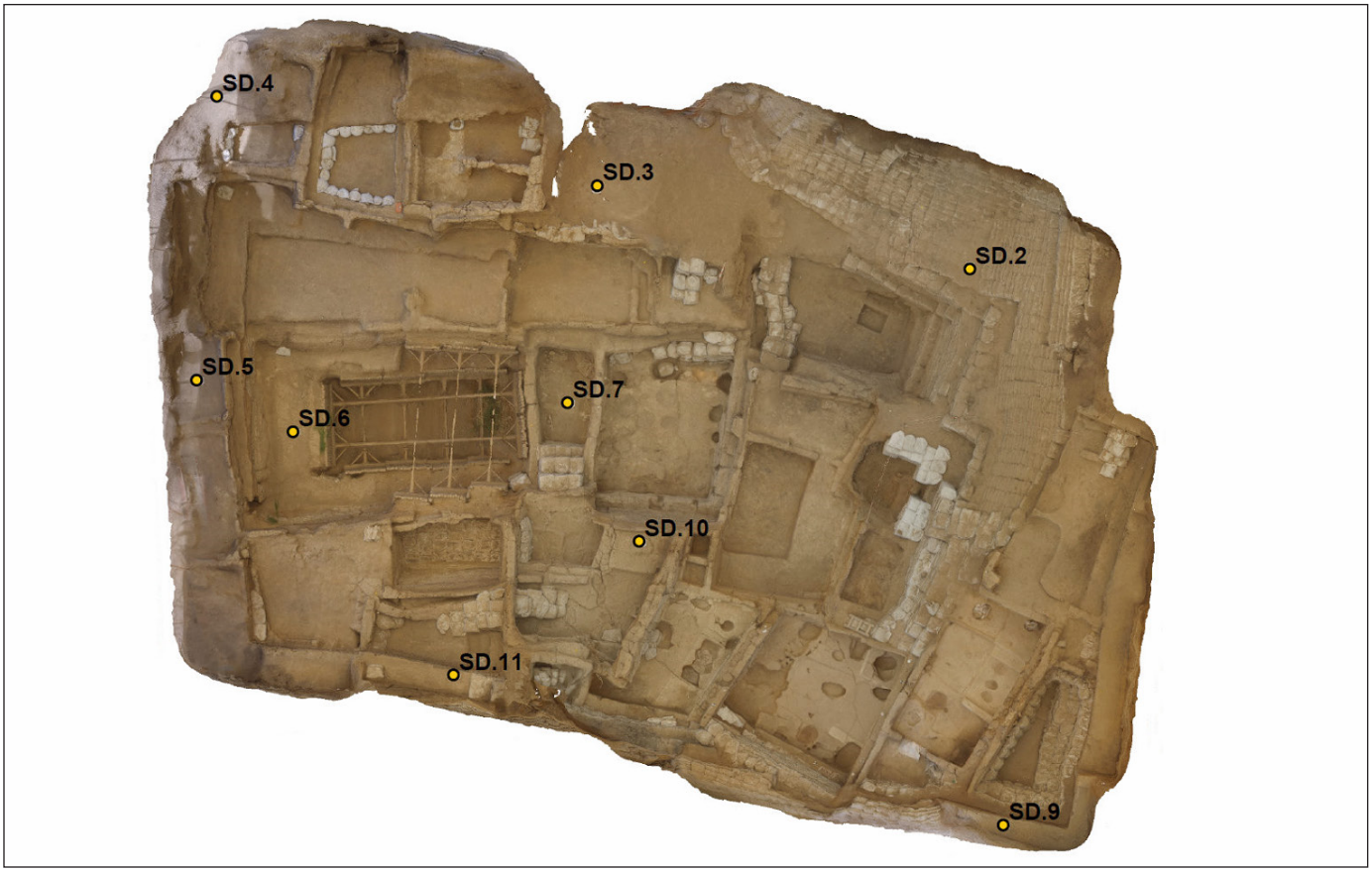


Fig. 21.3. *Orthomap of the South Area in 2015 generated using UAV imagery georeferenced using Ground Control Points from the Çatalhöyük survey team.*

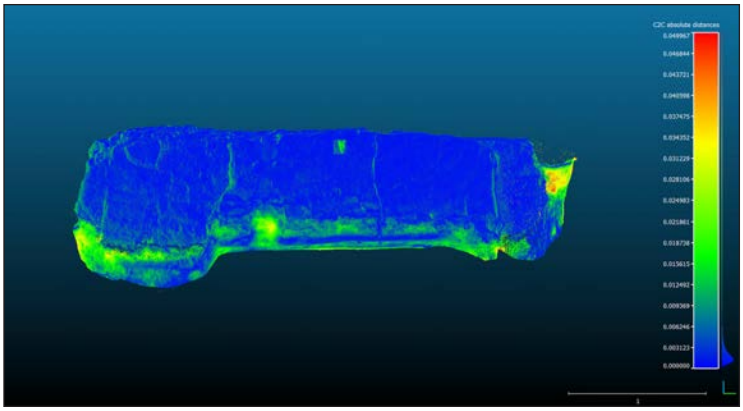


Fig. 21.4. *Point cloud comparison showing erosion of about 2cm (green data) in F.320 in B.5 between 2013 and 2015.*

Fig. 21.5. *Visualization of wall undercutting in F.230 and F.231 in B.5 due to erosion.*

The effects of mudbrick decay may compromise the safety of entire excavated areas of Çatalhöyük overtime, making it more problematic for visitors to access the outstanding remains and for the archaeologists to work beneath steep vertical sections. Thus, the CDPP seeks to develop GIS predictive models to be used by conservators for heritage diagnostics with the goal to enhance preventive onsite interventions at Çatalhöyük. The models will provide insight into areas that need intervention, which may have otherwise gone unnoticed; alternatively this system will allow the success of previous interventions to be quantitatively assessed. The developed best practices can be then employed in the conservation of other heritage sites presenting similar issues. These predictive models are generated by comparison and classification of point clouds and other 3D data using software such a Cloud Compare, FARO Scene and FARO 3D app Volume Measurement. Infrared and thermal imaging data, along with temperature and humidity information collected by data loggers, will also be integrated in the GIS predictive models to further advance the monitoring and knowledge of the site.

Preliminary spatial analysis and data visualization were also performed in season 2015 using 3D GIS platforms such as ESRI ArcScene and its plug-in 3D Analyst (Fig. 21.6). The limits and potential of using 3D data in archaeology in relation to GIS have been thoroughly discussed since the early 2000s, but a 3D GIS approach for the conservation of mudbrick sites in the Near and Middle East has been little discussed. Our work encompasses an almost unexplored field of research that presents methodological and theoretical challenges, but aims to produce new knowledge in the heritage conservation field.

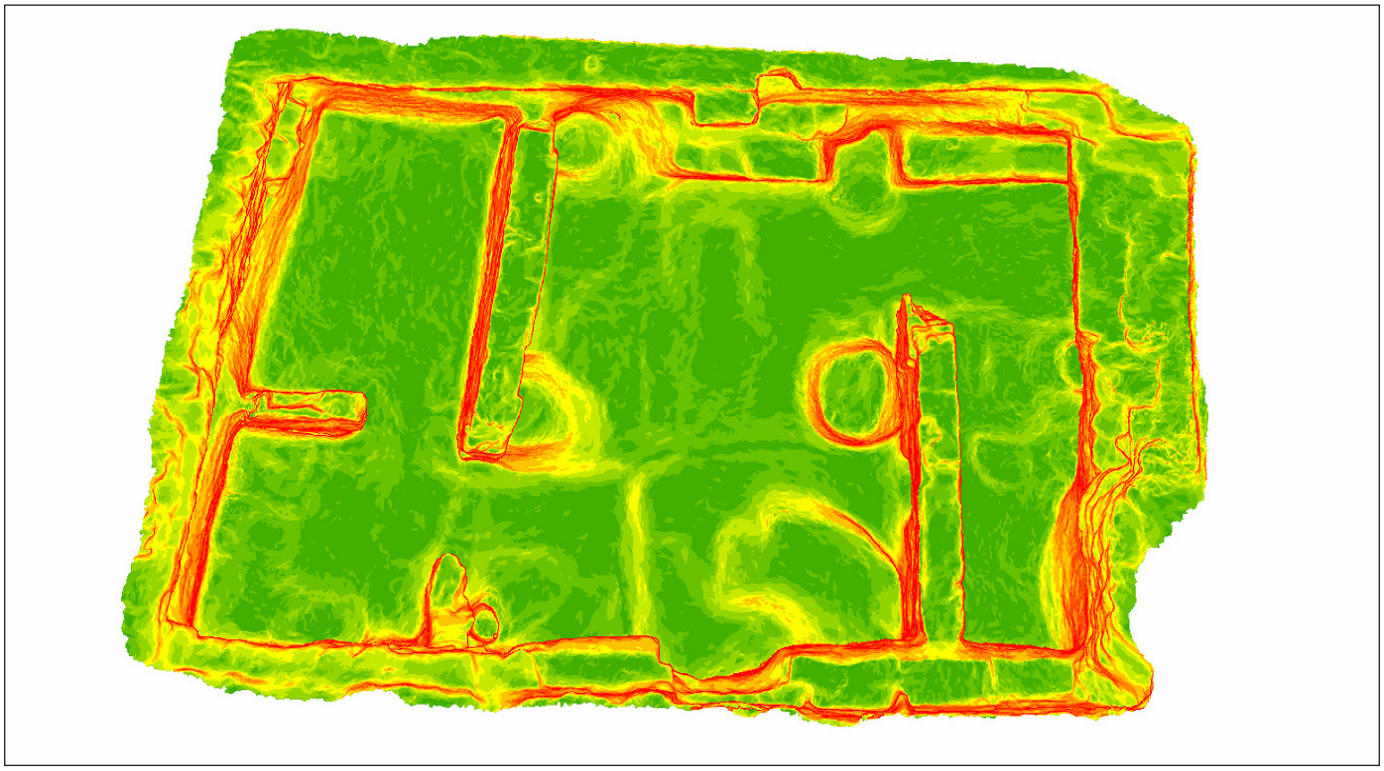


Fig. 21.6. *Building 5 surface slope visualization in ArcScene 3D Analyst.*

The project seeks to develop a 3D GIS platform where layers of information are built to extrapolate greater interpretation for preservation. The project plans to focus on six key areas: active excavation areas vs. display buildings, off season data interpretation, monitoring sections, erosion, wall tilt, and temperature/moisture surface interactions. Monitoring at Çatalhöyük has an added complexity of having active excavation areas in addition to those on permanent display. Monitoring buildings undergoing active excavation is crucial in terms of excavation safety, while those designated as display buildings impact visitor interpre-

tation and UNESCO Heritage designation. Allowing interpretative analysis to be carried out partially in the off-season creates additional time on site for treatment and carrying out conservation work. Monitoring sections, particularly in the South Shelter, is crucial for checking the stability of both the archaeology and foundations of the shelter. This project will also allow for quantitative analysis of eroded surfaces, which ties directly into calculating life expectancy of the site and effectiveness of conservation interventions. Tilt of walls and features is an early indicator of collapse; early detection could prevent disastrous loss at the site. Temperature and moisture interaction is important for understanding the mechanical stresses within the earthen materials of the site, identifying damp areas aids in prioritizing conservation or even shelter interventions.

During the 2015 season an initial pilot program was run in one building at the site (Building 5) to assess the feasibility of the project. In the preliminary phase B.5 in the North Area has been selected as a pilot case study. This choice was made because B.5's location at the northwest edge of the North Shelter makes it particularly sensitive to erosion, environmental agents, and decay. Moreover, as a display building, B.5 has not been excavated for a number of years allowing more precise comparison of historical data that describes the topology of its walls and vertical sections (Fig. 21.7).

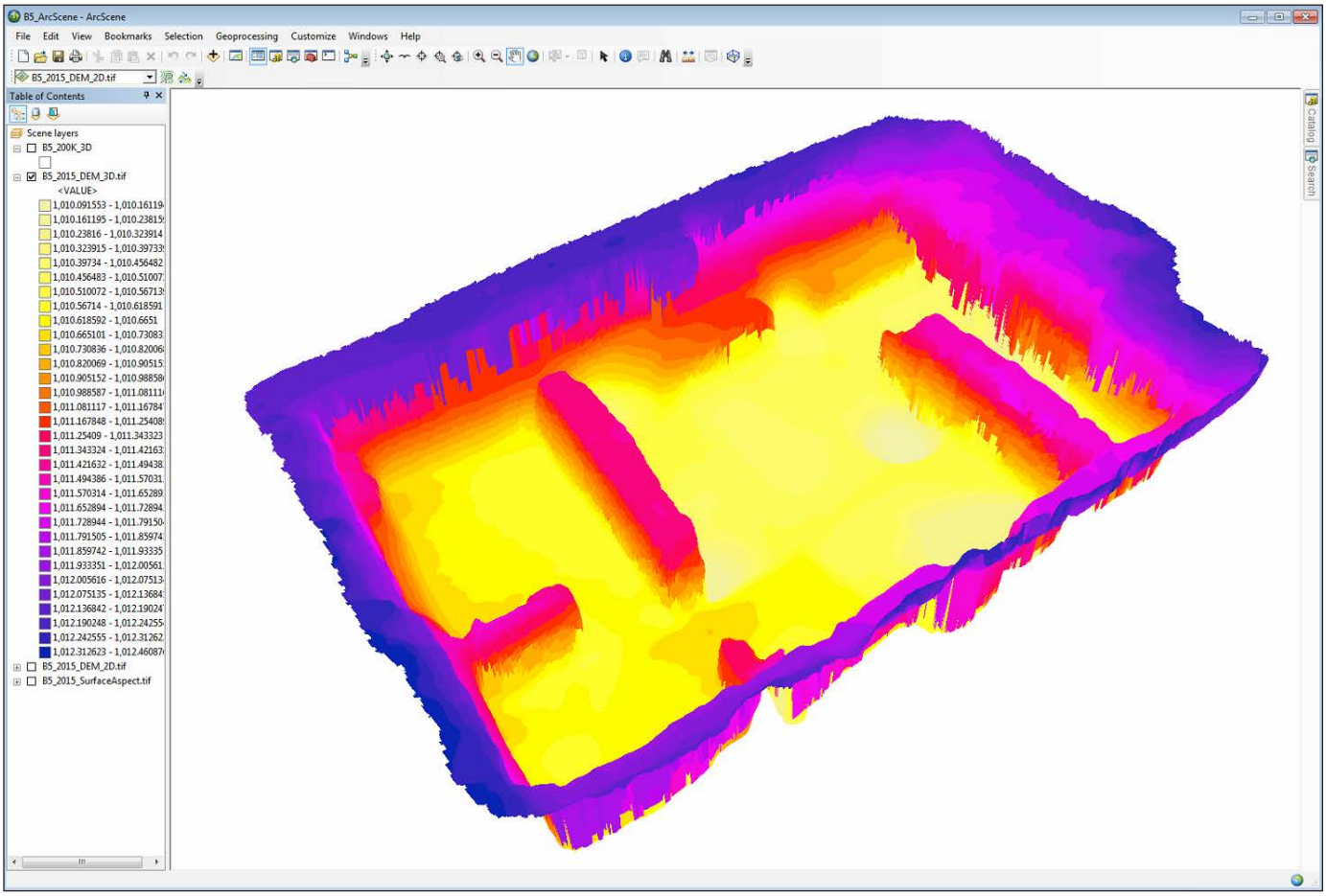


Fig. 21.7. *Interpolated digital elevation model (DEM) showing differences in elevation in B.5's walls and platforms.*

Given the initial successes of the Building 5 pilot study, in future seasons the Çatalhöyük Digital Preservation Project anticipates expanding and creating the type of holistic monitoring needed at a site as complex as Çatalhöyük. Utilizing digital technologies to create predictive models for conservation offers an opportunity of building a comprehensive view of the site in its current state, as well as creating informed in-

sight into the future. This project seeks utilize new tools for heritage preservation focusing on conservation to enhance preventive measures, and hopes to offer a best practice methodology that is easy to implement which can be used at other earthen sites.

Chapter 22

GDN Area: Research on Late Neolithic Architecture

Marek Z. Barański, Antoni Nowak, Katarzyna Regulska and Marta Saj

The paper presents a review of preliminary results from GDN (Gdańsk) Area situated within a relic of Mellaart's A and B trenches (Mellaart 1962) at Çatalhöyük East (Fig. 22.1). The main focus of this research on the archaeology of architecture is to evaluate on the site some of the archive plans and even more importantly to test former hypotheses and to re-interpretate spatial organisation of the Neolithic settlement at its final phases of occupation (Barański 2014a: 194).

***Figure 22.1**. Overview of Mellaart A/B Area before the current excavation work was commenced (Photo: Jason Quinlan).*

2015 GDN trench was situated in the southern part of the 1960s excavation area in the immediate neighbourhood of TP Area (see Marciniak and Czerniak 2012) and TPC Area (see Marciniak *et al.* 2012). It covered about 187m^2 and included remnants of buildings from Mellaart Levels I-III (Fig. 22.2). The coordinates of the corners of this trench of irregular shape were as follows: 954.5 E 987 N; 965.0 E 987.0 N; 965.0 E 984.5 N; 972.0 E 984.5 N; 972.0 E 994 N; 973.0 E 994.0 N; 973.0 E 996.0 N; 964.0 E 996.0 N; 964.0 E 997 N).

GDN research turned out to be challenging in many ways. The late Neolithic architecture was not only heavily disturbed by roots and animals but also affected by severe weather conditions. It must not be forgotten that the interiors of the buildings had been backfilled naturally over the decades with material com-

ing gradually from exposed walls and sections as well as commanding areas. In addition, the south-eastern part of Mellaart's trench has been lately sealed artificially with a considerable volume of dry-sieved spoil coming from TP Area. The removal of all these deposits was strenuous and time-consuming. Following sondage excavations in the hot and bright sunlight as well as final re-backfilling with just four team members and no help from the site workmen was equally difficult.

