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THE CONSTRUCTION OF EARLY HELLADIC II CERAMIC ROOFING TILES FROM MITROU, GREECE: INFLUENCE AND INTERACTION

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ABSTRACT

Ceramic roofing tiles were first invented during the Early Bronze Age (or Early Helladic [EH] period, ca. 3100-2000 BCE) and have been identified at 22 sites in mainland Greece. In this paper, I present a newly discovered assemblage of EH tiles from the site of Mitrou (East Lokris) and offer the first detailed, comparative analysis of EH tile production. I demonstrate that there was a shared tradition for the appropriate form and dimensions of tiles in mainland Greece. This uniformity, however, belies heterogeneity in production among sites and through time. The reconstructed *chaîne opératoire* of Mitrou's tiles, for instance, has affinities with the tiles of Zygouries (Corinthia) and Kolonna (Aegina), but not of the later House of the Tiles at Lerna and most tiles from Tiryns in the Argolid. With these results, I reveal a distinct network of interaction in mainland Greece in which construction knowledge was disseminated and maintained.

KEYWORDS: Roofing Tiles, Early Bronze Age, Greece, Corridor House Culture, Chaîne Opératoire, Early Helladic Ceramics, Architecture

1. INTRODUCTION

Recent excavations at the site of Mitrou in East Lokris, Greece recovered 180 fragments of Early Helladic II (EH II, ca. 2650-2200 BCE) ceramic roofing tiles. The ceramic tiled roof was first invented in mainland Greece during that period and remained a relatively rare and distinctive architectural feature. At the time of this publication, in fact, ceramic roofing tiles have been identified at only 22 EH II settlements (Figure 1). Another site, Akovitika, has one structure, Building B, that was roofed exclusively with schist tiles (Themelis, 1970: 307, 311; Papathanasopoulos, 1970: 177-179; Karagiorga, 1971: 128; Shaw, 2007: 141-144). Although schist tiles have been recovered elsewhere, such as at Lerna and Tiryns, these tiles were always placed alongside their ceramic counterparts on individual roofs (Wiencke, 2000: 270-274, 296, Fig. I.104b; Marzolff, 2017).

EH II ceramic roofing tiles have interested Aegean prehistorians for some time because of the tiles' frequent association with the monumental, corridor house structures of that period (e.g. Shaw, 1987; 2007: 138; Rutter, 1993: 761). The absence of roofing tiles from some corridor houses, such as Thebes's Fortified Building, and their presence at other sites without corridor houses, such as Asine, however, demonstrate that this association is not exclusive (Pullen, 2011: 291). At Mitrou, tiles were used for several non-monumental structures in both phases of the settlement's EH II occupation. Such variability suggests that there were different approaches to the use and meaning of ceramic tiled roofs within mainland Greece. In this paper, I attempt to determine Mitrou's relationship to the other sites with tiled roofs and understand more clearly the processes of adoption of this architectural technology.

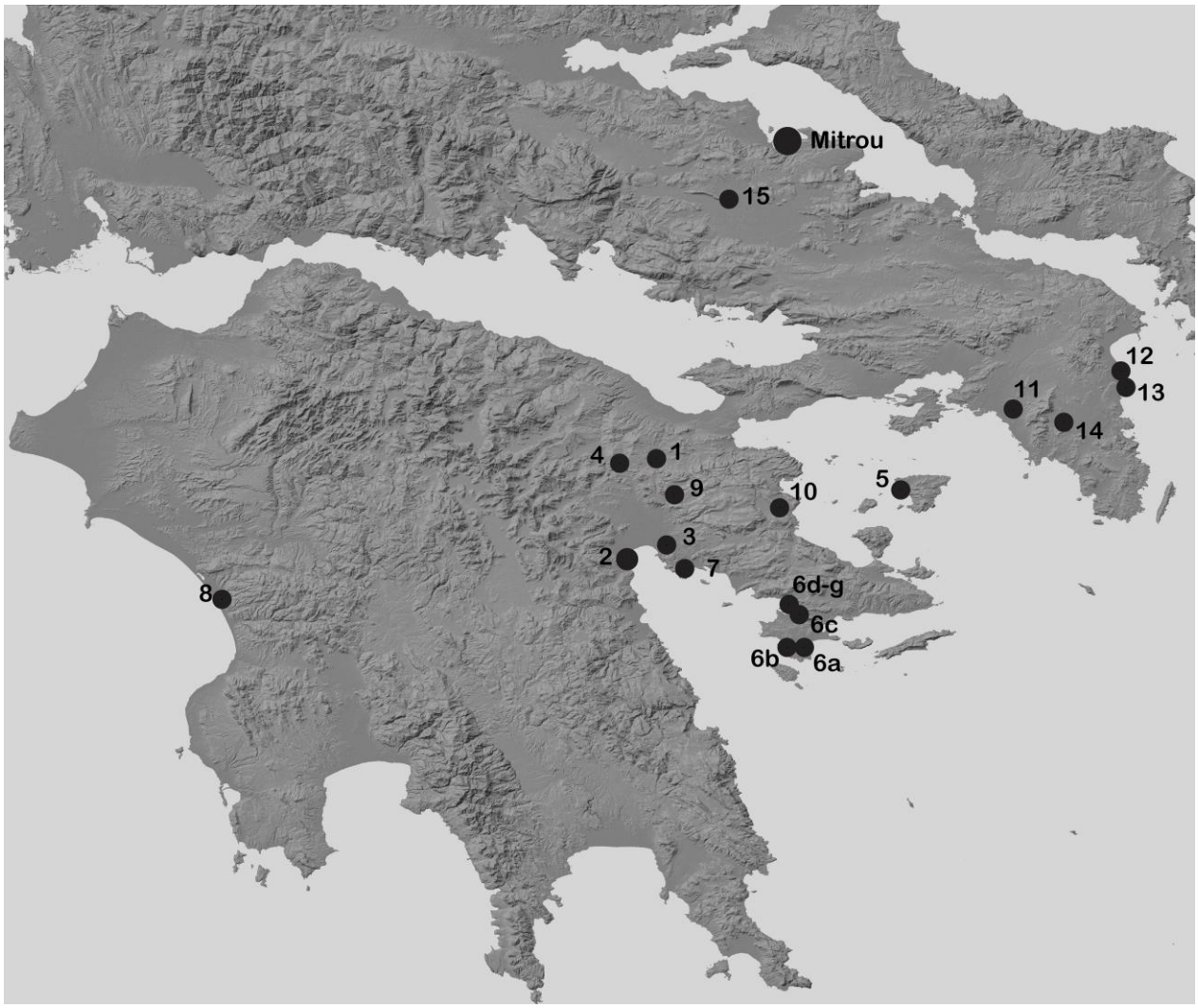

Figure 1. Locations with EH Tiles (in order of mention). 1. Zygouries; 2. Lerna; 3. Tiryns; 4. Tsoungiza; 5. Kolonna (Aegina); 6. Southern Argolid Exploration (a. A6, b. A33, c. B24, d. F5, e. F6, f. F20, g. F32); 7. Asine; 8. Ag. Dhimitrios; 9. Berbati; 10. Vassa; 11. Rouph; 12. Asketario; 13. Raphina; 14. Koropi; 15. Orchomenos.

In outward form, all EH II tiles have a similar appearance: they are nearly rectilinear slabs of fired clay (Figure 2). Although some possess a red or black shiny slip (also called Urfirnis) on the upper surface, this variation is limited and seems to be an aesthetic, rather than a functional, choice. Even with this, the form and dimensions of all tiles are quite consistent, indicating at least some interaction in the EH II period among the sites that adopted this architectural tradition.

In this paper, I argue that this interaction was more than casual emulation. The great quantities of roofing tiles that were necessary to roof individual structures, the unique inclusions and temper of each tile assemblage, and comparative petrographic and mineralogical studies in the Argolid, Lerna, and Kolonna together suggest local production at each of the 22 sites (Attas, 1982; Attas et al., 1988; Wiencke, 2000; Gauss and Kiriatzi, 2011). For tile manufacturing knowledge to have been disseminated among these settlements, there must have been movement of individuals who witnessed the tiles elsewhere, produced the tiles as mobile craftsmen, and/or taught tile production methods to inhabitants of each of the 22 settlements.