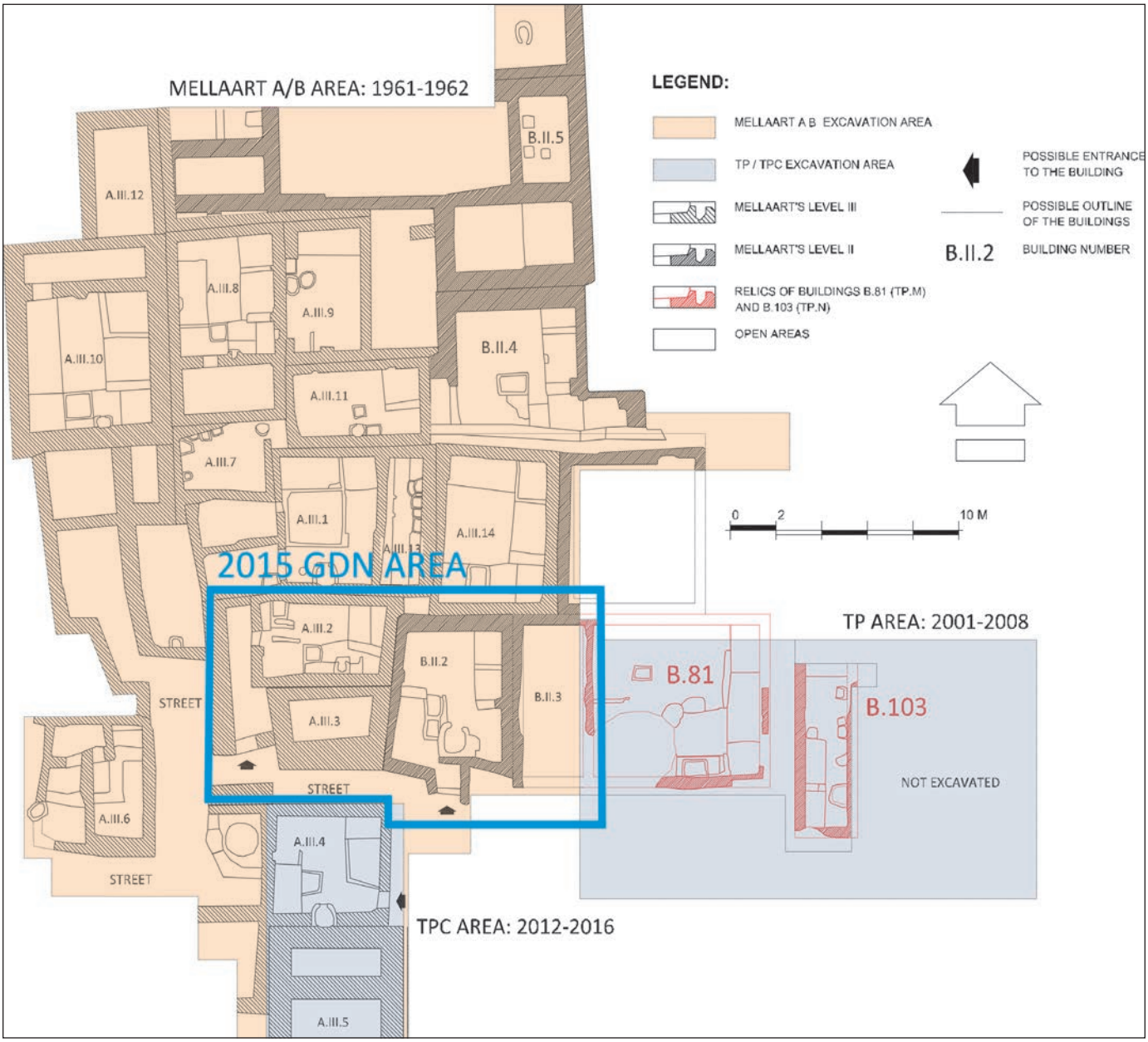


Figure 22.2. *Location plan of 2015 GDN Area (after Mellaart 1962).*

Despite all these difficulties, our intensive and goal oriented work allowed us to reveal complex life histories of buildings: B.140 (A.III.2) and B.142 (B.II.2) as well as spaces: Sp.555 (B.II.3) and Sp.561. These houses were documented in a cursory manner in the past and their architecture was viewed as static and dehumanised. The built environment, however, is always transitory, evolving and animated. We have documented various transformations of the buildings as well as interactions between the neighbouring spaces. Most of these events were embedded in rituals as reflected in meaningful artefacts. The further detailed

analysis on these and other matters should allow us to view architecture as a multi-faceted process (see Barański *et al.* 2015) and put GDN Area in a broader chronological and spatial context (see Bayliss *et al.* 2014). Consequently, we hope to shed more light on social organisation of the settlement in the Late Neolithic.

Space 555 (B.II.3)

One of the main goals for 2015 season was to provide a direct stratigraphic and chronological context for TP architecture. Hence Sp.555, located directly alongside the eastern limit of TP trench, was assigned as the main research area. The 1960s data indicated that this space could have been a western annex to the main room Sp.440 which was exposed in 2008 (Marciniak and Czerniak 2008: 80-82). This assumption was confirmed by new excavations. In addition, new data was provided on complexity and elaboration of B.81.

Figure 22.3. *Overview of Sp.555 as seen from the south.*

Figure 22.4. *Close up view on bins situated alongside the northern wall of Sp.555 (Photo: M. Saj).*

Sp.555 covered an area of about 29m^2 and went slightly beyond the northern limit of the main room of B.81. It was delimited by simple walls (F.2874, F.7692, F.7693 and F.8071), one of which constituted also an eastern wall of Sp.440. All these structures were made up of mostly light gray (7/1 5Y) but also very pale brown (7/4 10YR) mud-bricks with a dominant sand component. The difference between the bricks and the mortar was almost impossible to record as both these elements seemed to have the same physical characteristics. Next, most of the internal wall faces were still coated with sandy pale brown (7/4 10 YR) make up that was sealed with a final and thin layer of marl plaster.

In the course of excavation it turned out that Sp.555 actually consisted of two rooms which were separated by a simple division wall (F.8059) and connected through a wide wall opening (Fig. 22.3). This break in the wall was highlighted with a plastered threshold (F.8057).

The northern space contained a set of four relatively well preserved bins (F.8066) of a different size. These narrow features with a plastered pisé core were situated along the northern wall (F.8071), which stood up to a height of about 1.6m (Fig. 22.4). The bin's interiors seemed to be deprived of archaeobotanical material.

However, there were various artefacts found within the infill of the bins ((22871), (22883) and (22888)), namely a worked stone, a cattle femur, two horn cores, a cattle astragal and two mandibles belonging most probably to a cattle and a boar. There was also a cattle cranium found in an upside down position as if it had fallen from an upper part of the wall into one of the bins. This artefact was situated next to relatively large and cuboid architectural debris but was not attached to it.

There is another interesting architectural feature to mention. We mean an ovoid and large form (F.8072) made up of clay that was situated against an eastern wall (F.2874) and adjacent to one of the bins. There were some small fragments of red and white painted plaster observed on its surface. Unfortunately, the very poor state of preservation of this feature precludes us from reconstructing its original form and function. However, a scar on the wall face suggests it could have been much larger.

The southern space within the annex was characterised by a north-east corner platform (F.8060) with a bench. Together with eastern and southern walls (F.2874 and F.7693) this feature was partly damaged by retrieval pits (F.8062 and F.8067) assigned to Sp.420. Next, a hearth (F.8061) in the form of a shallow rimmed structure was found to the south of the platform. There were also various special deposits found directly on the floor (F.8065) of Sp.555 (Fig. 22.5). The most interesting set of artefacts includes: a stone polisher, a stone palette, an aurochs mandible, fragment of an articulated cattle limb, and sheep / goat bones. These artefacts were found lying in a row in close proximity to an elaborated wall opening in the southern wall (F.7693) that connected Sp.555 and Sp.567. This break in the wall with well-rounded and plastered corners was blocked with a bucranium and two horn cores (22835).

Figure 22.5. *Close up view on special deposits on the floor of Sp.555.*

Both northern and southern rooms within Sp.555 had a multi-plastered marl floor (F.8066 and F.8065 respectively). Curiously, no inlaid pebbles were observed as compared to a screed floor within the main room of B.81 (see Marciniak and Czerniak 2008: 81). In addition, the floor level in Sp.555 was documented about 0.7m and 0.3m lower than floor level in Sp.440 and Sp.561 respectively. However, the unearthed bottom of Sp.561 was, in fact, laid later than the floor within the annex.

The entire interior of Sp.555 was filled with debris of diverse nature ((22813) and (22871)) comprising mostly crashed building materials and chunks of stratified sediment sealed with a thin ashy deposit (22870). It is very likely that these architectural remains originally made up a ceiling or roof structure that collapsed suddenly. And that would at least partially explain numerous and exceptional artefacts that were found within this heterogeneous room-fill. A mace and a richly decorated arrow rectifier are two of the stone tools especially worth mentioning. This room-fill and underlying sequence of floors within the northern part of Sp.555 were truncated by a large and oval pit (F.8068) that was only partly excavated.

Space 561

The discovery of Sp.561 to the south of the annex and the main room of B.81 came as a surprise as it was not documented in the 1960s plans. More importantly, this space was connected through carefully modelled wall openings with not only Sp.555 (B.81) but also Sp.537 (B.142). With such stratigraphic and architectural evidence in hand, we decided to slightly extend the initial trench limit to the south in order to learn more about the character of this space. Despite this additional work, Sp.561 clearly extended beyond the limits of excavation. What we managed to expose, however, was an L-shaped area of about 14m^2 (Fig. 22.6) that was delimitated, from the north and west by simple and plastered walls (F.7692-7694 and F.7696). In the north-west part, these walls were set on bare compound foundations (F.3090 and F.3091) reminiscent of structures documented and excavated in TP Area (Barański 2014b: 175). This architectural and structural configuration seemed to be built onto the main building block of B.81 as a part of an extension.

Figure 22.6. *Overview of Sp.561 as seen from the north.*

The most elaborate architectural feature of Sp.561 was a plastered platform with a low and narrow bench at its southern edge (F.8063). It was situated within a north-west recess alongside the northern wall with a wall opening (F.7694). This break, about 0.6m wide, was almost identical to the wall opening in the southern wall of Sp.555. What is even more meaningful it was also blocked with a bucranium (22894), however, most probably a double one.

There were some stone tools and phytolith concentrations found directly on the platform surface. But most importantly a collection of about 200 astragals together with other worked stones and many diagnostic pottery sherds were deposited within the room-fill (22811) that sealed the entire Sp.551.

Building 142 (B.II.2)

B.142 was situated in the central part of 2015 GDN trench and had direct relationships with a set of various spaces, both internal and external. This building was abutted by B.138 (B.II.1) from the north, and B.140 (B.III.2) and B.141 (B.III.3) from the west, and Sp.555 (B.II.3) from the east. On the southern side, it was delimitated by an open space Sp.544 characterised by midden deposits (Barański 2014a: 200) as well as ambiguous Sp.593 and Sp.561.

Figure 22.7. *Overview of B.142 as seen from the north.*

B.142 covered an area of about 38m^2. It seemed to be made up of only one space (Sp.537) that was delimited by simple walls comprising sandy and very pale brown (7/3 10YR) mudbricks bound with light grey (7/1 10YR) mortar. In general, the plan of the building as well as a layout of internal features matched in the archive plans (Fig. 22.7). B.142 had a central zone of activity that appeared to be sunken in relation

to the surrounding features, including a hardly preserved sequence of raised platforms and benches to the east as well as fire installations, namely an oven and hearths, to the south. The boundaries between clean and dirty areas within Sp.537 were marked by ashy deposits. No art or other installations were observed on the walls as these structural elements were barely preserved beyond the height of the floor surface. Although, a multi-layered wall plaster was preserved in several places (eg. F.7691).

The excavation work concentrated on eastern part of B.142. The south-east corner of the building with the remnants of different occupational surfaces as well as related features and artefacts (e.g. *in situ* preserved ceramic bowl) turned out to be particularly interesting and informative. The partial excavation undertaken in this area allowed us to document a multiple sequence of platforms (F.8073 and F.8078) separated by ashy deposits including rake out material that came from neighbouring fire installations (Fig. 22.8). This sequence was situated on the top of room-fill that seems to be associated with re-building of the southern wall of B.142, which involved, among other things, connecting Sp.537 and newly built Sp.561 through an opening in a simple mud-brick wall set on compound foundations. The contemporaneity and long use of these two spaces is an important argument for complexity in spatial and social organization of space in the Late Neolithic. It also sheds light on ritualized symbolic practices as the wall opening was at some point of time blocked with a double bucranium (22849).

Figure 22.8. *Close up view on cross section through sequence of platforms within the south-eastern part of B.142.*

Another sequence of only fragmentary preserved platforms (F.8051, F.8052, F.8056 and F.8058) with associated burials (F.7690, F.7699, F.8079 and F.8080) was revealed along the eastern wall (F.7691) of the building. Human remains of at least four individuals were documented and excavated. The bones were found mostly disarticulated due to the 1960s excavation and latter erosion of the cross section. Neverthe-

less, a careful analysis allowed us to reconstruct the depositional history of the burials and to select organic material which radiocarbon dating could be used. In this regard, particularly important and interesting were human remains (22896), including articulated lower legs and feet with associated stone beads of two kinds (Fig. 22.9).

Figure 22.9. *Close up view on articulated human remains underneath the eastern platform of B.142.*

Space 593

Sp.593 is rectangular in plan and about 1.4 x 1.2m internal space that was interpreted by Mellaart as an entrance to building B.142 (Mellaart 1962: 45; fig. 3). This view was consistent with his understanding of a neighbouring narrow lane Sp.544 as a place where a street ran (see Barański 2014a: 200). The current results, however, clearly stand against this hypothesis. First of all, no connection in the form of a doorway, wall opening or a crawl hole was documented between Sp.593 and B.142. It rather seems that Sp.593 was built as a part of re-building of the southern wall of B.142 as well as extending of B.81 to the south and east. Secondly, the localisation, the shape and the dimensions of Sp.593 were reminiscent of external ovens documented within Sp.333 in the South Area (Regan 2014: 133-136). There was, however, little tangible evidence to fully support this hypothesis due to the 1960s excavation and general wear in GDN Area. Also, no traces of ash neither baked floor surface were found within what could be the inner chamber of the oven. In contrast, the remnants of internal wall faces as well as the base of this feature (F.7697) were all covered with a fine layer of whitish plaster. More importantly, the space was filled in with numerous artefacts, mostly pot stands of various sizes and types (Fig. 22.10). In addition, there were infant burials (F.8089) revealed

within the base of this feature when its northern part was partly excavated. The further analysis of all these artefacts should allow us to provide more information on this ambiguous structure.

Figure 22.10. *Close up view of special deposits within Sp.593 (Photo: A. Nowak).*

Space 420

Sp.420 was assigned to a group of midden-like deposits that accumulated over remnants of B.81 (Marciniak and Czerniak 2008: 76). In 2015 this open area was further excavated to the southwest and the previous numbering was continued.

The space consisted of a thick and finely stratified midden ((22829) and (22834)) that sealed the room-fill ((22813), (22833) and (22842)) of Sp.555 and Sp.561. These distinct deposits as well as underlying floors (F.8064 and F.8065) and walls (F.2874 and F.7693) of B.81 were truncated by a few retrieval pits (F.8062, F.8067 and F.8069). These features were filled in with soft and ashy deposits that, just as the midden itself, contained a great number of various artefacts. Most of these finds were quite typical of domestic waste, however, a few of them, for example beads in various stages of production, bone tools, pot stands as well as two stamp seals, are worth mentioning.

Building 137 (B.I.5)

When removing the backfill in the south-eastern part of GDN Area, we hoped to reveal remnants of B.137. This building was documented on the 1960s Level I plan and seemed to be characterised by compound mud-brick structures that delimitated internal space with a centrally situated hearth (Mellaart 1962: 45; fig. 3). Unfortunately, all the architectural features related to B.137, with the only exception of very poorly preserved eastern foundation (F.2896), were not preserved. This mudbrick structure was most probably dug into the midden (22834) that made up Sp.420.

Building 140 (A.III.2)

In his first preliminary report, Mellaart (1962: 55) suggested that B.140 might have been a stone workshop on the basis of the stone material he collected. The remnants of this building were re-exposed in 2014 and actually some crystals and stone tools were found lying on the floor surface (F.7654 and F.7656) within Sp.540 as well as Sp.541 (Barański 2014a: 199-200). There was, however, too little evidence to fully support or reject Mellaart's hypothesis. Therefore, we decided to reveal once again the two of internal spaces mentioned and excavate the floors that constituted the last of the distinguished occupational phases. As a result, we managed not only to collect, among other finds, more stone tools (e.g. large fragment of a quern) and raw material but also to define the exact extent of some of the internal architectural features, including an oven (F.7651), a basin (F.7650) and a hearth (F.7652) that were all situated alongside southern wall (F.7451) of Sp.540 (Fig. 22.11).

Figure 22.11. *Overview of Sp.540 as seen from the east.*

We also chose to take an advantage of the fact that the north-eastern corner of B.140 was either truncated by a huge pit or damaged by water streaming down the South Arealope as well as the 1960s sections. We undertook a sondage excavation in this area in order to reveal the life history of Sp.540 in the section as well as to learn more about stratigraphic relationships with the reference to remnants of B.146 (A.III.1) – a so called shrine situated directly to the north of B.140 (see Mellaart 1962: 61-65). The thick colluvial deposits together with some of the underlying room-fill (31906) were excavated until an architectural basal boundary was reached. Consequently, a considerably large and well preserved platform (F.8088), delimitated by multi-plastered corner walls (F.7653 and F.7676) with a clear horizontal moulding, was revealed (Fig. 22.12).

Figure 22.12. *View on architectural features exposed within the sondage trench.*

With reference to the relationships between B.140 and B.146, they still remain a nagging puzzle due to the scale of the 1960s excavation and the fearsome amount of backfill that covers the remnants of related architecture.

Space 544

Some minor excavation work continued also in Sp.544 (see Barański 2014a: 200) in order to assign stratigraphic relationships between this open area and neighbouring buildings. As a result, we can argue that the midden deposits continued underneath compound foundations of B.141 and abutted the walls of B.111 (B.III.4).

Space 1010

Sp.1010 constitutes all the backfill of the Mellaart Area. This year, after discussion with lab specialists, the decision has been made to collect only human bones as well as visual appealing artefacts as all the other finds had very limited archaeological meaning.

Conclusions

The 2015 season was the last of the field seasons undertaken as a part of GDN research. It provided a large amount of valuable data. Rich material culture together with collected architectural, sediment and organic samples is going to be analysed in the following years in order to shed more light on spatial and social organisation of the Late Neolithic settlement.

Acknowledgments

We would sincerely like to thank Ian Hodder, Vahip Kaya and Çatalhöyük Research Project team members for all their support during the season. We extend particular thanks to Marta Perlińska, Mateusz Dembowiak, Serena Love, Aroa García Suárez, Alex Bayliss, Lisa Guerre, Michelle Gamble, Katarzyna Harabasz, Duygu Tarkan, Lech Czerniak, Kamilla Pawłowska, Christina Tsoraki, Jesse Wolfhagen, Ashley Lingle Meeklah, Bilge Küçükdoĝan, Olja Mladjenović, Ian Channell, Sean Doyle, Carla Lancelotti and Iwona Klamann.

GDN research project "Çatalhöyük in the Late Neolithic (ca. 6,500 – 5,900 cal. BC): reconstruction of the settlement layout based on architectural and structural aspects of buildings" is funded by the National Science Centre in Poland (PRELUDIUM 6: DEC-2013/11/N/HS3/04889) as well as private entities.

References

Barański, M.Z.
2014a. Late Neolithic architecture. In *Çatalhöyük Archive Report 2014,* http: //www.catalhoyuk.com/downloads/Archive_Report_2014.pdf

Barański, M.Z.
2014b. Çatalhöyük›te Geç Neolitik Mimarisi: Höyüğün ve Bina İnşasının Teknik Yönleri. In *Arkeoloji'de Bölgesel Çalişmalar Sempozyum Bildirileri* (Yerleşim Arkeolojisi Serisi 4), eds. B. Erciyas and E. Sökmen. Istanbul: Ege Yayınları, 173-177.

Barański, M.Z., A. García Suárez, A. Klimowicz, S. Love and K. Pawłowska
2015. Complexity in simplicity: reflections on Çatalhöyük architecture as process. In *Assembling Çatalhöyük* (Themes in Contemporary Archaeology Volume 1), eds. I. Hodder and A. Marciniak. London: Maney Publishing, 111-126.

Bayliss, A., S. Farid. and T. Higham
2014. Time will tell: practicing Bayesian chronological modeling on the East Mound. In *Çatalhöyük Excavations: The 2000-2008 Seasons* (Çatalhöyük Research Project Volume 7), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 53-90.

Marciniak, A. and L. Czerniak
2008. TP Area. In *Çatalhöyük Archive Report 2008*, http: //www.catalhoyuk.com/downloads/Archive_Report_2008.pdf

Marciniak, A. and L. Czerniak
2012. Çatalhöyük unknown: The late sequence on the East Mound. In *Proceedings of the 7th International Congress on the Archaeology of the Ancient Near East. Volume I: Mega-cites and Mega-sites. The Archaeology of Consumption and Disposal, Landscape, Transport and Communication,* eds. R. Matthews and J. Curtis. Wiesbadan: Harrassowitz Verlag, 3-16.

Marciniak, A., P. Filipowicz and A.J. Mickel
2012. The excavations of the TPC Area in the 2012 season. In *Çatalhöyük Archive Report 2012,* http: //www.catalhoyuk.com/downloads/Archive_Report_2012.pdf

Marciniak, A., M.Z. Barański, A. Bayliss, L. Czerniak, T. Goslar, J. Southon and R.E. Taylor
2015. Fragmenting times: interpreting a Bayesian chronology for the late Neolithic occupation of Çatalhöyük East, Turkey. *Antiquity,* 8: 154-176.

Mellaart, J.
1962. Excavations at Çatal Hüyük: first preliminary report, 1961. *Anatolian Studies,* 12: 41-65.

Regan, R.
2014. The sequence of Buildings 75, 65, 56, 69, 44 and 10 and external Spaces 119, 129, 130, 144, 299, 314, 319, 329, 333, 339, 367, 371 and 427. In *Çatalhöyük Excavations: The 2000-2008 Seasons* (Çatalhöyük Research Project Volume 7), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 131-189.

Chapter 23

Modelling Chronology

Alex Bayliss and Shahina Farid, English Heritage

Two articles on the chronology of different parts of the East Mound have been published during 2015. Bayliss *et al.* (2015) present an updated model for the base of the sequence (part of the on-going modelling of the South Area), and Marciniak *et al.* (2015) present a model for the latest deposits on the East Mound, excavated in the TP Area. Work on expanded the extent of both models continues.

Excavations by Marek Barański and colleagues in the Gdańsk Area (GDN) should enable stratigraphically earlier buildings and open areas to be added to the published model for the TP Area, thus increasing the temporal overlap of this model with that for the latest deposits in the South Area. In the absence of a direct stratigraphic link between the South Area and the excavations on the summit of the East Mound (TP, TPC, and GDN Areas), this will increase the reliability of the comparision between the two stratigraphically separate models for the East Mound deposits. It is hoped that this can be further strengthened by dating a stratigraphically related part of the TPC Area.

Steady progress has been made on the scientific dating programme for the South Area over the course of 2014/15. There is now a skeleton suite of radiocarbon results through the entire mound (from B.10 to Sp.181), and work is now focussing on completing the sampling of this spine of deposits through the mound and dating further strands of buildings and spaces that can be stratigraphically related to it. This work crucially depends on the re-analysis of the Mellaart stratigraphy, using the new plans from the 1960s excavations which were kindly lent to the project by James Mellaart before his death. Shahina and Alex are now well advanced in the reassessment of Mellaart's Area E, and Cordelia Hall has begun the digitisation of these buildings and spaces.

With the approach of the final season of excavation in 2016, the process of assessing the potential for radiocarbon dating and Bayesian chronological modelling to provide precise chronologies that will enable the research objectives of the wider project to be achieved has begun. This depends both on the depth of stratigraphy revealed and the availability of sufficient suitable samples for dating from them (Bayliss *et al.* 2014).

Burcu Tung and Alex met in California in May to assess the potential in the North Area. The lack of vertical depth of deposits excavated is a major constraint on the effective use of radiocarbon dating in this area. Seven separate stratigraphic strings were identified that contained a sequence of three or more buildings/spaces (the minimum judged viable, given the precision needed to engage with the emerging narrative from other parts of the site). Work continues to determine the viability of these strands although samples were retrieved for dating from the most promising group, that centred on B.77, during the 2015 season.

In addition to sampling the Neolithic areas, in 2015, sampling was also undertaken on a number of post-Neolithic human burials. We would like to thank Michelle Gamble and Scott Haddow for assistance in sampling the human bone assemblage, Julie Daujat, Romy McIntosh, and David Orton for assistance in sample the faunal material, and Dragana Filipović for her assistance with the charred plant material, both on site and in Oxford.

Funding for different components of the dating project has been provided by the John Templeton Foundating, the Albert Reckitt Archaeological Fund (administered by the British Academy), the Polish Academy of Sciences, the US National Science Foundation, and the Arts and Humanities Research Council, UK.

References

Bayliss, A., F. Brock, S. Farid, I. Hodder, J. Southon and R.E. Taylor
2015. Getting to the bottom of it all: a Bayesian approach to dating the start of Çatalhöyük. *Journal of World Prehistory*, 28: 1–26.

Bayliss, A., S. Farid and T. Higham
2014. Time will tell: practising Bayesian chronological modeling on the East Mound. In *Çatalhöyük Excavations: The 2000-2008 Seasons (Catalhoyuk Research Project Volume 7)*, ed. I Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 53–90.

Marciniak, A., M.Z. Barański, A. Bayliss, L. Czerniak, T. Goslar, J. Southon and R.E. Taylor
2015. Fragmenting times: interpreting a Bayesian chronology for the late Neolithic occupation of Çatalhöyük East, Turkey. *Antiquity*, 89: 154–176.

Chapter 24

Use-Wear Analysis of Chipped Stone Tools from the Neolithic Phases of Çatalhöyük

Cristina Lemorini[1], Davide D'Errico[2]

[1]"La Sapienza" University of Rome, [2]Leiden University

Season 2015 was dedicated to complete the selection of artifacts coming from Building 77, North Area of East Mount, and to carry out the selection from a new building, Building 44 in the South Area and its related midden/yards. The portions of artifacts showing use-wear (traces of use or hafting) were molded with a two components silicone and the moulds were brought to the laboratory of Technological and Functional Analysis of Pre-and Protohistoric Artifacts of the University of Rome "La Sapienza" to complete the study.

During seasons 2013 and 2014 the chipped stone tools from Buildings 65 and 56 were selected. Buildings 44 and 10, that we will select in the future season, will complete the study of an entire sequence of houses made one over the remains of the other. The aim of this choice is to highlight the use of the inside and outside spaces of each building and the continuities or discontinuities of use during times.

Interpreting what spaces were used for is a way for understanding the social organization of a community that lived together in the same village and, in a smaller scale, for understanding the social organization of the household that formed the village.

As an example, the functional data obtained from the analysis of the moulds from Building 65 and its open spaces, midden Sp.299 and yard Sp.314, gives various suggestions regarding the use of the inside and outside spaces.

Building 65

The moulds were analyzed with both Low and High-Power Approaches using a steromicroscope with a reflected light system and a metallographic microscope with a reflected light plus DIC system.

The results of the analysis were presented at the AWRANA Conference held in Leiden, 27-30 May 2015: C. Lemorini, D. D'Errico, "*Life at Çatalhöyük during Neolithic times. The contribution of microwear analysis of chipped stone tools to interpret the use and the manipulation of Neolithic domestic space*".

Summarizing, the first results obtained by the detailed analysis of Building 65 show a great variety of activities related to the gathering of many different types of herbaceous plants, probably linked to both food and craft purposes, that is weaving and textile or building construction.

The comparison with experiments carried out during spring 2015 in Italy and aimed to better define and distinguish the use-wear developed on obsidian tools when herbaceous plants are cut, confirmed that plants with highly abrasive stems as various plants from Poaceae family were gathered. Moreover, other types of herbaceous plants with less abrasive stems are present together with various types of shrubs.

Processing of herbaceous plants and wood and crafts activities related to the production of small stone objects, as beads or similar, are present both inside and outside the building while butchering or hide processing were carried out mostly in the yard north of the building, Sp.314. Moreover, the chipped stone tools found in this yard have a higher rate of mechanical alteration from trampling than the rest of the arti-

facts, suggesting that this area was probably a passageway of various people, maybe from distinct households sharing the same open space. It is worth mentioning that in B.65 and its open airs other activities on mineral materials were detected and, in particular, the contact with clay probably in different state of humidity, was found.

Figure 24.1. *Burial F.7634, OB34, Projectile point; scale bar equal to 1cm.*

Burials related to Building 132

The use-wear analysis of the chipped stone tools found during season 2015 in two burials from the closure levels of B.132, F.7634 and F.7632, produced interesting results that add new suggestions to the role of lithic industry used as grave goods at Çatalhöyük.

In burial F.7634, 17 items were found: 14 made of chert and three made of obsidian. Except for two items, the artifacts made of chert are "old" tools that show a highly patinated surface suggesting a long period of abandonment in open air before their deposition in the burial. Instead, two retouched flakes show use-wear. On one item some remains of the contact with herbaceous plants were observed that testify a use before the resharpening of the edge; on the other one, polishes related to the contact with woody plants, are slightly altered suggesting that the tool was not anymore in use for some time when it was placed in the burial.

The items made of obsidian are two débris and one projectile point (Fig. 24.1). The projectile is unused and was produced from a blade that was used for cutting herbaceous plants as suggested from the remains of striations and polishes as shown in Figure 24.2.

The beautiful dagger (21630.x5) made of chert found in burial F.7632 does not present any use on its finely retouched edges; nevertheless, in the area of the edge not affected by the retouch use-wear related to a previous use for cutting meat were detected.

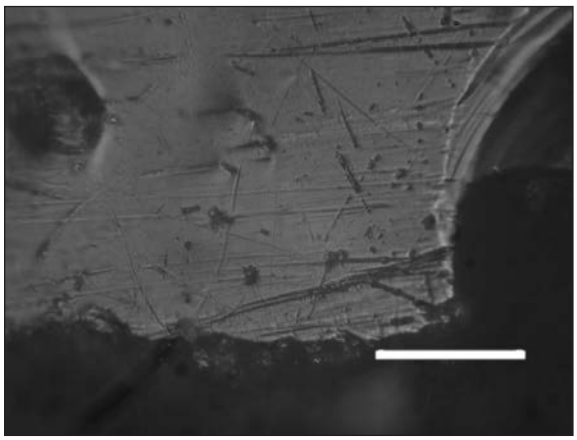
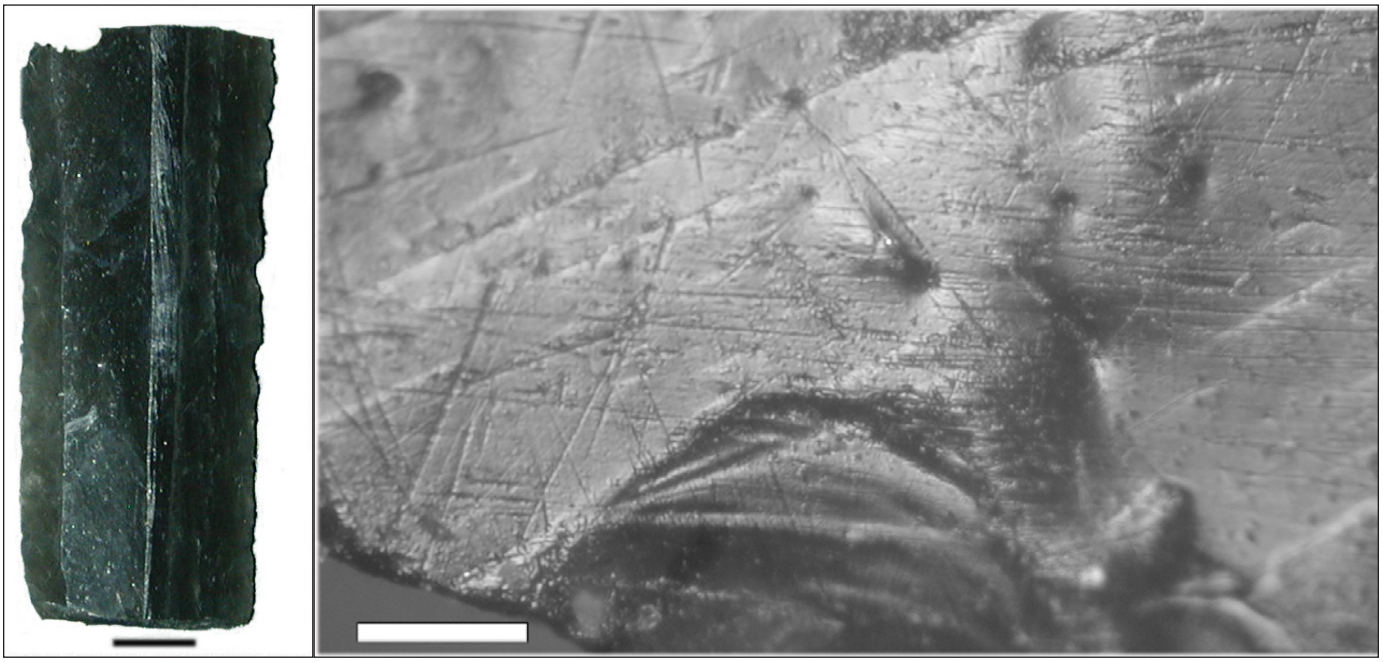


Figure 24.2. *Burial F.7634, OB34, Remains of striations and polishes interpreted as herbaceous plant cutting; scale bar equal to 1mm.*

Selection of chipped stone tools from Building 44

During season 2015 all the chipped stone tools from B.44 and open area Sp.130 and Sp.319 were selected and moulded . The selection of the lithic industry of Sp.129 is almost finished. The first impression from the use-wear quickly observed on the field suggests that the cutting of abrasive herbaceous plants (Fig. 24.3) is strongly predominant in Sp.120 both in the foundation levels than in the upper levels. Besides, the working of mineral materials was found even if with a much lower frequency than plants.



***Figures 24.3**. (left) Building 44, Sp.120, (11670), obsidian blade fragment (scale bar equal to 1cm); (right) related use-wear interpreted as herbaceous plant cutting (scale bar equal to 1mm).*

Chapter 25

Micromorphology: High-resolution Contextual Analysis of Buildings and Open Areas

Aroa García-Suárez, University of Reading

The micromorphological study of archaeological deposits at Çatalhöyük is part of a wider research aimed at investigating the Neolithic socio-economic framework of the Konya Plain. This issue is being tackled through further high-resolution analyses of occupation sequences at the herder campsite of Pınarbaşı (9th-7th millennium BC) and the early agricultural site of Boncuklu (9th-8th millennium BC). This investigation of house floors and middens has as its main objective the identification of the origin, deposition, and periodicity of components indicating particular domestic activities such as storage, fuel procurement and discard practices, with special emphasis on the ecological and social variations of these. Landscape strategies, household networks and uses of space will be explored in this manner at the three study sites, allowing for the spatio-temporal comparison of their occupation sequences at multiple timescales.

In this context, the goals of the microstratigraphic research at Çatalhöyük are as follows:

- To explore the socio-economic significance of small-sized buildings during the Neolithic occupation of the settlement.
- To investigate intra-site variability in ecological strategies and household networks across contemporaneous buildings and open areas.
- To identify patterns in uses and concepts of space, fuel choices and surface architectural materials at the three study sites that can potentially shed light into each community's ecological and social bases.

Ethnographic observations have shown that the smallest residues and artefactual remains are the most likely to represent primary activity refuse in a given context (Schiffer 1983). Geoarchaeological studies have proven the potential of thin-section micromorphology to investigate the depositional pathways of these remains and the activities they represent through the contextual and compositional analysis of the deposits in which they are embedded (Matthews *et al*. 1997; Milek 2012). In order to undertake this research, undisturbed sediment blocks have been collected from stratigraphic sections during the last three years of excavation at Çatalhöyük and to date, a total of twenty-four large-format (14x7cm) thin-sections from domestic contexts at the site have been produced at the Micromorphology Preparation Unit of the University of Reading. These samples have subsequently been examined at magnification 25x to 400x under a polarising microscope and described according to standard terminologies (Stoops 2003).

Microstratigraphic observations form selected sampled contexts

Building 114

Partially excavated by the BACH team in 2002-03 (Stevanović 2012), this building was re-opened in 2012 and it has been the focus of extensive micromorphological sampling since.

The abandonment fill of B.114 is characterised by its abundance of animal and human bones, few of which were found in partial articulation. Microscopically, the infill of this building consists of an extremely compacted and poorly sorted mix of silty clay loam in which a wide variety of cultural inclusions has been

found: wall plasters (15%), fragmented mudbricks (5%), marl (5%), bone and shell fragments (15%), plant fossils (10%) and highly reworked faecal aggregates (5%). Multiple discernible depositional episodes have not been identified at the microscale.

The platform on the central-east part of B.114, F.7114, shows a 15cm-deep sequence of carefully maintained mud plaster floors ranging in texture from loamy sand to fine silty clay. Sparse thin lenses of accumulated occupation remains (<0.3mm thick) have been encountered on top of some of these surfaces, consisting of rounded (swept?) silty clay aggregates and soot, likely trapped under mats. Amorphous phosphatic aggregates have been found in high proportions (up to 15%) at the interface of a number of these surfaces. The identification of the specific nature of these organic aggregates would require further analytical and chemical characterisations.

The micromorphological evidence from the fire installations F.7345 and F.7607 points at the continuous use of herbaceous plant species as fuel, alongside with animal dung and wood, present in much lower proportions. The preservation state of the organic inclusions suggest rather low firing temperatures (<500ºC).

Space 470

The floor of Sp.470, part of the Shrine 8 Annex sequence, is characterised by a clay loam matrix rich in fine-grained alluvial aggregates (10%) and marl inclusions. This floor is considerably thick (*c*. 5cm), a common feature in storage areas.

A thin microunit (2-3mm) of heavily trampled, compacted herbivore dung has been found on top of the floor, which suggests that, at this point in the lifespan of this room and probably for a short period of time, this space was used as a pen. Laminations of herbaceous phytoliths were found directly on top of this microunit, possibly the remains of an overlying dehusking waste deposit (Ryan 2012).

Space 511

Suspected collapsed roofing was exposed during excavation in 2013 and sampled for microstratigraphic analyses. These architectural remains consisted of two different sequences of laid plasters where virtually no debris was allowed to accumulate. These plasters are considerably thicker (1.5 to 2.5cm) than those encountered in ground floors rooms, likely to prevent cracking and abrasion from both trampling and weathering. All units were stabilised with 5-15% plant material, attested by pseudomorphic plant impressions and voids. Some of the finer-grained packing units have a platy microstructure, probably due to shrinking and dilation caused by desiccation and frost-action (Van Vliet-Lanoë 2010). The absence of water-laid crusts in this sequence suggests the existence of some form of roofing above these floors.

Building 89

Up to twenty-six occupation events have been identified in the clean floors of Sp.379, marked by continuous soot accumulations. This part of the building was frequently plastered with a range of mud and white plasters, and the virtual absence of accumulated residues stands for the high level of maintenance of this space. A remarkable continuity in the materials selected for the manufacture of these plasters has been noticed.

The area to the south of Sp.379 was plastered less frequently, and the floors show a greater thickness (1-2.5cm) than those of the clean sequence described above. These plasters are formed by sandy clay to silty clay alluvial sediments tempered with 5-15% plant stabilisers. Towards the top of this sequence continuous accumulations of occupation discard have been identified in the form of micro-laminations (2-8mm

thick) of ashes and charcoal, probably formed as hearth rake-outs and subsequently trampled on, leading to the high degree of fragmentation of their components. It is likely that this part of the building shifted from a 'clean' to a 'dirty' area coinciding with the construction of the hearth.