To understand Mitrou's place within the EH II network of interaction that facilitated the dissemination of this tile production knowledge, I conduct a construction-oriented analysis of the tile assemblages. As many studies have shown, material production is a socially embedded process that is not dictated entirely by function, technology, and material availability (e.g. Lemonnier, 1983; Gosselain, 2000; Roux, 2003; Choleva, 2012; Gauss et al., 2015). This social aspect of production is demonstrated by the presence of several possible choices at each step in the production sequence - many of which would not necessarily alter the finished form of an object. The precise manner and order of production, i.e. the *chaîne opératoire*, however, are typically transferred intact or nearly intact from teacher to student and remain an artefact of this interaction. Therefore, a comparison of an object's *chaîne opératoire* with those of ostensibly similar objects can shed light on the nature of interaction among the producers of those objects and help to distinguish emulation from shared, intensive training among producers.

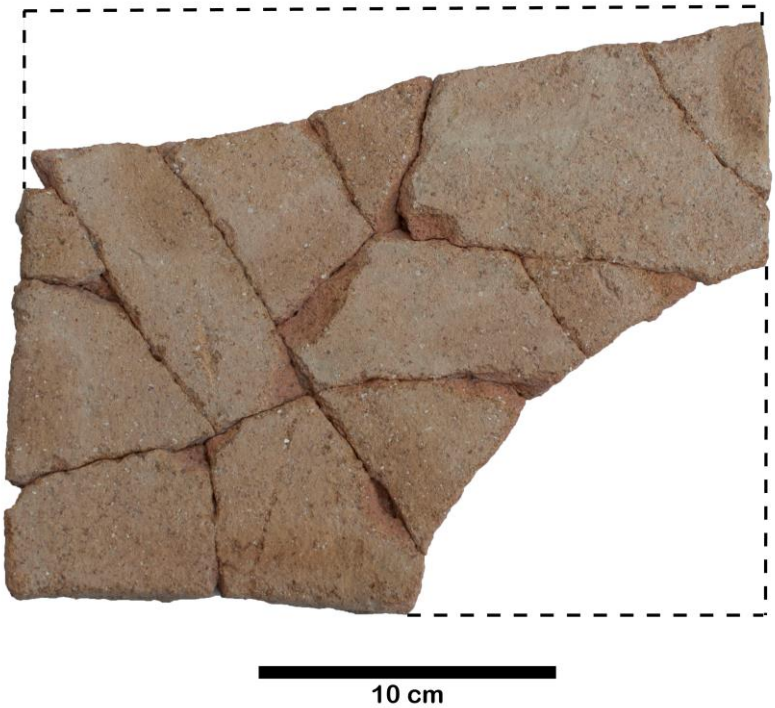

Figure 2. A nearly complete tile from Mitrou (LX784-155-069). The full tile is reconstructed with the dotted lines.

By closely examining the cut marks, mould marks, fingerprints, and other impressions that are visible on the surfaces of the EH tiles, I offer a detailed reconstruction of the *chaîne opératoire* of Mitrou's tiles. I then compare this with the *chaînes opératoires* of other tile assemblages to determine Mitrou's role in the exchange of building knowledge in the EH II period. These results demonstrate that Mitrou participated in a network of interaction with several settlements to the south, especially Zygouries and Kolonna (on the island of Aegina), and shared a distinctive method of production with them: "the mould-and-cut" technique. Despite the superficial similarities among all tiles in general form, this production method is

not reconstructed for all tile assemblages and sub-phases of EH II. Tile manufacture, therefore, was not a homogenous tradition in mainland Greece, nor was there a single network through which construction knowledge was disseminated.

2. EH II MITROU AND ITS TILES

Mitrou is a tidal islet located near the modern town of Atalanti in East Lokris, Greece (Figure 3). The site is well-situated for prehistoric settlement with a natural harbour(s) and location along the coastal route from Boeotia to regions farther north. In 2004-2008, the Mitrou Archaeological Project (a *synergasia* between the University of Tennessee and the Greek archaeological Ephorate of Phthiotida and Eurytania, co-directed by Aleydis Van de Moortel and Eleni Zahou) conducted excavations, surface survey, and geophysical examination of the site revealing continuous occupation from the EH IIB to Protogeometric periods (Van de Moortel and Zahou, 2012).