TPC Area

The Late Neolithic midden sequences analysed so far consist of superimposed, alternating layers of herbaceous ashes and charred plant materials, with a nearly absent minerogenic fraction. These ashy deposits are interbedded with discontinuous layers of large (up to 1cm) fragments of charred juniper wood, suggesting use of the wider landscape for fuel sources. There is no sign of trampling or compaction of these organic layers, which might indicate that this area was merely used for discard and/or open air fires. Post-depositional alterations, such as bioturbation and the re-precipitation of gypsum salts, are conspicuous in this part of the settlement, an effect of the proximity of the archaeological deposits to the modern topsoil.

Further work

The next stage of this project involves the use of targeted microanalytical techniques to aid in the chemical characterisation of specific deposits and components related to human activities. XRF and FTIR will shed light into choices of architectural materials through the identification of specific elements present in floor plasters. SEM-EDX and micro-FTIR will allow for the measurement of the mineralogical composition of specific materials present in the thin-sections analysed that are difficult to identify on the sole basis of micromorphology.

This year, micromorphological sampling was conducted on site (North and GDN Areas) to investigate specific questions that had arisen during excavation. Four sediment blocks were collected from the lowest occupation deposits and wall plasters of B.114, and six from building interiors and open spaces in the GDN Area (B.140, B.142 and Sp.544). The preparation and study of these samples will be undertaken next year in order to test the working hypotheses suggested during the excavation of these contexts.

Acknowledgements

I am grateful to the Konya Museum for permission to export the micromorphological blocks and sediments. I would like to thank Jędrzej Hordecki, Marta Perlińska and the GDN team for support with sampling. This fieldwork has been possible thanks to an overseas travel grant from the University of Reading.

References

Matthews, W., C.A.I. French, T. Lawrence, D.F. Cutler and M.K. Jones
1997. Microstratigraphic traces of site formation processes and human activities. *World Archaeology*, 29: 281-308.

Milek, K.B.
2012. Floor formation processes and the interpretation of site activity areas: an ethnoarchaeological study of turf buildings at Thverá, northeast Iceland. *Journal of Anthropological Archaeology,* 31: 119-137.

Ryan, P.
2012. Preliminary phytolith results for 2012. In *Çatalhöyük Archive Report 2012*, http: //www.catalhoyuk.com/downloads/Archive_Report_2012.pdf

Schiffer, M.B.
1983. Toward the identification of formation processes. *American Antiquity,* 48: 675-706.

Stevanović, M.
2012. Neolithic excavation in the BACH Area, Çatalhöyük 1997-2003. In *Last House on the Hill: BACH Area Reports from Çatalhöyük, Turkey, R.* Tringham and M. Stevanović (eds.) Los Angeles: Cotsen Institute of Archaeology Press, 23-98.

Stoops, G.
2003. *Guidelines for Analysis and Description of Soil and Regolith Thin Sections.* Madison, Wisconsin: Soil Science Society of America.

Van Vliet-Lanoë, B.
2010. Frost action. In *Interpretation of Micromorphological Features of Soils and Regoliths,* ed.s G. Stoops, V. Marcelino and F. Mees. Amsterdam and Oxford: Elsevier, 81-108.

Chapter 26

Ancient DNA Analysis on Çatalhöyük Human Remains: Initial Results

Gülşah Merve Kılınç[1], Füsun Özer[1], Ayça Omrak[2], Melike Dönertaş[1], Nihan Dilşad Dağtaş[1], Eren Yüncü[1], Sinan Can Açan[1], İnci Togan[1], Anders Götherström[2], Mehmet Somel[1]

[1]Middle Eastern Technical University (METU), [2]Stockholm University

At the end of the 2014 season, 13 human remains samples (molars and petrous temporals) of individuals from Buildings 49, 77, 80, 89 and 96 were exported to the Ancient DNA (aDNA) Laboratory of the Middle East Technical University in Ankara for genetic analysis, under a permit issued by the Konya Museum. The purpose of the study was to obtain a first insight into aDNA preservation of Çatalhöyük samples, and to evaluate the feasibility of different ancient genomic approaches, with the eventual goal to be able to determine genetic relatedness among Çatalhöyük individuals.

The samples were first studied in the dedicated aDNA laboratory at METU with all necessary precautions to avoid modern human DNA contamination. After removing the outer part of the samples, 300mg of material from each sample was pulverized by drilling. DNA was extracted following a standard silica-based aDNA protocol (Ottoni *et al.* 2011). The samples were tested for the presence of human DNA using polymerase chain reaction with primers targeting mitochondrial DNA. Among the samples studied, we chose seven, from five different individuals, for genomic analysis (Table 26.1). The samples were transferred to the Stockholm University under a permit issued by the Museum of Anatolian Civilizations in Ankara.

Sample Lab ID	Sample	Tissue	Reads sequenced	Reads mapped to human	Reads mapped and filtered	% Human DNA	Authentic DNA signal	Notes
Cat001	ÇH19887	Molar	51598420	35529	672	0.001	no	Infant
Cat002	ÇH20034	Molar	23343430	14792	268	0.001	no	Infant
Cat003	ÇH20683	Molar	16717747	17855	556	0.003	no	Mature female (burnt building)
Cat004	ÇH20830	Molar	17741081	6631	1130	0.006	yes	Adult
Cat005	ÇH13609	Molar	39297351	16892	3899	0.010	yes	F.1492, B.49
Cat006	ÇH20683	Petrous	13941300	82649	687	0.005	no	Mature female (burnt building)
Cat008	ÇH13609	Petrous	34675205	18080	2712	0.008	yes	F.1492, B.49

Table 26.1. *Sample and sequencing characteristics.*

In Stockholm we prepared sequencing libraries for the seven samples and paired-end shotgun sequencing was performed on the Illumina Hiseq2500 platform at the SciLab (Uppsala). We thus generated a total of 197 megabases (Mb) of sequencing data (14 to 52 million DNA reads per sample). We merged the paired-end sequencing reads and aligned them to the human reference genome (version hs37d5) using the BWA software (Li and Durbin 2009) including MAQ, which is accurate, feature rich and fast enough to align short reads from a single individual. However, MAQ does not support gapped alignment for single-end reads, which makes it unsuitable for alignment of longer reads where indels may occur frequently. The speed of MAQ is also a concern when the alignment is scaled up to the resequencing of hundreds of individ-

uals.\n\nRESULTS: We implemented Burrows-Wheeler Alignment tool (BWA. We removed PCR duplicates using Picard MarkDuplicates module (http: //broadinstitute.github.io/picard/) and filtered the reads based on the length and mapping quality (Table 24.1). After filtering, the proportion of unique reads mapping to the human genome ranged between 0.001% and 0.01% of all sequenced reads.

Accumulation of specific mutations at the termini of the ancient DNA molecules, caused by spontaneous post-mortem deamination, is widely used to assess authenticity of sequenced DNA molecules (Paa-

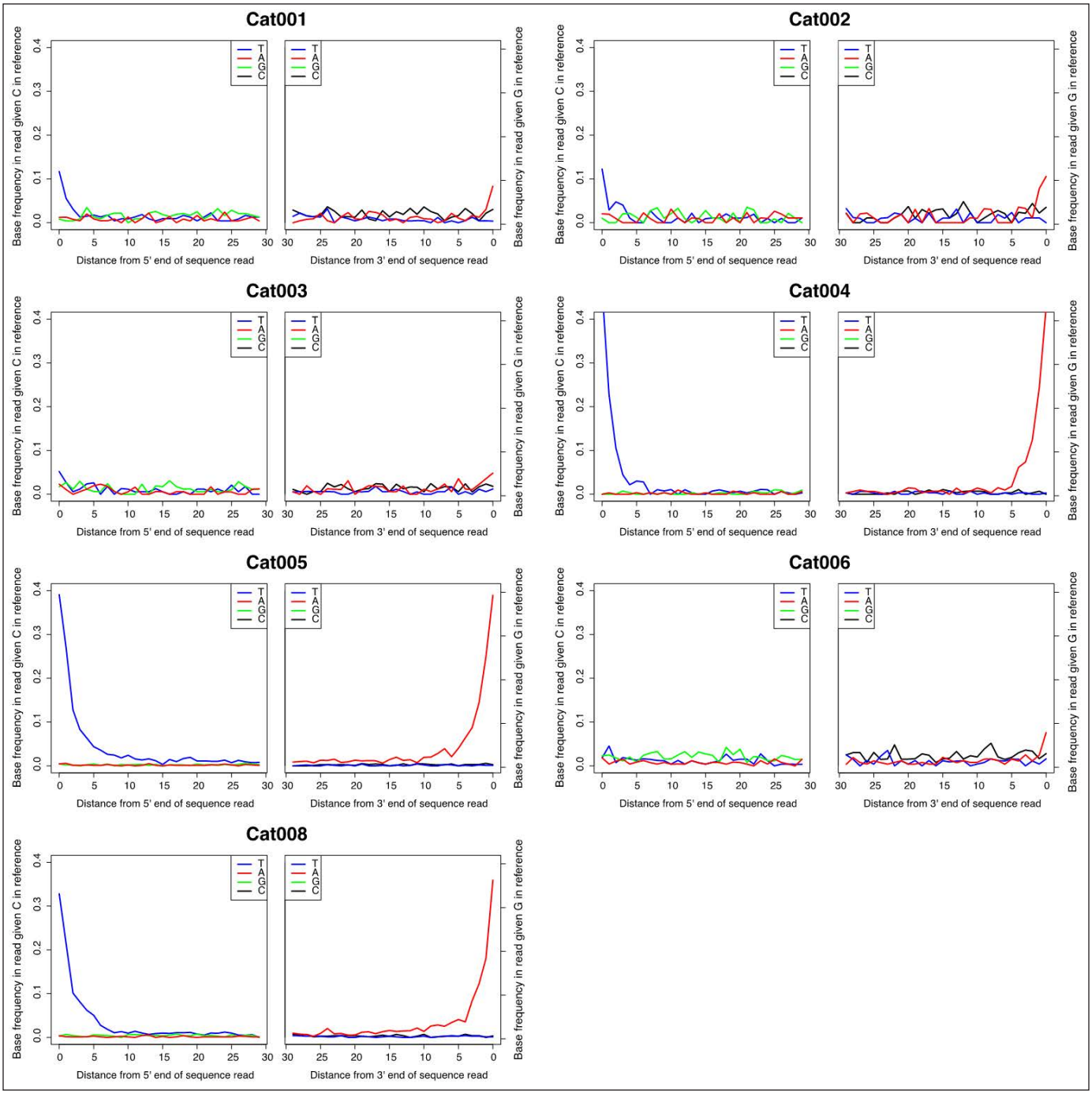


Figure 26.1. *Authenticity signals in the 7 libraries. The x-axis shows the distance from the 5' and 3' ends of human DNA reads at a mutated site, and the y-axes show the frequencies of mutations at sites where the reference human genome contains a C (left panels) or a G (right panels). The excess of mutations from C->T and G->A at the 5' and 3' ends of molecules is considered an authenticity signal for that molecule.*

bo 1989; Briggs *et al*. 2007; Skoglund *et al.* 2014). An excess of C->T and G->A mutations at the 5' and 3' termini, respectively, represent post-mortem damage, and a high proportion of such mutations (e.g. >25%) are considered an indication of authentic DNA (e.g. Haak *et al.* 2015). We therefore examined mutation accumulation patterns for DNA reads produced from the seven sequenced Çatalhöyük samples. Of these, DNA from three samples, representing two individuals, had a conspicuous excess of mutations (>30%) representing post-mortem damage (C->T and G->A) at respective ends of reads (Figure 26.1; Table 26.1). These were also the three samples with the highest proportions of endogenous DNA.

Of the rest, 2/7 showed weak excess of post-mortem damage (>10%), and 2/7 showed no excess. We noticed that these four samples with the poorest endogenous DNA yield were derived from two infants, and one mature female from a burnt building (Building 77).

These results indicate the possibility of authentic DNA retrieval from Çatalhöyük samples. The DNA content in all studied samples is low (close to 0.01% in the best case), and therefore genome-wide sequencing would be an inefficient strategy for studying genetic relatedness among these individuals. Instead, hybridization-based sequencing strategies (e.g. Haak *et al.* 2015) could be successful in extracting sufficient genetic data from at least some of these and other Çatalhöyük samples.

References

Briggs, A.W. U. Stenzel, P.L.F. Johnson, R.E. Green, J. Kelso, K. Prufer, M. Meyer, J. Krause, M.T. Ronan, M. Lachmann and S. Paabo
2007. Patterns of damage in genomic DNA sequences from a Neandertal. *Proceedings of the National Academy of Science USA,* 104: 14616-14621.

Li, H. and R. Durbin
2009. Fast and accurate short read alignment with Burrows-Wheeler transform. *Bioinformatics,* 25: 1754-1760.

Ottoni, C., F-X. Ricaut, N. Vanderheyden, N. Brucato, M. Waelkens and R. Decorte
2011. Mitochondrial analysis of a Byzantine population reveals the differential impact of multiple historical events in South Anatolia. *European Journal of Human Genetics,* 19: 571-576.

Pääbo, S.
1989. Ancient DNA: extraction, characterization, molecular cloning, and enzymatic amplification. *Proceedings of the National Academy of Science USA,* 86: 1939–1943.

Skoglund, P., B.H. Northoff, M.V. Shunkov, A.P. Derevianko, S. Pääbo, J. Krause and M. Jakobsson
2014. Separating endogenous ancient DNA from modern day contamination in a Siberian Neandertal. *Proceedings of the National Academy of Science USA,* 111: 2229-2234.

Chapter 27

Post-Chalcolithic Burials: Small Finds and Osteological Analysis

Sophie Moore, Michelle Gamble

Work on the post-Chalcolithic burials continued this year with Michelle Gamble working out of the Human Remains Laboratory on the osteological material from July 28th to August 18th and Sophie Moore working on the small finds and archive from the Finds Laboratory from July 22nd to August 18th.

Osteological analysis of post-Chalcolithic individuals

Having completed the analysis of the post-Chalcolithic human remains from the North Area in 2012 and 2013, this year Michelle's focus was on the osteological analysis of the post-chalcolithic from West Trench I and individuals from the North Area excavated after 2008. Michelle examined the skeletal material, composing inventories in coordination with the current Human Remains team database as well as determining age and sex of the individuals and recording evidence of any pathologies.

Twenty-two features excavated between 1998 and 2001 were examined this year, including 15 recognised grave features (numbers: F.700, F.705, F.706, F.709, F.726, F.728, F.730, F.731, F.732, F.735, F.744, F.746, F.747, F.749 and F.1354) of the known graves, five features did not contain human remains – F.728, F.731, F.744, F.746 and F.1354. Several pit features or clusters of human remains from surface collection were also examined (unit numbers: (2922), (2918), (2913), (2901), (2909), (2916), (2920)). Of particular interest, due to the severity and nature of their pathological changes, were the adult male individual from F.706 and the adult female from F.700. The individual from F.706 had extreme changes to the long bones suggesting a congenital disorder leading to gigantism and a brachial-plexus issue which withered the left arm. The individual from F.700 was in quite poor condition, particularly the post-cranial bone which was highly fragmentary and only partially complete, but appears to have possibly suffered from a possible endocrine disturbance causing achondroplasia.

Having completed the osteological analysis of the West Mound Trench I Post-Chalcolithic burials, several burials from the North shelter excavation area, excavated after 2008, were examined. Of the eight recorded post-Chalcolithic burials from the North Area, six were examined this season – feature numbers: F.3631, F.3632, F.3633, F.3685, F.3687 and F.3689, leaving F.3640 and F.3641 to be completed as a priority in 2016. Of particular interest due to their grave goods and interesting skeletal biology are the adult female from F.3685 and the double burial, F.3687, of an older adult female and a young adult male.

Contextual analysis of post-Chalcolithic burials

In addition to work which focused directly on mortuary contexts, work continued on post-Chalcolithic ceramics from various areas of the site. Sophie located and analyzed the ceramic material from two kilns excavated in 2000 and produced illustrations and photographs of the material for inclusion in an article in preparation; '*Survey, field-walking and landscape in the immediate environs of Çatalhöyük*'. Further analysis was conducted on the ceramics collected during the field-walking survey which took place in 2013 (Jackson *et al*. 2013). This included using a digital microscope to take fabric reference images, and photography and illustration for publication.

References

Jackson, M., S. Moore, E. Hudak and T. Sutcliffe
2013. Survey and fieldwalking in the immediate environs of Çatalhöyük 2013, in *Çatalhöyük Archive Report 2013*, http: //www.catalhoyuk.com/downloads/Archive_Report_2013.pdf

Moore, S.
2014. Analysis of the post-Chalcolithic cemeteries, in *Çatalhöyük Archive Report 2014,* http: //bit.ly/catal2014report.

Moore, S. and M. Jackson
2013. Late burials from 4040, in *Çatalhöyük Excavations: The 2000-2008 Seasons* (Çatalhöyük Research Project Volume 7), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Archaeological Institute Press, 603-620.

Chapter 28

Painted Plaster Head

Ashley Lingle[1], Nicoló Dell'Unto[2], Lindsay Der[3], Sean Doyle[4], Kathryn Killackey[5], Arkadiusz Klimowicz[6], Lynn Meskell[3], Phil Parkes[1], Burcu Tung[5]

[1]Cardiff University, [2]Lund University, [3]Stanford University, [4]McMaster University, [5]Çatalhöyük Research Project, [6]Adam Mickiewicz University

Introduction

Figure 28.1. *Plaster head 21666.x1 (Photo: Jason Quinlan).*

The 2015 season offered a number of exciting finds at Çatalhöyük. One of the most remarkable was a plaster head (Fig. 28.1) installation found within Building 132, the predecessor of Building 77, located in the North Area. The face, which may be interpreted as either human or animal, and may have been intentionally ambiguous, is painted with an alluring pair of obsidian flakes in place of the eyes. The use of obsidian in this capacity is unique to the site and rare in Neolithic Anatolia. This unprecedented find offered an opportunity for the Çatalhöyük Research Project team to take an interdisciplinary approach from the initial excavation through various levels of specialist analysis. The perspectives offered here are from the excavator of B.132 and the area supervisor, conservators, a 3D modelling specialist, illustrator, obsidian specialist, and the figurine team. The holistic study of this exceptional object provides its contextualization at the site and in the Anatolian Neolithic.

Plaster head installation: an overview of the discovery

Arkadiusz Klimowicz and Burcu Tung

In the last week of excavation in the 2013 field season, Sp.511 was uncovered in the west-central part of the North Area, eliciting many questions and prospective research directions. Space 511 was identified below Sp.489, a midden abutting B.77 immediately to its south. Only partially exposed by its eastern end, Sp.511 was assumed to be part of a larger architectural feature. Thus, it was possible for Sp.511 to have been a southern side-room for the building preceding B.77 (see Archive Report 2013). By the end of the 2014 excavation season, Sp.531, located immediately north of Sp.511 was uncovered. The northern limit of Sp.511, wall F.3679, was the key attribute to make a connection between the spaces. Thick layers of plaster were evident on either side of the wall, indicating it was most likely an internal wall within a large building. Finally, the discovery of a crawl-hole in the 2015 season unquestionably linked the two spaces. The plaster head and additional associated architectural installation was an ancillary discovery during the investigation of the relationship between these spaces.

The plaster head installation was situated in the southwestern corner of Sp.531, at the junction of wall (F.7346) the western wall of Sp.531, and wall (F.3679) the division wall between Sp.511 and Sp.531. Crawl hole (F.7856) is also located at this junction, carved into wall F.3679.

Initially, the plaster head (21666.x1) was not recognized as a wall installation. It formed the upper-most limit of the western wall, which was truncated some time after the building's abandonment during the construction of B.108. The truncation removed much of the plaster head's upper connection to the western wall. The wall installation was entirely covered by thin layer of white plaster formed on the western wall (F.7346). This was the final plastering event before the abandonment of the building, which was seen across the entire space. When excavations were carried out around the crawl-hole, the plaster head was removed before it could be fully understood within the space, as it was no longer stable. The exact positioning of the head was reconstructed after intensive photogrammetry and 3D modeling (see below).

It is important to note that the plaster head is part of a larger wall feature molded in the southwest corner of the Sp.531. In its final position (Fig. 28.4) the head extended eastward, facing the crawl-hole. A large oval groove appears to be set immediately beneath the head, although animal burrowing had extensively damaged this groove. The western wall, which extended into Sp.511, was molded into undulations. What these convex and concave features represent is still unclear, and will require further investigation in 2016. Overall, the feature's location suggests it may have played a symbolically important role with the intramural passage (F.7856). This view is supported by the *in situ* location of the plaster head installation that clearly flanked the northern façade of the entrance. Furthermore, the particular position and arrangement of the head, may have emphasized the act of approaching the access into the space.

The western end of Sp.511 remains unexcavated. Therefore the exact nature of the crawl hole, and what lies immediately south of the molded feature and the plaster head remains to be discovered.

Figure 28.2. *Plaster head just after excavation.*

Construction

Ashley Lingle and Phil Parkes

Once the plaster head had been removed from site it was taken in for conservation work. Initially, the plaster head had little to distinguish it as an object, with an obsidian flake and a few specks of red paint (Fig. 28.2). Upon mechanical cleaning to carefully remove the plaster, a decorative surface began to emerge as well as a secondary obsidian flake. This was now a face with eyes. The uppermost surface was covered with two layers of plaster, a greyish base or "make-up" layer followed by a fine white layer, the same pattern as seen on the plaster walls. The neck area and the mouth had been filled in with the make-up material, which had further obscured the shape. The plaster was cleaned back to the latest decorative layer, and consolidated for stabilization.

The plaster layers are compromised at the back due to a post-depositional animal burrow, however, this proved to be fortuitous. While the burrow somewhat structurally compromised the plaster, the visible mixture of substrate showed earth, plaster, and charcoal inclusions. There were no bone inclusions present or visible in the plaster layers, indicating that the face is made entirely of plaster, unlike the bull and sheep head installations that are common at Çatalhöyük (Rusell and Meece 2006).

Missing parts of the face allowed further study for the construction of this unique object. In cross section, approximately ten different painting events can be seen. In between these painted layers there are only 2-3 unpainted layers, suggesting this face was regularly maintained. On the painted layers directly under the obsidian eye there is black paint, suggesting the eyes were painted before the final obsidian flakes were put in place. The plaster of the head and upper-neck is non-contiguous to the surrounding plaster in some areas. Based on the sequence of the currently visible plaster layers, it is likely the head was constructed, painted, and re-plastered several times before it was attached to the surrounding wall plaster.

Additional painted layers were visible on the bulk plastering at the base of the object. Further investigation on site showed identical layers of plaster from the location where the face was removed. This link led the team to explore the idea of studying the face *in situ*. 3D modelling then became the next approach in the study.

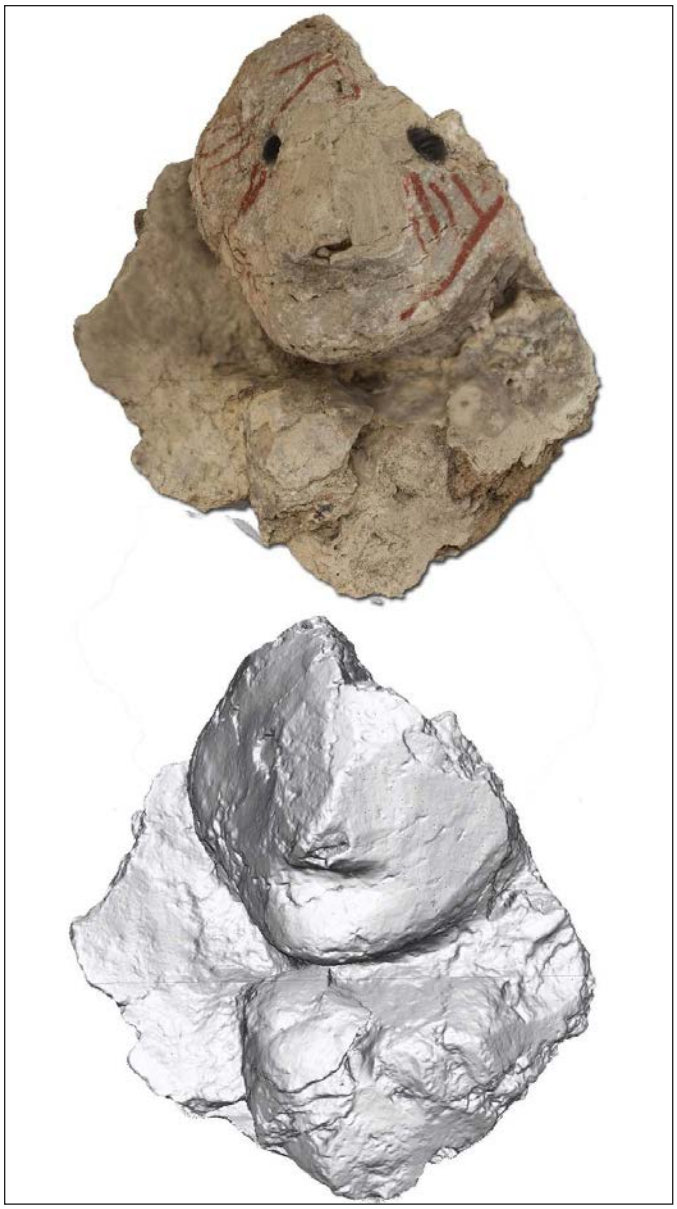


Figure 28.3. *3D model of the plaster head after conservation intervention. The model was generated using Agisoft Photoscan Pro 1.1.*

3D Modelling

Nicoló Dell'Unto

After an initial period of experimentation, realized in the context of the Çatalhöyük 3D Digging Project (Forte *et al*. 2015), a successful experiment was carried out to virtually reinstall the plaster head *in situ*. Since 2013, image-based 3D modeling techniques have been systematically applied by the Çatalhöyük Research Project team to document and geo-reference: buildings, spaces and features at different stages of the excavation (Berggren *et al*. 2015). In doing so, we have been able to create bi-dimensional orthoimages of contexts in support of graphic documentation. The advantage in using such a technique is that a simple digital camera can be employed to generate an accurate three-dimensional model, which can be used in the interpretation of the excavation.

Recently, several experiments were performed to test the use of this technique in support of archaeological practice (Callieri 2011; Opitz, 2012; De Reu *et al.* 2013a). Three-dimensional models were mainly used for building accurate bi-dimensional maps and sections of the site (De Reu *et al.* 2013b; Quartermaine *et al*. 2014), and for monitoring the different steps performed by archaeologists during field investigations (Callieri *et al*., 2011; Forte *et al*., 2012; Forte *et al*. 2015).

By using the 3D archive realized so far, it was possible to identify the plaster head (21666.x1) when still *in situ*. However, despite recognizing that the plaster head was part of a larger installation, we were unable to gain a clear understanding of its spa-

tial relation with the rest of the building since it was completely covered with a layer of plaster. For this reason, it was necessary to virtually restore the plastered head to its original location once the obscuring plaster layers were removed. This virtual recreation allows for the re-examination of the feature in relation to the rest of the building (Fig. 28.3). For instance, it is now clear that the head, in its final stage, was facing the crawl-hole, rather than the room itself.

Due to the lack of geometric correspondence between the model generated after the removal of the plaster head and the models retrieved in the archive, the process of 3D geo-referencing was not an easy task. The three dimensional models of B.132, previously generated by the team, were originally processed at a medium resolution for the purpose of a generic visualization. For this reason, only a few pictures were acquired in the field to document the southeast corner of the building. The lack of images represented an

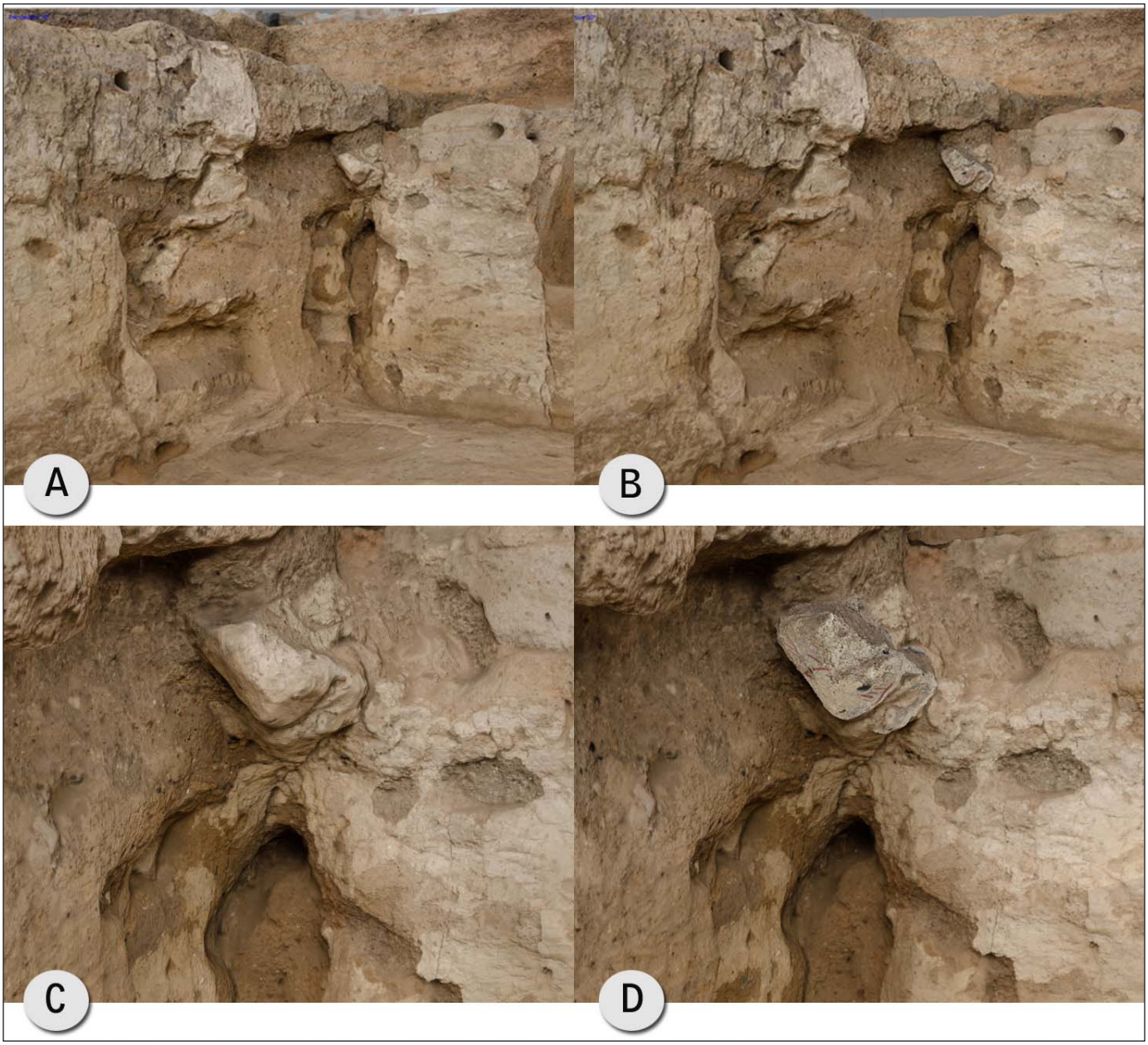


Figure 28.4. *3D model of the south-east corner of B.132 where the plaster head was found. On the left side of the image (Panels A and C). The building with the plaster head as retrieved on site, on the right side of the image (Panels B and D). Building 132 with the plaster head after the intervention of the conservation laboratory (Photos: Jason Quinlan, Marta Perlinska and Nicoló Dell'Unto; 3D models: Nicoló Dell'Unto).*

obstacle for the generation of a model that could be efficiently used as a reference for the alignment of the plaster head model acquired in the conservation laboratory. Despite this restriction, in order to increase our chances of finding geometric correspondences, the 3D models retrieved in the archive were re-processed to obtain a model with more detailed geometry. The result of the new interpolation allowed the detection of a sufficient number of corresponding points, which permitted us to perform an acceptable alignment.

Once the plaster head was geo-referenced, the virtual plaster head was imported into a 3D geographic information system (3D GIS) for further processing. From there, it was spatially visualized with models of the excavation location. The simulation and analysis were performed using ESRI ArcGIS. Due to the capacity

Figure 28.5. *Sequence of screenshots of 3D GIS of the North Area built using the models realized by the Çatalhöyük Research Project team. Specifically, the image displays the temporal sequence of Sp.490 (A), Sp.488 (B) and B.132 (C). On the bottom right of the image (Panel D), the plastered head after conservation intervention, imported and visualized into 3D GIS (Photograph and 3D models: Jason Quinlan, Marta Perlinska and Nicoló Dell'Unto).*

of this platform to directly import, manage, and analyze 3D surface models, together with more traditional datasets, it was possible to link the model of the plaster head, with the model of B.132 from the project archive (Fig. 28.4).

This operation allowed for the identification of the different contexts directly related with the feature in a temporal sequence. Such identification enables us to gain a better understanding of how the plaster head was related to the construction sequences of the building (Fig. 28.5).

The 3D model of the plaster head generated for this experiment was made with the specific aim of virtually visualizing the feature while still *in situ*. A second acquisition campaign together with different interpolation parameters would have allowed the generation of a 3D model capable of displaying finer details noticed after the conservation intervention. As it was not possible to obtain a second acquisition, the opportunity arose for a cooperative interpretation with the site illustrator, Kathryn Killackey.

Drawing

Kathryn Killackey

Three illustrations were created of the plaster head installation. There were two main considerations in creating these illustrations. The first consideration was to provide information the 3D model did not, and the second was how to safely handle such a friable object during the illustration process. Regarding 3D models, scaled illustrations of archaeological objects have an advantage over photographs in that they record the exact dimensions of the artifact. This advantage is lost with 3D models since they also record artifact dimensions. At first glance, it seemed that Dell'Unto's model had recorded all available information and illustrations would be redundant. After careful examination and comparison of the plaster head and its 3D model, and with consultation with the conservator, Ashley Lingle, several areas were identified where illustration could complement the 3D model.

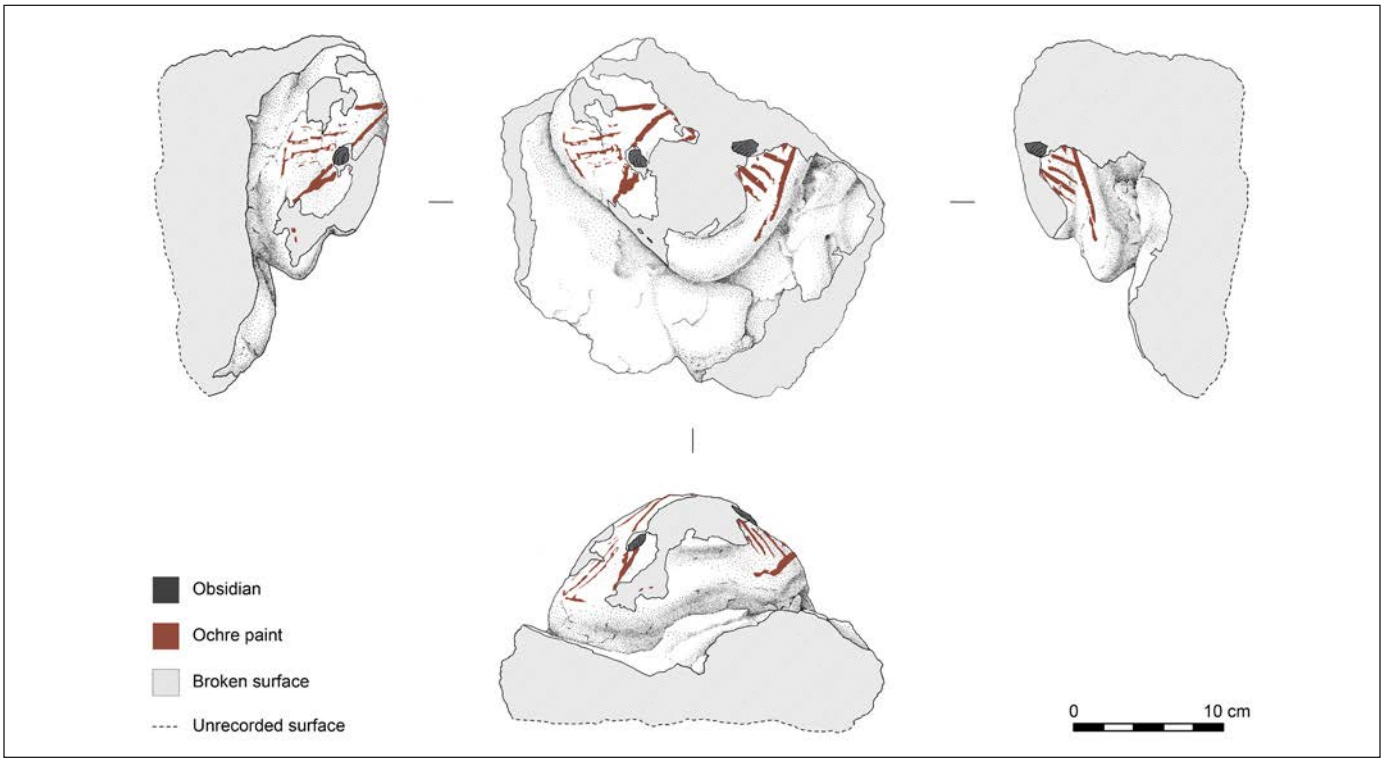


Figure 28.6. *Scaled illustration of the plaster head with latest layer of ochre recorded (Illustration: Kathryn Killackey).*