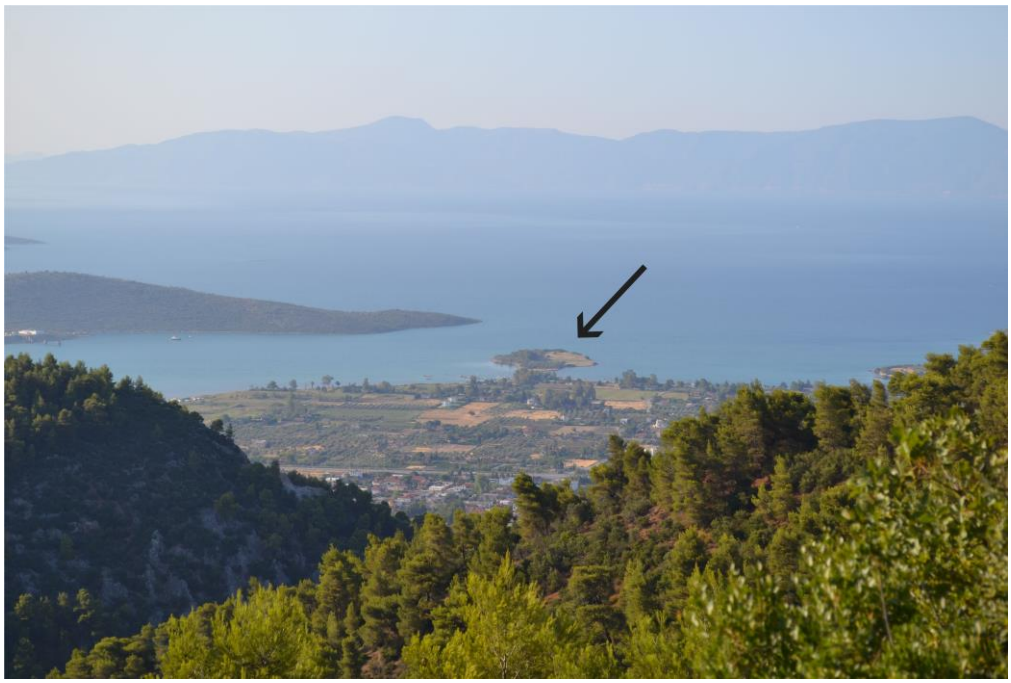

Figure 3. Mitrou. A tidal islet in East Lokris.

Because of the lengthy prehistoric occupation, EH IIB levels are located at great depths at the site and were reached by excavation in only two trenches, LX784 and LR797. Although these soundings yielded limited architectural remains from this period, ceramic roofing tiles were found in significant numbers in both trenches. Parallel "scarps" on the east and west sides of the islet that were created by centuries of erosion and tectonic activity also provided several fragments of ceramic tiles. These were found deposited on EH II floor surfaces and re-used as the bases of hearths by the EH III inhabitants. Additionally, occasional tile fragments were found in later deposits from the site and during the intensive surface survey.

In all, 180 ceramic roofing tiles were collected and studied. These were originally used to roof several buildings that were constructed in the two phases of EH II occupation. The associated ceramics demonstrate that both local habitation phases are contemporary with the IIIC sub-phase at Lerna (2012; Zahou, pers. comm.). Mitrou does not seem to have been occupied in the final phases of EH IIB.

Because the islet-wide distribution of the tiles suggests that they were used to roof more than one structure, if not the entire village, it is unlikely that tiled roofs were reserved for monumental constructions. In fact, the closest architectural association, field stone socles of mud brick walls 65 cm wide in LX784, are substantially narrower than the 90-95 cm wall socles of the monumental House of the Tiles at Lerna (Mitrou: Van de Moortel and Zahou, 2012: 1132; Lerna: Wiencke, 2000: 291). Further excavation is required to prove this apparent distribution and vernacular use at Mitrou, but it is consistent with other sites, such as Asine, which had several structures with tiled roofs – none of which could have been very large (Frödin and Persson, 1938: 233, Fig. 170; Pullen, 1985: 186-187, 192; 2011: 291; Shaw, 1987: 61).