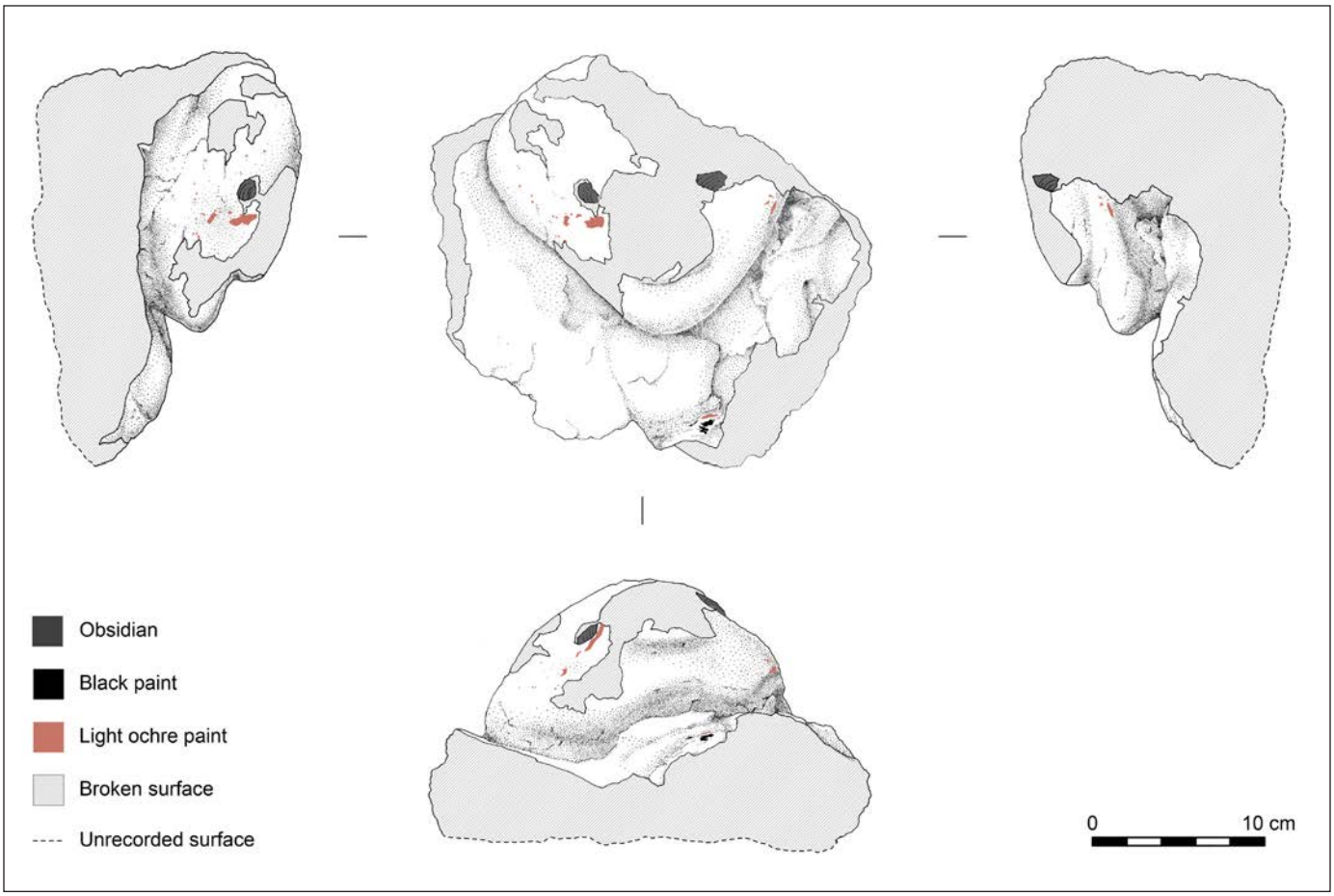


Figure 28.7. *Scaled illustration of the plaster head with earlier layer of ochre paint recorded (Illustration: Kathryn Killackey).*

The plaster head is made up of many delicate applications of plaster, some of which had flaked off and revealed portions of earlier layers as mentioned above. These layers were also visible in the broken sections where the head had originally attached to the wall and in the areas damaged by animal burrowing. The 3D model and photographs captured the general areas of white and ochre plaster but not the fine details, as due to the initially unremarkable nature of these areas they were over-looked. Dell'Unto's model was created before specialist input, and there was not an opportunity for another to be created. The above-mentioned fine layers of detail, which provide insight into the construction of the plaster head, could be effectively interpreted in illustration, along with additional temporal clarification. The first illustration (Fig. 28.6) shows four views of the plaster head and records the latest layer of ochre painted decoration. It also removes the details of earlier painted layers to clarify the latest painting. Finally, it delineates damaged and broken areas, making clear what is the original, intended surface of the feature. Figure 28.7 shows the same four views of the plaster head, with only the areas of an earlier layer of ochre painted decoration visible. Again, this illustration clarifies the earlier painted details for the viewer by removing the later ones. These first two figures show standard illustration views of an archaeological object. Two additional views were needed to capture details of where the plaster head had been attached to the western wall (F.7346) of Sp.531. Lingle had noticed the difference between the delicate plaster layers on the head and the bulky layers of plaster attaching the head to the wall. The two views in Figure 28.8 highlight this connection, showing it on a) the upper left side of the head and b) the right side of the head. One final illustration is planned to occur when we better understand the role of Sp.531. This illustration is a reconstruction showing the plaster head *in situ* and the space in use.

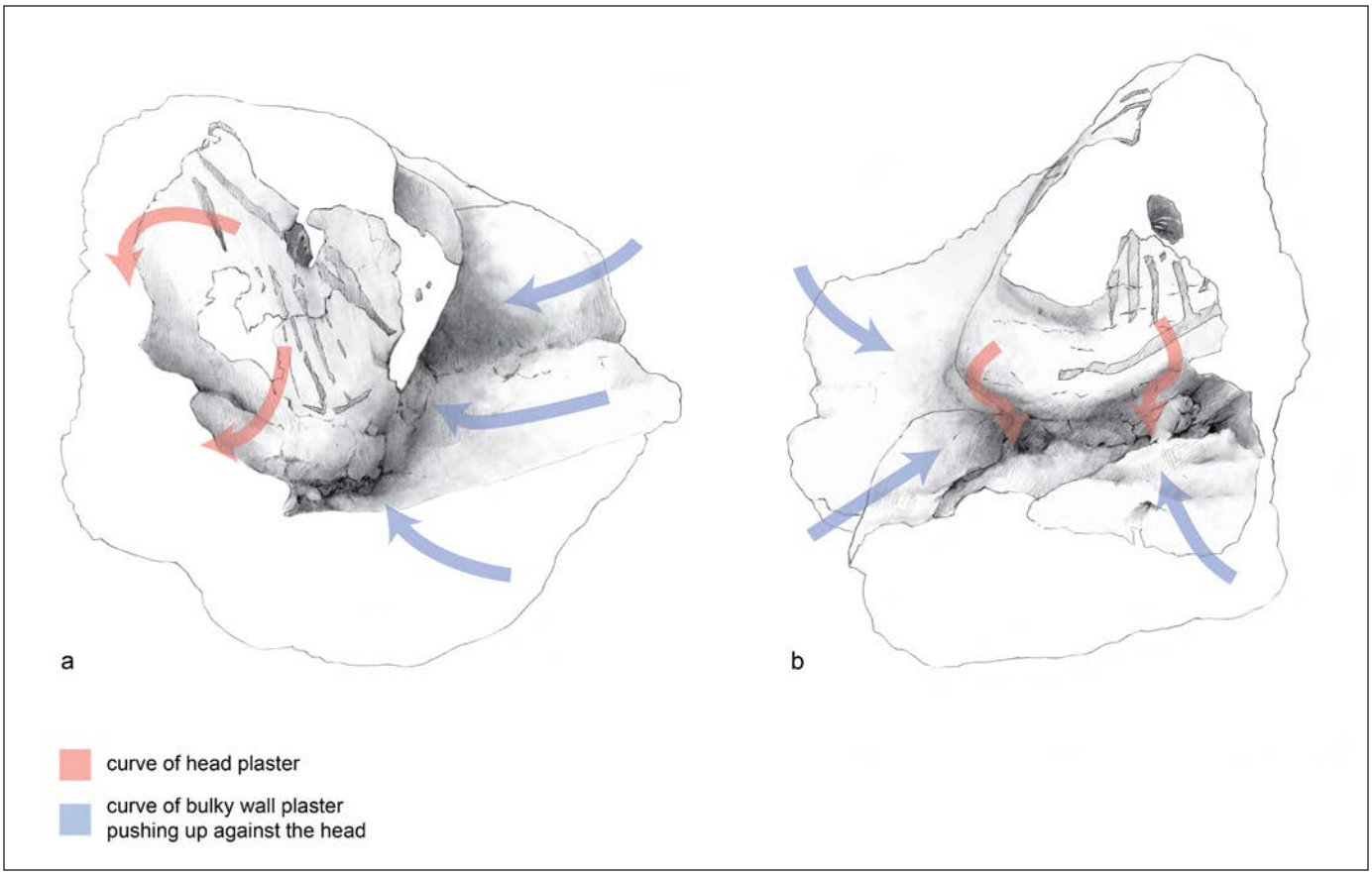


Figure 28.8. *Two views of the plaster head and wall plaster joining, a) upper left side and b) right side (Illustration: Kathryn Killackey).*

The plaster head is both bulky and fragile, making it difficult to properly stance and measure. This makes the second consideration of physically handling the plaster head during the illustration process challenging. Illustrations began in the traditional manner, using calipers and rulers to take measurements, but it quickly became apparent that this would be a laborious and lengthy task. Instead, to take advantage of the new technology available, the 3D model was used as a basis for the drawings. With the help of photographer Jason Quinlan, a digital model was rotated into the proper views, which were then printed. These print outs became the framework for the drawings, allowing focus on the requisite details. It also eliminated the need for wasting valuable time measuring the plaster head, something the model already did with more accuracy. Using orthoimages in this context meant the plaster head did not have to be moved frequently and damage was less likely to occur. This hybrid approach to drawing worked well and will be used again in the future for awkward objects.

Obsidian sourcing

Sean Doyle

When a light is shone through the sculpture's left eye (the one most visible as a result of rodent burrowing), the source can be attributed with 94-97% confidence to the East Göllü Dağ volcanic range, (Fig. 28.9) and tentatively to the sub-source of Kayırlı-Kabaktepe, where large amounts of Neolithic workshop waste have been recovered (Binder and Balkan-Atlı 2001). This conclusion is based on the complete transparency and slight purple-grey tint apparent when looking through the obsidian, attributes exclusively associated with Type 6 in the visual characterization scheme originally introduced by Kayacan and Milić (Archive Report

2008). The confidence rating is based on chemical characterization tests of an initial one hundred artifacts from site to determine their source, with subsequent additions to the data and visual comparisons performed by chipped stone lab members (Milić *et al.* 2013). The texture and morphology of the plaster are clearly present underneath the eye, and there are no traces of streaking, cloudiness, or colors that are characteristic of other obsidian sources, again leading to the Kayırlı attribution. This source was most commonly exploited during the early Neolithic levels of Çatalhöyük (pre level VI), and is consistently present in other Building 77 and 108 deposits. In general East Göllü Dağ obsidian represents up to 80% of these early assemblages, and are dominated by the Komürçü outcrop where the Epi-Palaeolithic to Mesolithic Kaletepe workshop was located (Carter and Shackley 2007). Kayırlı is less commonly found but persists in lower frequencies throughout these levels.

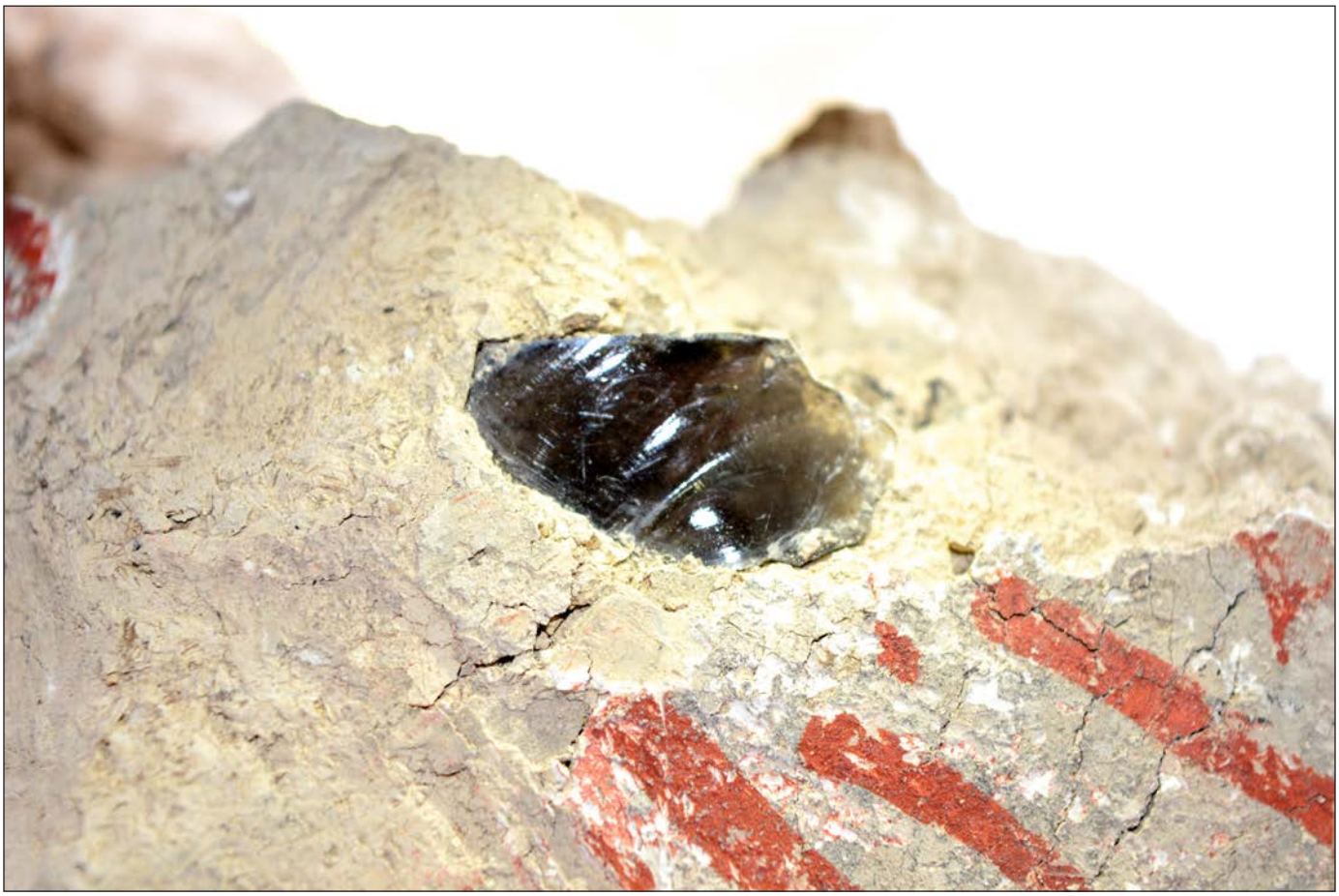


Figure 28.9. *Obsidian sourcing examination (Photo: Sean Doyle).*

Technologically speaking, these two flakes are unremarkable. They are common debitage flakes produced via direct percussion, and judging by the left eye (from its perspective, and because its edges can be seen as a result of the damage to the head) they are non-retouched and unused. Due to the slight curvature of the flake, and the small number of prior removal scars on the dorsal side, they are likely either late stage biface reduction flakes or preparation flakes removed to shape a flake or microblade core, industries commonly observed in the early occupation levels of the site (Carter and Milić 2013). Similar examples are frequently recovered from the earlier levels of Kayırlı obsidian. The edges of the left eye were snapped off in antiquity before being placed into the sculpture, based on how the broken edge abuts the plaster around the left eye. Presumably the right eye was treated similarly and came from the same obsidian source, but this is impossible to conclude because its edges are fully covered by the plaster.

Both of the eyes were placed with the ventral sides facing out, whereby the surfaces visible to observers were rippled as a result of the percussive force employed to remove them from their core. This was perhaps done intentionally, as one can imagine how the eyes might seem to dance or move when lit up by the flames of a hearth fire or torch. The bulbs of percussion are both located on the left sides (from its perspective) of the eyes, and perhaps functioned as irises and/or pupils looking into the centre of the room from which the plaster head was recovered. The slightly curved profile of the flakes might have made it seem that the eyes followed people as they moved about the room, the shifting flickering lights suggestive of an inner soul or consciousness.

Figure 28.10. *Anthropomorphic limestone sculpture recoverd from Yeni Mahalle (Photo: Lynn Meskell).*

The plaster head: regional and site contexts

Lindsay Der and Lynn Meskell

Considerations of the plaster head in its regional context bring to mind other figurative examples with inlaid obsidian eyes. From the Pre-Pottery Neolithic, we are reminded of "Urfa Man" (Fig. 28.10), a 1.93m tall anthropomorphic limestone sculpture found at the site of Yeni Mahalle (Hauptmann 2011; Schmidt 2010; Hauptmann, and Schmidt 2007). Recovered in 1993 due to urban development in the Balıklıgöl and Dergah area, this sculpture is of a legless, naked, male figure with a "V" detail at the neck. The hands are positioned around the genital area, which is marked with red discoloration, leading to interpretations of phallic masculinity (Hodder and Meskell 2010, 2011). Like the Çatalhöyük plaster head, this figure also has no mouth depicted but features a pronounced nose. Most notably, the face has black obsidian blades for eyes and translucent, black obsidian cores have been found at many sites in the Urfa region besides Yeni Mahalle including Karahan Tepe, Sefer Tepe, and Hamzan Tepe (Çelik 2010).

While there are no parallels with obsidian eyes from Çatalhöyük, during Mellaart's 1960s excavations a red-ochre coated skull with two cowrie shells was discovered (Shrine VII.10). In earlier levels in the same building sequence, both a headless burial (Building 6), and a skull deposited from a post pit (Building 17), were recorded by the current team (Hodder 2005).

Examples elsewhere in Anatolia include anthropomorphic vessels with obsidian eyes from the Chalcolithic site of Hacılar. James Mellaart's excavation reports describe red-on-cream ware from Level I of the settlement with obsidian inlay for eyes, ears, brow, nose, and chin (Mellaart 1960, 1970). Although many "Hacılar" figurines and pots have been exposed as modern forgeries, these are unprovenanced artifacts purported to derive from the Hacılar I cemetery not the excavated settlement (Muscarella 2013; Aitken *et al.* 1971). Even so, some of these funerary objects have been deemed genuine, ancient articles, although whether they originated from Hacılar or from another neighboring site remains unknown. Further afield, at Yanik Tepe in Azerbaijan, multiple examples of Chacolithic pottery with anthropomorphic faces have been

found. These faces have inlaid obsidian flakes for eyes; the obsidian is always translucent (Burney 1962). While there are no obsidian eyes at the Late Neolithic site of 'Ain Ghazal in Jordan, black pigment, likely bitumen, was used to demarcate the eyes of clay statues and plastered skulls (Griffin *et al*. 1998; Rollefson 1986).

The use of obsidian for inlaid eyes in figurative artifacts is not limited to the prehistoric Middle East. Some Old Kingdom coffins in Egypt have inlaid obsidian pupils on their exterior (for example, at Dayr al-Barsha and Giza) (De Meyer 2011). Portable anthropomorphic woodcarvings from Rapa Nui (Easter Island) also have inlaid obsidian eyes (Forment *et al.* 2001), as do ivory death masks found in graves at Ipiutak (McGillivary 2005). While we are not advocating for any sort of direct comparisons with the Çatalhöyük example, the practice of demarcating eyes with obsidian has been found in various regions.