Ostensibly, all of Mitrou's EH II tiles share a uniform morphology and appearance. The tiles have a smoothed/wiped upper surface and an unfinished

bottom (parallel) surface. They also possess a relatively uniform thickness of 0.7-3.0 cm, with most (72%) between 1.0-1.5 cm. This form is generally similar with those of the tiles found at other sites. Urfirnis – an occasional feature in some tile assemblages – has not been identified on any tile from Mitrou.

Because no intact tile was recovered at Mitrou, the dimensions of the complete tiles cannot be determined with precision. The lack of complete tiles at Mitrou is not unusual. Zygouries, for instance, had a comparable volume of excavated soil in the phase of occupation with ceramic roofing tiles and a similar number of tile fragments (195) were recovered – all of which are incomplete (Pullen, 1985: 199-208; 1986).

It is possible to approximate the dimensions of the complete tiles from Mitrou. LX784-155-069 is the best-preserved tile at the site (12 joining fragments) and preserves the full length (26.5 cm) and most of its width (23.4 cm) (Figure 2). It is unlikely that the original width was much greater than that preserved width. At Mitrou, fingerprints are always found near the corners of the tiles where the producers lifted the tiles prior to firing and such fingerprints are evident on the parallel sides of the nearly complete tile. LX784-155-069, therefore, can be reconstructed to 26.5 x ~25 x 1.2 cm.

3. MITROU'S TILE CONSTRUCTION

Because the tiles were placed on the roofs of buildings and, thus, away from close inspection, it was not necessary for the producers to have carefully finished the surfaces of the roofing tiles and eliminate all traces of the production process. As a result, small markings, impressions, and fingerprints are often still visible on the surface of Mitrou's tiles. Most of these are found along the edges. These are of several types: a. fingerprints/impressions; b. vertical projections along the upper surface of the tile and at the edge that disrupt the wiping marks on the surface – the "bunching" that Wiencke describes for the Lerna III roofing tiles (2000: 253); c. vertical projections along the upper surface at the tile's edge with wiping continuing toward the top of the projection; this is accompanied by a noticeable "hollowing" on the upper surface's edge; d. horizontal projections from the bottom of the tile's edge, i.e. clay "seepage;" e. pinching of the corners; f. an obliquely angled edge; and, g. impressions from the production surface on the bottom of the tile (Figure 4).

By closely examining these remains of the production sequence, it is possible to reconstruct much of the *chaîne opératoire* for Mitrou's EH II tiles. This *chaîne opératoire* is summarized below (Table 1):

Table 1. The chaîne opératoire of Mitrou's ceramic roofing tiles.

Preparation	Find/prepare a sandy surface
	Prepare clay by adding temper and inclusions
	Acquire tools (mould, cutting implement)
Step 1	Place the clay in the mould
Step 2	Spread the clay in the mould
Step 3	Remove the mould
Step 4	Cut individual tiles through the width of the shaped clay
Step 5	Lift the tiles
	Pinch the corners
Step 6	Allow the tiles to dry
Step 7	Fire the tiles

First, the tiles at Mitrou were formed on a sandy surface. This is indicated by the presence of dense multi-coloured stone and mineral inclusions only on the bottom surfaces (Figure 4g). Production on sand likely helped with the removal of the tiles from the surface after the clay dried. Marzolff describes the need for such a surface for this very purpose (2017). The use of sand as a parting agent is further strengthened by the finds from a Roman tile production facility near Llafranc, Spain. There, tiles were excavated *in situ* on their original drying surface – a layer of sand that had been spread on top of the ground soil (Nolla et al., 1982). During a recent experimental reconstruction of EH II tiles (Figure 5), the need for such a production surface also became quite evident when the tiles stuck to the wooden surface on which they were formed.