In terms of the site itself, while this plastered head (21666.x1) is to date unique, it shares certain characteristics with other plaster installations at Çatalhöyük. We also know that wall paintings, plastered features, bucrania and, in one case, a human head were repeatedly maintained and curated with additional layers of plaster and paint (Meskell 2008). The heads of animals (bulls, vultures, goat, wild boar jaws) were attached to walls and embedded and 're-fleshed' with wall plaster in houses. These features could be removed from buildings, possibly being installed elsewhere. This is part of a wider a longer-term tradition of circulation and handing down of objects at Çatalhöyük. At various stages after the end of the house cycle, the impressive plastered elements of animal heads and horns were often removed and/or retrieved and potentially reused in other structures. Their retrieval suggests their potent or salient status in many, but not all instances. We should remember too that plastered anthropomorphic features, like the splayed figures, also had their heads and hands or paws removed at closure (Hodder 2006; Meskell 2008). The current example 21666.x1 may have undergone such a process.

Figure 28.11. *10264.x1 (Photo: Lynn Meskell).*

Within the house there is a tendency toward animal skulls and horns, rather than other body parts, within the most dramatic plastered features. Importantly, we have not found human heads or body parts incorporated into this tradition. While animal heads and parts thereof were fixed to walls and features, human skulls and body parts remained detached, circulating and more likely to move from one special deposit to another. Thus we might then suggest that 21666.x1 is most likely a representation of an animal head of some sort, yet we should resist any neat division of anthropomorphism and zoomorphism and there can be humanization of the animal world or indeed hybridity across the species (Meskell *et al*. 2007).

Though we know that there is no skeletal material embedded within the plaster we do suggest there are resonances and similarities within the figurine corpus. 10264.x1 is a limestone anthropomorphic figure (Fig. 28.11) discovered in 2004 with a long neck and carved face. The eyes are indicated by two inward slanting, incised slashes; the carved nose protrudes from the face. The head is delineated from the neck by a smoothly carved line, and the

neck is differentiated from the body by a similar but slightly coarser line at the neck/torso interface. Although unsexed, there is some ambiguity since the overall shape of the head and neck appears phallic. It shares some similarities with Final Neolithic Cycladic and Cypriot Neolithic figurines (Nakamura and Meskell 2013: 207).

Figure 28.12. *18523.x1 (Photo: Jason Quinlan).*

Figure 28.13. *5021.D1 (Photo: Jason Quinlan).*

Figurine 18523.x1 (Fig. 28.12) was located in house fill in B.79. It is a freestanding limestone figure of bearded man, with important parallels from Mellaart's excavations. Its basic shape is a triangular seated or reclining form that is moderately carved or possibly unfinished. The face is largely comprised of a protruding nose and lightly marked holes for eyes. The distinguishing feature is the hair and beard such as Ankara examples 79-457-65 and 79-191-65. Below the bead and directly onto the chest area is a deeply incised V, similar to the images carved at Göbekli Tepe and Nevalı Çori.

5021.D1 (Fig. 28.13) was found in 1999 in B.17, before the current figurine team joined the project. It is described by Naomi Hamilton as intentionally broken before deposition and located in fill, possibly during a closure event. It is a head with possible ears. There is a potential parallel with the head of 5043.x1 although slightly smaller; the head from top to bottom measures 3.2cm with a width of 4cm. The main difference in features is that the nostrils are shown on this face. This example looks to be more zoomorphic than anthropomorphic, with a pronounced nose and nostrils poked into the clay, and the overall effect is rather bear-like in form. The face is very flat and wide, with emphasized cheeks, the top of the head is also flattened. The cheek area is punctuated by holes as well on either side. The eyes are made by poking small holes into the clay and the small mouth is indicated by a short lengthways incision.

In 2014 we suggested that a more quantitative analysis of facial traits was needed (Nakamura *et al*. Meskell 2014). For example, 14 of the 20 heads we have recorded appear to be human and show a range of details, many with ears, facial features and different hairstyles or head garments. While all 20 heads (or fragments with heads) have been categorized as 'anthropomorphic', the remaining heads have a more animal like appearance. Some appear to have broad blunt snout-like noses with wide cheeks and high ears

(e.g. 5021.D1, 5043.x1, 19385.x3), while others appear to have narrow faces, very large protruding beak-like noses, and intriguingly, dowel holes (e.g. 4121.H6, 12501.H1). This too supports the idea that there were representational crossovers between human and animal species, or at least levels of hybridity that defy easy classification.

References

Aitken, M.J., P.R.S. Moorey and P.J. Ucko
1971. The authenticity of vessels and figurines in the Hacilar style. *Archaeometry*, 13(2): 89-89.

ESRI
2010. *What's new in ArcGIS 3D Analyst 10*. Resource document. http: //help.arcgis.com/en/arcgisdesktop/10.0/help/index.html#//00qp0000000z000000.htm Accessed 20 February 2014

ESRI
2012. *The Multipatch Geometry Type—an ESRI White Paper.* December 2008. Resource document. http: //www.esri.com/library/whitepapers/pdfs/multipatch-geometry-type.pdf. Accessed 20 March 2014.

Berggren, Å., N. Dell'Unto, M. Forte, S. Haddow, I. Hodder, J. Issavi, N. Lercari, C. Mazzuccato, A. Mickel and J. Taylor
2015. Revisiting reflexive archaeology at Çatalhöyük: integrating digital and 3D technologies at the trowel's edge. *Antiquity*, 89: 433-448.

Binder, D. and N. Balkan-Atlı
2001. Obsidian exploitation and blade technology at Kömürcu-Kaletepe (Central Anatolia). In *Beyond Tools*, eds. I. Caneva, C. Lemorini, D. Zampetti and P. Biagi SENEPSE 9. Berlin, ex oriente, 1-16.

Burney, C.A.
1962. The excavations at Yanik Tepe, Azerbaijan, 1961: Second preliminary report. Iraq, vol. 24, no. 2, pp. 134-152.

Callieri M., N. Dell Unto, M. Dellepiane, R. Scopigno, B. Soderberg and L. Larsson
2011. Documentation and interpretation of an archeological excavation: an experience with dense stereo reconstruction tools. In *VAST: The 11th International Symposium on Virtual Reality Archaeology and Cultural Heritage*, eds. M. Dellepiane, F. Niccolucci, S. Pena Serna, H. Rushmeier, and L. Van Gool. Eurographics, 33–40.

Çelik, B.
2010. Hamzan Tepe in the light of new finds. *Documenta Praehistorica*, 37: 257-268.

Carter, T. and M. Milić
2013. The chipped stone. In *Substantive Technologies at Çatalhöyük: Reports from the 2000-2008 Seasons* (Çatalhöyük Reseach Project Series Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 417-478.

Carter, T. and M. Shackley
2007. Sourcing obsidian from Neolithic Çatalhöyük (Turkey) using energy dispersive X-Ray Fluorescence. *Archaeometry,* 49(3): 437-454.

De Meyer, M.
2011. Inlaid eyes on Old Kingdom coffins: A history of misidentification. *Journal of Egyptian Archaeology*, 97: 201-203.

De Reu J., G. Plets, G. Verhoeven, P. De Smedt, M. Bats, B. Cherretté, W. De Maeyer, J. Deconynck, D. Herremans, P. Laloo, M. Van Meirvenne and W De Clercq
2013. Towards a three-dimensional cost effective registration of the archaeological heritage. *Journal of Archaeological Science*, 40: 1108–1121

Forment, F., D. Huyge and H. Valladas
2001. AMS (14)C age determinations of Rapa Nui (Easter Island) wood sculpture: Moai kavakava ET 48.63 from Brussels, *Antiquity*, 75(289): 529-532.

Forte, M., N. Dell'Unto, J. Issavi, L. Onsurez and N. Lercari
2012. 3D Archaeology at Çatalhöyük. *International Journal of Heritage in the Digital Era*, 1: 351–377.

Forte, M., N. Dell'Unto, K. Jonsson and N. Lercari
2015. Interpretation process at Çatalhöyük using 3D. In *Assembling Çatalhöyük* (Themes in Contemporary Archaeology Volume 1), eds. I. Hodder and A. Marciniak. Leeds: Maney Publishing, 43-57.

Griffin, P.S., C.A. Grissom and G.O. Rollefson
1998. Three late eighth millennium plastered faces from'Aln Ghazal, Jordan. *Paléorient*, 24(1): 59-70.

Hauptmann, H. and K. Schmidt
2007. Anatolien vor 12 000 jahren: die skulpturen des frühneolithikums. In *Vor 12.000 Jahren in Anatolien: Die a¨ltesten Monumente der Menschheit*, ed. Badisches Landesmuseum Karlsruhe. Karlsruhe: Badisches Landesmuseum, 67-82.

Hauptmann, H.
2011. The Urfa region. In *The Neolithic in Turkey: New Excavations and New Research*, eds. N. Başgelen, M. Ozdoğan and P.I. Kuniholm. İstanbul: Archaeology and Art Publications, 84-83.

Hodder, I. and L. Meskell
2011. A 'curious and sometimes a trifle macabre artistry': Some aspects of symbolism in Neolithic Turkey. *Current Anthropology*, 52(2): 235-263.

Hodder, I. and L. Meskell
2010, The symbolism of Çatalhöyük in its regional context. In *Religion in the Emergence of Civilization: Çatalhöyük as a Case Study*, ed. I. Hodder. Cambridge: Cambridge University Press, 32-72.

Hodder, I.
2006. *The Leopard's Tale: Revealing the Mysteries of Çatalhöyük*. London: Thames and Hudson.

Hodder, I.
2005. Peopling Çatalhöyük and its landscape, in *Inhabiting Çatalhöyük: Reports from the 1995-1999 Seasons* (Çatalhöyük Research Project Volume 4), ed. I. Hodder. Cambridge: McDonald Institute for Archaeological Research; London: British Institute at Ankara, 1-32.

McGillivary, P.A.
2005. Recovering the lost treasures of Ipiutak (Pt. Hope), Alaska, *OCEANS. Proceedings of MTS/IEEE*, pp. 1122.

Mellaart, J.
1960. Excavations at Hacılar: Third preliminary report, 1959. *Anatolian Studies*, 10: 83-104.

Mellaart, J.
1970, *Excavations at Hacılar*. Edinburgh: Edinburgh University Press.

Meskell, L.M.
2008. The nature of the beast: curating animals and ancestors at Çatalhöyük. *World Archaeology*, 3: 373-389.

Meskell, L.M., C. Nakamura, R. King and S. Farid
2007. Çatalhöyük figurines. In *Catalhöyük Archive Report 2007*, http: //www.catalhoyuk.com/downloads/Archive_Report_2007.pdf.

Milić, M., K. Brown and T. Carter
2013. A visual characterization of the Çatalhöyük obsidian. In *Substantive Technologies at Çatalhöyük: Reports from the*

2000-2008 Seasons (Çatalhöyük Research Project Volume 9), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, Chapter 21 CD appendix.

Muscarella, O.W.
2013. Forgeries of ancient Near Eastern artifacts and cultures. In *Critical Approaches to Ancient Near Eastern Art,* eds. B.A. Brown and M.H. Feldman. Boston: de Gruyter, 31-54.

Nakamura, C., L. Der and L. Meskell
2014. Çatalhöyük figurines. In *Catalhöyük Archive Report 2014*, http: //bit.ly/catal2014report

Chapter 29

East Mound Beads

Milena Vasić

Personal adornment at Çatalhöyük consists of a variety of ornaments: armbands made of marble and copper; potential hair and/or clothing pins; collars made of boar tusk; finger rings made of animal bone and copper, and beads made of stone, shell, animal bone, clay, copper, and wood. In addition to this, there are fasteners known as "belt hooks and eyes", although the evidence suggests that they were not always worn around the waist, or in a pair. Amongst other things, pigments (ochre, cinnabar, malachite and azurite) were also used for body painting as witnessed in burials. Textile fragments were retrieved from a small number of burials, but due to their carbonisation, it is hard to tell what exactly the cloth looked like. Depictions of adornment also exist, though rarely, on wall paintings and figurines.

Although the body adornment assemblage is quite diverse at Çatalhöyük, beads represent the majority with more than 40,000 beads so far been recovered from the contexts excavated in the 1960s and from 1993 onwards. The second largest adornment category are rings, but their numbers (N<200) are small in comparison to beads whilst the other items related to bodily ornamentation are even more rare.

Although ornaments consisting of beads of the same material do exist, a large number of strings of beads retrieved from burials show that the ornaments at Çatalhöyük were commonly including beads of different types and materials. However, once they are found on site and recorded in the finds database, they are distributed to the specialists and recorded in the databases according to their material. For example, shell beads go to the shell database, beads made of animal bone go with the rest of the worked bone to the faunal database etc. Given the large extent of the excavation and the sheer quantity of archaeological material recovered during the last 23 years, not all the material gets to be fully analysed. In the same time, some artefacts are bound to be analysed before others. Various researchers have done thorough studies on certain parts of bead assemblage, but unfortunately, not all the information is available in the Çatalhöyük databases. Consequently, there are different datasets that still need to be integrated in the database. Therefore, it is very difficult to trace all beads and study them as part of the ornament they once formed.

For that reason, it has been decided to slightly alter the way in which beads are being recorded. The new system will enable the following:

- Information of every single bead will exist in the database
- Integration of the data from Mellaart`s excavations
- Easier study of bead groups from each unit
- Systematic querying of the data

In order to have a better understanding of the ways in which the ornaments were used but also how the ornaments looked like, when possible, the order of the beads on a string should be recorded. Therefore, when groups of beads are found *in situ* in burials and directly associated with a skeleton, the conservation team should try to keep the order of beads by stringing them. The excavators should make a note in the records that beads were strung in the original order. If different groups of beads are visible in the fill, they should be given different X-find numbers, but these beads however, should not be strung.

As keeping beads on a string would create additional use wear, once they are brought to the Finds Lab, photographs should be made in order to keep the visual record of how the ornament looked like and the

order of beads. A photograph should be made whilst beads are still strung, and another one when the string is removed. However, even once the string is removed, if possible, the photograph should be made in that way so it preserves the order of beads. After the photographs are done, a custom-made box will be provided to enable the preservation of the original order of the beads. Once they are stored in a plastic box, they can be put in the crate BE4. If beads are of different materials or types, a photo will be sufficient. However, if the group of beads includes multiple beads of the same physical properties, the finds officer should give the strung beads to the specialist for further recording.

If beads were assigned an X-find number in the field, they are to be recorded under the given X-find number however, an additional field will be given that enables the number of materials and the count of beads in the Finds Database (on the X-find sheet) to be recorded. A finds officer will be able to register all beads in the Finds Database and distribute them to the specialists or store in crate BE4 in case specialists are not currently on site.

Each bead should have a unique GID unless a group of beads consists of beads of the same physical properties (same raw material, same size, same colour, manufacture, use wear etc.) If a group of beads was recorded as an X find, an additional identifier should be assigned for each bead. All databases will be altered in order to accommodate this numbering system with additional identifiers.

At the moment all the beads are stored in crates by material (stone beads are in crate BE1, shell and bone beads are in BE2 and clay beads are in BE3). Each year the government representative chooses the finds for the “Etutluk” so if beads are not in BE1, 2 or 3, they are (supposed to be) either in crate ET14 or in the Konya Museum. When specialists come across beads in different crates whilst studying other material, they should relocate them to the bead crates. For example, if a bead fragment is found in a worked bone crate, the faunal specialist should move it to the bead crate and notify the finds officer who will make the changes in the Finds Database accordingly.

The way in which beads are stored was altered last year so that all beads regardless of their material are kept in the same crate. BE4 crate is a designated crate for beads of all materials that haven`t been studied by the specialists. Once they are fully studied and recorded, they should be placed in crate BE5, in a bag with other beads from the same unit. BE5 crate is organized by area and unit numbers. Each unit should have one bag with all the beads together (stored separately in small bags according to the material). This goes for all beads apart from beads that were recovered from burials. They are to be stored in a crate with other artefacts from the same burial (BURIAL crate).

Specialists working on the material have different research questions. Different aspects of the material culture are recorded in a different way, providing diverse information. Therefore, every interface of the central database (for example faunal database, shell database etc.) will preserve the data that is stored there. In the same time, another database will be created. This database will be related to all of the databases at Çatalhöyük, linking all the necessary specialist information on beads but also, other important information such as data from the excavation database, human remains database in case of burials as well as the finds register.

This way, every bead will be recorded. It will also be possible to study beads as part of the ornament they once formed, regardless of material they had been made from. At the same time, the deposition patterns of beads will be easier to study. Together with the use wear analyses, it will be possible to explore how and where and in what ways beads were once used. In addition to this, the bead database will also contain records with basic information about beads from the 1960s excavations. The bead database will display the data in a standardized way and ensure that the data can be accessed and systematically analysed even after the end of the project.

Chapter 30

West Mound Beads and Personal Ornaments: 2014 and 2015 Seasons

Hallvard Bruvoll, Université Paris I Panthéon-Sorbonne

The series of personal ornaments made from mineral materials – rocks, minerals and clays – from the West Mound of Çatalhöyük were recorded and studied during the summer seasons of 2014 and 2015. This study noes not include bone or shell artefacts, nor the ornaments associated with post-Chalcolithic periods, which are treated elsewhere. The research carried out during the two seasons was in general terms guided along the same research questions and applying the same methods. Thus, the study is presented here as a whole rather than in two separate sections.

A total of 270 finds were initially recorded as personal ornaments, as they had already been recorded in the site's central finds database. However, many objects that had been seen as potential bead preforms or pieces of production waste by the excavators, did not yield any traces of manufacture or use when studied under a microscope, and were subsequently excluded from the study. Other finds, recovered from the last heavy residue samples from the 2013 excavations, were added to the corpus during the study seasons, so that by August 2015, the sample of Chalcolithic beads, pendants and other ornaments from the West Mound included 182 objects.

The main aim of the present study is to widen our understanding of the social changes that occurred during the Neolithic–Chalcolithic transition at Çatalhöyük. Substantial changes in the cultural sphere have already been noted by several researchers, concerning in particular the burial rites, the shape and decoration of houses as well as the the painting of pottery (Biehl *et al*. 2012). However, since little is known of the use of personal ornaments and bodily decoration during the Early Chalcolithic, it has so far been impossible to include this parameter to the assessment of cultural continuity and change between the East and West Mounds of Çatalhöyük. The present ongoing study will hopefully provide the first major insights to the visual expression of identity on the Chalcolithic West Mound – at the scale of the community, social groupings, gender or individuals – and thus contribute to the study of the general temporal changes between the two mounds.

Methods

The intrinsic data observed and recorded from the artefacts are grouped within morpho-metric variables (typology), material descriptions, production marks and use wear. Basic statistical analysis is used in order to reveal patterns within and between these variables, though purely qualitative case studies are also performed. The emerging patterns are furthermore to be compared with the spatial distribution of the finds, though the spatial analysis is somewhat limited by the relatively small sample and the lack of rich or special ornament deposits on the West Mound (such as burials or bead production contexts).

Typology

A working typology has been established for classification and further analysis of the finds, defining 13 types of Chalcolithic beads and simple pendants (Table 30.1, Fig. 30.1). An effort is made to assure compatibility with the already proposed typology of the Neolithic East Mound ornaments, and thus the criteria and terminology are based on the Beck classification system for beads and pendants (Vasic *et al.* 2014). The typology does not include some unique objects found on the surface and in later mixed deposits, such as

two types of bracelets (in obsidian and marble) and a small marble plaque, which could all date from later periods. Among the Chalcolithic ornaments, the vast majority of finds consist of regular beads of circular or lenticular face section, and of simple polished pendants and river pebble pendants. Two stamp seals are also recorded, cone and button shaped respectively, the first of which is engraved with a geometric pattern.

	Types	#	%
Ornament types	Circular short/disc	1	3.7%
	Perforated pebble	9	33.3%
	Circular convex cylinder	1	3.7%
	Simple pendant (drop/rod)	1	3.7%
	Lenticular square	1	3.7%
	Circular straight cylinder	1	3.7%
	Circular truncated cone	1	3.7%
	Circular square	1	3.7%
	Oval cylinder	1	3.7%
	Stamp seal	2	7.4%
	Rectangular disc	1	3.7%
	Oval short/disc	1	3.7%
	Lenticular disc	1	3.7%
Other	Indeterminate	1	3.7%
	Spheroid	1	3.7%
	Grooved spheroid	2	7.4%
	Production waste/nodule	1	3.7%
	Total	**27**	**100%**

Table 30.1. *Number and frequency of ornament types and other finds within the studied corpus. The "indeterminate" category represents beads too fragmented to be precisely classified.*

A series of minute unperforated spheroids made from naturally decorative rocks (finely banded red limestone, marble breccia and others) are treated apart, due to the uncertainty of their function. A final typology of West Mound ornaments is expected to include all materials, both organic and mineral, and will thus include types that are not represented among the rock and mineral ornaments, such as rings and more elaborate pendants.

Raw material study

Since no sample of ornaments from the West Mound has been accepted by the authorities for export and chemical or petrographic analysis, the only means of identifying the applied raw materials remains for the time being that of macroscopic observation and description of the polished and broken surfaces using a set of fixed variables. The finds have thus been classed in 35 different material groups, for most of which a precise rock or mineral designation has been proposed. However, due to the very small size of the beads in par-

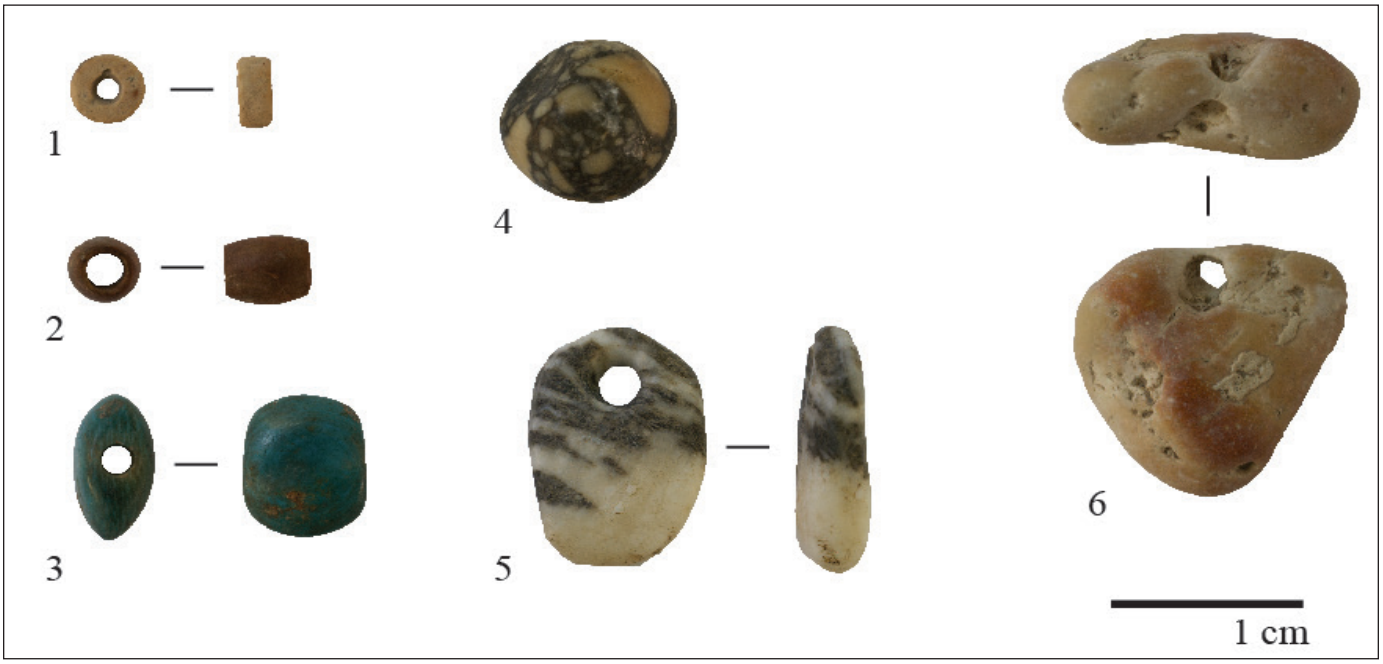


Figure 30.1. *Examples of the main types of beads and pendants found at Çatalhöyük West. 1: Circular disc from (15348), 2: circular convex cylinder (16850), 3: lenticular square (31220), 4: spheroid (31232), 5: rod pendant (9012), 6: perforated pebble (15592). The materials are interpreted as limestone (1 and 6), jasper (2), possibly glazed steatite (3) and marble/limestone breccia (4 and 5).*

ticular, several of these material groups may in reality correspond to different faces of the same rock type. Furthermore, it seems highly possible that many of the defined varieties of limestones and marbles may be found in the same source areas around the site.

This method is clearly not entirely satisfactory, and future archaeometric analysis is needed for confirmation and to allow further interpretation of the results. The main results of the raw material study remain for now the observed dominance of calcium carbonate rocks (varieties of limestones and marbles) among the ornaments, as well as the notable presence of what seems to be heat treated and artificially coloured mineral materials (see below).

Technology

The technological approach of the ornaments has been oriented towards the observation and recording of production marks still visible on the finished and unfinished artefacts, both with the aim of identifying the applied production techniques and in an attempt to reconstruct the manufacturing *chaînes opératoires*. In this way, it is noted that a mechanical drilling technique (bow or pump drill) seems to be far more dominant than hand drilling, where such a distinction is possible. Also, and despite the vast majority of finished and entirely polished beads in the sample, the presence of some clearly unfinished beads indicates on site bead production.

Several stone beads seem to have been artificially coloured, possibly by means of glazing, as broken beads show that a blue or blue-green coloured micro-thin vitreous layer covers various core materials. This would implicate a somewhat complex production sequence, necessitating specific materials as well as a highly developed heat treating competence. Furthermore, there seems to be a strong link between the lenticular shaped beads and the blue and blue-green colours obtained by these glazes, though the data is somewhat scarce. If the coloured crusts can really be called glazes, then they might in fact be among the very earliest documented cases of this pyro-technique, which in later periods are known to use copper as a colorant (Barthélémy de Saizieu and Bouquillon 2001). These beads will be given special attention in the further research.

Use wear analysis

The entire sample has been observed in low magnification (50x) under a stereoscopic microscope for the documentation of basic use wear (residues, edge rounding, deformations and micro-striations). The intention has been to test the performance of use wear studies on stone beads, the goal being to identify recurrent attachment techniques and patterns – results that could ultimately be interpreted in terms of culture-specific traits and traditions. However, only 48 of the objects in the sample had conserved any observable wear, and the recordings were neither clear enough do be confidently compared with the available reference literature, nor sufficiently recurrent for any generalisations to be made. Of course, a new study could be performed using more powerful equipment, but it seems nevertheless clear that this analysis method is far less rewarding on stone beads than on other artefacts which are more subject to use wear, such as shell and bone ornaments.

Further research

The data set collected during the 2014 and 2015 seasons will be further studied for intrinsic links and patterns, but also by integrating it to the spatial data on the site and regional scale. Can the distribution of bead types, unfinished beads, different materials and so on, tell us anything about the use of houses or the functioning of their infill deposits? To what extent are the West Mound ornaments related to those of

other contemporary sites such as Can Hasan I and Hacılar? And finally, are these objects marked by strong Neolithic traditions inherited from the Çatalhöyük East Mound, or are they dominated by new stylistic and technical innovations? These and other questions are currently being addressed, and will hopefully result in new insights to social life on the West Mound in the Early Chalcolithic.

Acknowledgements

The research conducted during two study seasons was funded by fieldwork grants from Lånekassen (2014) and the Norwegian Institute at Athens (2015), for which I am highly grateful.

References

Barthélémy de Saizieu, B. and A. Bouquillon

2001. Émergence et évolution des matériaux vitrifiés dans la région de l'Indus du 5e au 3e millénaire (Mehrgarh - Nausharo), *Paléorient,* 26(2): 93-111.

Biehl P. F., I. Franz, S. Ostaptchouk, D. Orton, J. Rogasch and E. Rosenstock

2012. One community and two tells: the phenomenon of relocating tell settlements at the turn of the 7th and 6th millennia in Central Anatolia. In *Socio-Environmental Dynamics over the last 12,000 Years: The Creation of Landscapes*. eds. R. Hoffman, F. Moetz and J. Müller. Bonn: Rudolf Habelt, 53-66.

Vasic M., R. Bains, N. Russell, D. Bar-Yosef Mayer, L. Meskell and C. Nakamura

2014. Dress: a preliminary study of bodily ornamentation at Çatalhöyük. In *Integrating Çatalhöyük: Themes from the 2000-2008 Seasons* (Çatalhöyük Research Project Volume 10), ed. I. Hodder. London: British Institute at Ankara; Los Angeles: Cotsen Institute of Archaeology Press, 197-220.

Chapter 31

Understanding the Complexity of Clay Ball Use on the West Mound

Daniel Murphy, Flinders University

The primary objective for 2015 is to analyse clay objects from the West Mound, with a specific focus on clay balls. This will be done in order to ascertain a more thorough understanding of the utility of clay balls, and whether or not they constituted a stored form of raw material for the production and repair of larger clay objects. Ascertaining to what extent clay was collected from the Çarsamba River system is critical to the effectiveness of this study. Given the pivotal role clay played in the construction techniques of the ancient denizens of Çatalhöyük, this is a significantly important question. This will involve a number of off-site analytical methods, namely P-XRF for residue analysis and typological analyses.

Gaining a more nuanced understanding of the depositional processes for clay balls (Fig. 31.1) on the West Mound is similarly critical to this study. How and why raw (unfired/undried) clay balls were stored in large volumes in several household contexts bares unique importance to any understanding of the larger material record. The complexities of clay use on the West Mound during the Late Neolithic/Chalcolithic periods are unique to the site, and warrant a closer examination than has previously been conducted. Clay ball classification in the Near East has thus far been a relatively generalised process; this study aims to undermine that process and adequately address the clay material culture of the West Mound.

Figure 31.1. *Well-preserved clay balls from clay ball cluster (15343), Trench 5 of the West Mound.*

Chapter 32

Oral History of the Çatalhöyük Excavations and Inclusive Recording

Allison Mickel, Stanford University

Introduction

For the last three years, I have been interviewing the current and former site workers at Çatalhöyük, asking about their memories of the practices and findings of the project. I will later systematically compare these stories to the formal excavation archives. I'm hoping to demonstrate how the site workers' oral histories complement the archival record, providing additional and important information that is *different* from the multimedia databases created by the project since site workers have very rarely participated in the creation of any kind of documentation at Çatalhöyük. The interviews and subsequent analysis I have been conducting for the past few years illustrate the gaps in the scientific records kept by the archaeological team, as a result of this division of labor.

Additionally, this year I introduced an additional component to this research project, in which the site workers were given a camera by which to record the events and findings that they found most important to record. The impetus for this was not just to point to the gaps in the record, but to offer some potential means of filling them. The reasons why photography was chosen for experimentation, how the experiment proceeded, and some preliminary ideas about what it suggests regarding inclusive recording in archaeology are discussed in turn below.

Methodology

This year, some interviews took place on site and some in the local village of Kucukkoy, where many of the current and former site workers live. The interviews were conducted in Turkish, with the help of a translator who volunteered to interpret the conversation. This year, Tunç Ilada accompanied me on the majority of the interviews, though Duygu Ertemin and Ali Kavas also assisted with some of the on-site interviews.

Beginning with a list of all of the site workers who have been named in the project's newsletter each year, I asked the site guards as well as men and women in the village how I might make contact with the people on this list. Together with an interpreter, I would approach a former team member and we would introduce ourselves, then explain the nature of my dissertation project. We would then ask if they wanted to participate in the study. For the first time, a few people did decline to participate this year though were willing to tell me why they were uncomfortable with being interviewed—a valuable insight in itself.

I began each conversation by asking the interviewees how long they had worked at Çatalhöyük, and what their work was like. I then asked about why they had decided to work on the project, what sorts of things they knew about the site before they came to work, and what they had learned since then. Other questions solicited stories about Mellaart's excavations. The majority of the questions were designed to identify what kinds of expert knowledge these team members gained by working in their specific positions (i.e. flotation, the kitchen, sorting heavy residue, etc.). Furthermore, although I had prepared a list of questions prior to approaching each interviewee, most of the time was spent discussing follow-up questions stemming from the specific stories and memories that people offered. I also allowed ample time for participants to ask me questions about my project, about Çatalhöyük, or about the project, in order to alleviate

as much as possible the sense that they were being quizzed on excavation methods or that their job performance was being reviewed. Research participants preferred that I hand-write what they were saying, rather than recording either video or audio, and each interview lasted about an hour. In total, I spoke with 18 individuals this year; in total, over the course of three years of conducting these kinds of interviews, I have interviewed 40 locally-hired people who have worked at Çatalhöyük.

New insights into oral history

The 2013 and 2014 archive reports on this work (Mickel 2013, 2014) discuss the preliminary findings from the first two years of conducting these interviews. Many of these themes characterized the interviews in 2015 as well, such as the recollection of very specific finds' appearance and provenance—especially burials and beads. Interviewees also discussed their knowledge of the methodologies employed at Çatalhöyük, explaining how they learned to perform the jobs for which they are hired at the site, as well as what unique perspectives on the excavation they gain from occupying these positions. A few individuals offered their ideas about what they envision happening in the future at Çatalhöyük, particularly after the current excavation ends. Finally, a number of the interviews addressed what aspects of the excavation are less visible and less well-understood by locally-hired team members in order to get a full assessment of the role they play in knowledge production at Çatalhöyük. The 2015 interviews therefore build on the material collected from the past two years, adding further evidence regarding site workers' expertise about particular aspects of the research process.

This year's interviews also brought up some new ideas that will be considered more in depth when this research is prepared for publication. For one, although I have interviewed people in groups before, this year I interviewed some groups repeatedly. Watching their interactions as they answered questions allowed me to observe internal hierarchies as well as differences of opinion. Although much of my research entails looking for trends across the interviews I conduct, experiences like these reflect a lack of total coherence across the perspectives held by site workers about their work and about the archaeology. Just as different specialists interact with different material evidence and interpret the same material evidence differently, so too do site workers. Oral history is not unlike academic discourse in how strongly it is shaped by experience as well as prestige, and so the oral historical record of the project takes its form through the interaction not just between the core team of excavators/laboratory specialists and site workers, but also between site workers and other site workers.

Relatedly, one phenomenon I encountered this year but not any other was that some individuals simply did not want to talk about their time at Çatalhöyük. Generally, they did not possess wholly positive memories and either did not feel comfortable sharing them with me or did not want to relive them. Still, immediately after declining to be interviewed, these same individuals would invite my interpreter and me to stay for dinner, so this should not be read as hostility toward the excavation and everyone affiliated with it. Rather, these incidents can be taken as an important reminder that the people who are most willing to participate in this kind of research are those who are most comfortable talking about their experiences and have happier recollections; this is not representative of those who felt mistreated, or disagreed with the project's operation, or even simply felt on the periphery of the team. Moreover, these instances are also significant for understanding how archaeological knowledge becomes encoded in oral history, since there is information lost when site workers do not wish to discuss their time on an archaeological project. These people are much less likely to tell their friends and families about their observations and ideas about the archaeological work—let alone a researcher, a stranger—and in this way their memories and interpretations never become part of the oral history of the site. Examples like these illustrate the close link between labor conditions and the preservation of knowledge in archaeology.

Results of inclusive recording

This year, I also conducted a six-week experiment in which I invited the five locally-hired site workers to participate in the documentation of the excavation. This experiment built upon a similar program implemented previously at Çatalhöyük, in which wherein the women working on site were given cameras in order to create photographs that would be used in the site museum in order to show how locals see and value this archaeological site (Bartu 1998). In my own interviews with these women, they routinely mention this project as something that made them feel involved and included in the archaeological process. Drawing on this positive feedback, this year, one person per day was given a point-and-shoot camera (this person changed on a rotating basis). He was asked to take pictures of any events, processes, or finds of interest during the day with a goal of at least three photographs per day. The key question guiding this experimentation was, "What additional kinds of information and viewpoints are able to be considered when local team members are included in the documentation strategies of archaeological sites?" In order to answer this question, team members' photographs will be analyzed alongside the official site photographer's pictures in terms of composition and content, to see how they are different and similar.

The participants in the study were very enthusiastic about taking their own photos, and in fact I ended up with ten or more photos per day rather than the three I suggested. The photos were of a range of subjects, and composed in very different ways. Some depicted everyday details of the excavation process (i.e. flotation bags awaiting processing), others were more general overviews of excavation going on in multiple buildings at once. For my dissertation, I will systematically compare the workers' photographs to the full photographic archive created by the excavation team in order to discuss what this kind of methodological change can add to the archaeological record.

Conclusion

This season was the last in which I will be conducting these interviews and experimenting with inclusive recording methods. This body of research will comprise my PhD dissertation, the goal of which is to produce a more nuanced, inclusive, and dynamic archaeological record at Çatalhöyük by identifying gaps in the existing documentation and demonstrating a means of filling these gaps. This project will add new and diverse perspectives to the wide-ranging multimedia strategies of data collection which already exist at Çatalhöyük. With this research, I will also make a larger contribution to the field of archaeology both by presenting new methodological possibilities and by investigating processes of epistemology during excavation. I hope to demonstrate how crucial local team members have been to the production of knowledge about the past, and to show the particular perspectives they have to offer the field of archaeology by occupying particular, unique roles in the excavation process at Çatalhöyük and at other archaeological sites around the world.

References

Bartu, A.

1998. An archaeological landscape in the making: a view from Çatalhöyük. *Çatal Newsletter 5*. http: //www.catalhoyuk.com/newsletters/05/anthrop98.html

Mickel, A.

2013. Initial interviews: first steps toward assembling an oral history of excavation at Çatalhöyük. In *Çatalhöyük Archive Report 2013*, http: //www.catalhoyuk.com/downloads/Archive_Report_2013.pdf

Mickel, A.

2014. Assembling an oral history of excavation at Çatalhöyük. In *Çatalhöyük Archive Report 2014,* http: //bit.ly/catal2014report

Chapter 33

Major Trends of Crop Consumption at Çatalhöyük East Mound in the Settlement Levels H, I, N, O

Talu E. Tüntas

Due to a lack of overlap in dates between myself and my supervisors (Amy Bogaard, Mike Charles), the primary goal of the 2015 season, to conduct a full analysis of 20 light residue samples from East Mound Levels H, I, N, O, was not fulfilled. Another problem was the lack of an extensive type collection. Consequently, the material analyses for my Master's Thesis was postponed and is planned to be undertaken at Oxford University. After clarification of the circumstances, I was charged with keeping the Archaeobotany lab running during the West Mound study season in August. This included the organisation of the floatation area, the registration of the processed samples, the bagging of dried samples and the entering of records into the database. In addition, a new accelerated sieve-scanning method was conducted to filter prominent light residue samples. Samples marked as prominent, covering samples greater than 50ml, will be analysed next season.