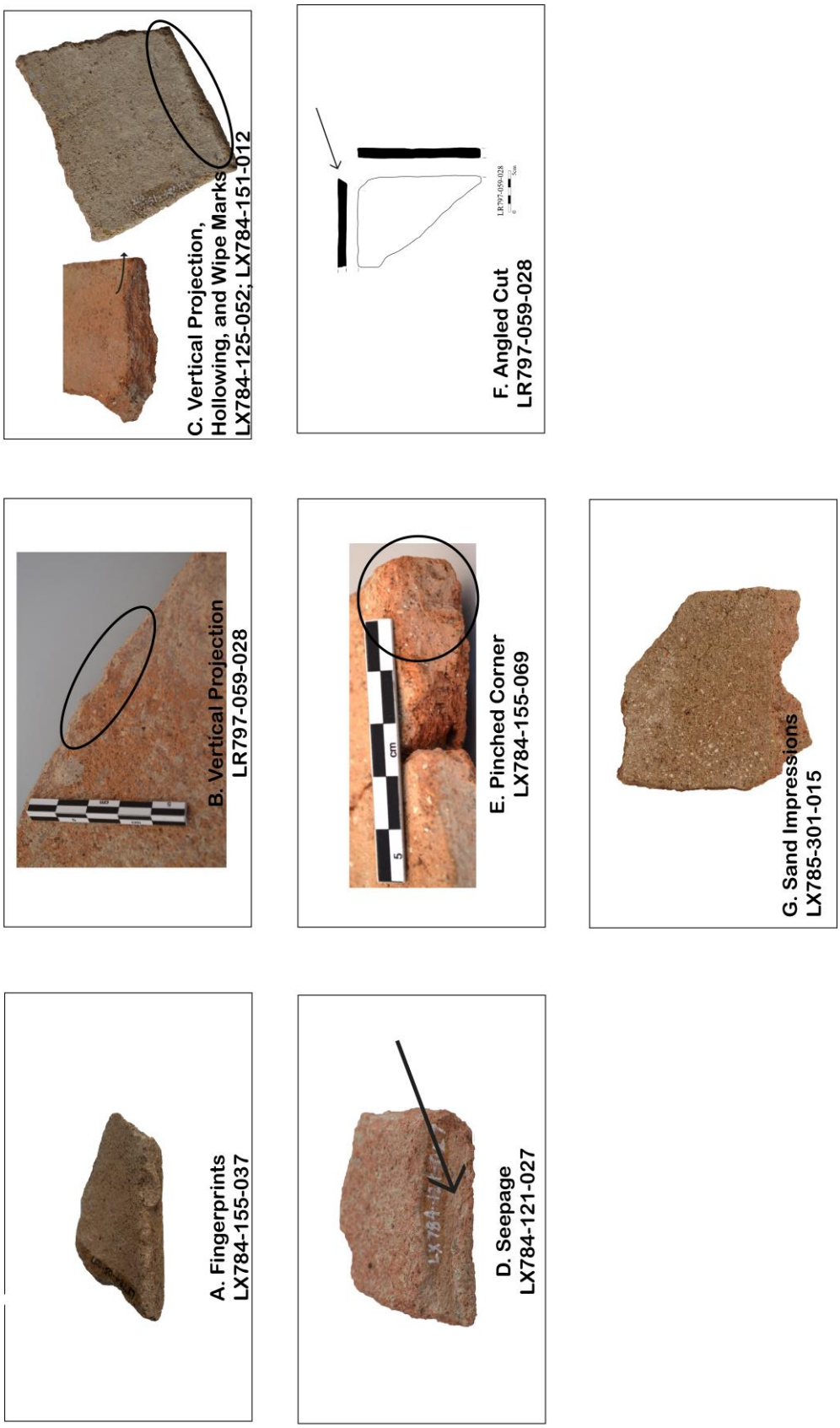

Figure 4. The evidence for the manufacture of Mitrou's tiles (drawing in 4f by Tina Ross).

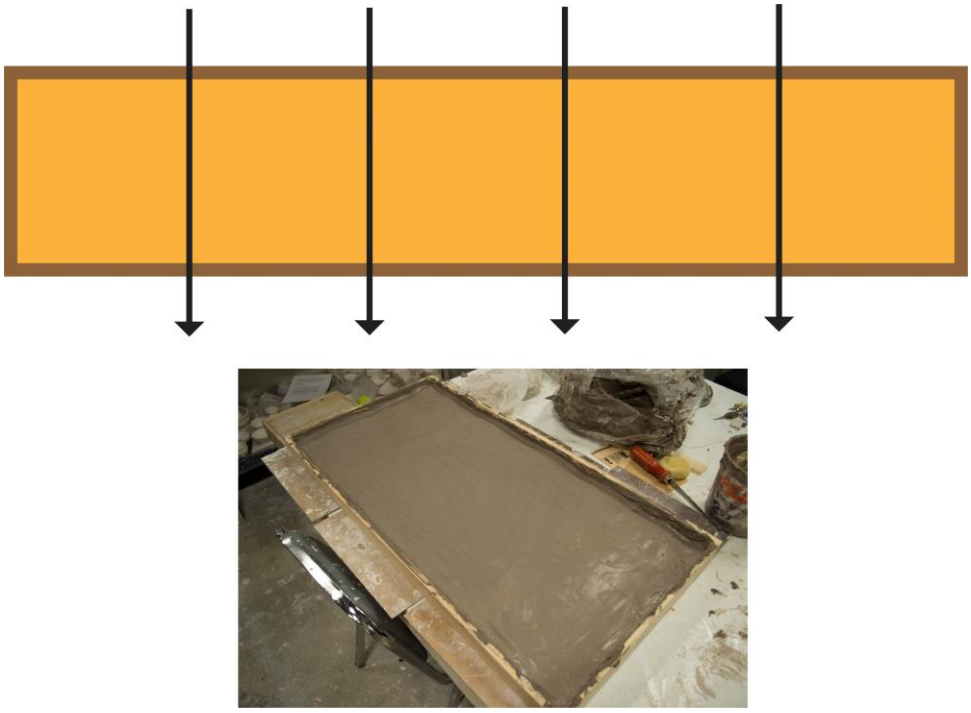

Figure 5. Above: A schematic drawing of individual tiles cut (arrows) from a mould (brown). Below: An experimental reconstruction of mould-formed tiles.

The clay used for Mitrou's tiles was spread within a long, rectangular mould. After the mould was removed, individual tiles were cut along the mould's narrowest dimension (Figure 5). I call this method of production, the "mould-and-cut" method for this reason.

The use of a mould is indicated by several pieces of evidence. First, a clear 90˚ angle is formed by the meeting of the edges at the corners of some tiles. This was created by the clay abutting the walls of a rigid, rectangular mould. The tiles with such right angles at their corners were those at the ends of the mould, because a right angle is not necessarily formed by cutting unless the producer exercised great care when cutting the tiles. Second, the thickness of all clay tiles typically decreases from the centre of the tile toward the mould edge (Figure 6). This predictable variation is likely due to the motion of tilemakers as they spread the moist clay in the mould. Initially, the producer placed a large mass of clay in the centre of the mould and then dragged the clay towards the edges to reach the mould's prescribed height. The mass of clay in the centre is considerably thicker, and the clay becomes progressively thinned by the spreading motion. The tilemaker could only match the precise thickness of the mould near the edge closest to the mould itself. Third, there is a slight hollowing at the edges of the tile that originally abutted the mould (Figure 4c). Such hollowing is the natural result of the drying process. As the moisture evaporates, the tile's thickness diminishes throughout the mould except at the mould edge. There, the clay clings to the mould, maintaining a height equal to that of the mould. Such hollowing was observed in the experimental recreation of EH II tiles shown in Figure 5 and an earlier experimental reproduction of mould-made mud bricks. With this characteristic of the drying process, a vertical projection also remains along the edge to indicate the full height of the mould. Because this projection was caused by evaporation, the wiping and smoothing marks visible on the upper surface are not disrupted along the edge of that projection. Finally, a horizontal protrusion of clay is sometimes evident at the bottom of the mould edge (Figure 4d). This feature is the result of wet clay that seeped out from under the bottom of the mould as the tilemaker pressed the clay against the mould. Both experimental reconstructions described above produced similar horizontal projections, or "seepage."

Figure 6. The decreasing thickness of the tile, LX784-125-052, is indicated by the arrows.

The cutting of the tiles is also deduced from a small number of distinctive features. Most telling is the presence of a vertical projection (Wiencke's "bunching") that disrupts the wiping/smoothing of the upper surface and the lack of any evident hollowing before the edge (Figure 4b). This bunching is caused by the insertion and dragging of a cutting implement through the clay. As the implement cuts the tile, clay is displaced upwards and against the cutting implement. Such vertical projections are also described and illustrated by Marzolff for the Tiryns tile assemblage (2017). An additional piece of evidence for the cutting edge is that there is no gradual thinning of the tile's thickness in profile view because the clay was spread by the tilemaker in a motion perpendicular to that cut edge (Figure 4f). Finally, faint parallel lines are occasionally detected on the edge surface from the (wooden?) cutting implement as it was dragged through the clay of the tile.

The markings on the tile also make it clear that the individual tiles were cut only after the mould had been removed. If the cutting occurred with the mould still in place, there would be a larger vertical projection of clay at the corner from the removal of the cutting implement. Instead, clay is pulled horizontally away from the tile by the motion of the cutting implement. For most tiles, the craftsman followed the cutting by pinching the corner to make it even and more pointed (Figure 4e).

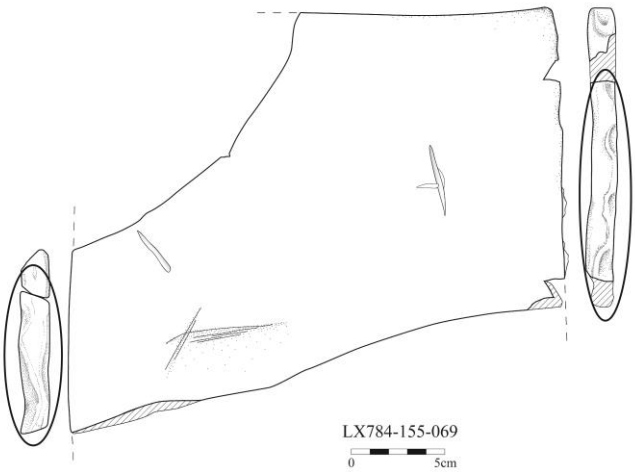

Figure 7. Fingerprints preserved on the edge of one tile, LX784-155-069 (drawing by Tina Ross).

The tile was lifted from the forming surface when the clay was still moist. Fingerprints from this lifting incident are often present along the bottom and top surfaces of the parallel edges of the tiles (Figure 7). This likely occurred at the time of corner "pinching," because the clay was still moist enough to leave impressions of the tilemaker's fingers. The tiles were then moved to a new location to facilitate the drying and allow for additional use of the production surface.

At Mitrou, it seems that the producers exercised great care when lifting the tiles, because the fingerprints are exclusively found near the edge. The dominant hand supported the tile from underneath and three or four fingers provided the lifting force. At the same time, the thumb balanced the upward force with its placement on the upper surface of the tile. On the opposite edge, the index and middle fingers of the non-dominant hand provided the lifting power at the bottom of the tile and the thumb was placed on top of the tile to stabilize the mass (Figure 8). The lifting almost exclusively occurs at the mould edges because it offered more space for the craftsmen to insert their fingers.

Figure 8. Lifting the tile that is shown in Figure 7. Fingers are placed in the corresponding impressions.

There is only minimal evidence for EH II kilns or other apparatuses that might shine light on the firing of the tiles. Hasaki catalogues two Early Bronze Age kilns, both in the Chalkidike, at Ag. Mamas and Polychrono (2002: 195-198), but she admits that kilns of this size and shape would have been inadequate for firing ceramic roofing tiles (Hasaki, 2002: 197). Excavations at Proskynas, an EH site just kilometres away from Mitrou, also provide evidence for pottery production and firing, but this site was almost certainly not the place of production for Mitrou's tiles because the excavated remains pre-date the settlement at Mitrou (Zahou, 2009; Pentedeka et al., 2009; Zahou, pers. comm). Thus, it is likely that there is an unexcavated or unpreserved EH IIB kiln(s) at the site of Mitrou, or the tilemakers used an open pit to fire the settlement's tiles.

I observed the reconstructed *chaîne opératoire*, the "mould-and-cut" method, for all fragments at Mitrou, no matter the sub-phase in which the tiles were used. Although fabric and temper vary to some extent within the collection, the construction methods were consistent. This indicates that the tile-making tradition was maintained in a relatively closed and conservative system of production. Perhaps related to this, almost no unidentifiable impressions or significant visual defects (such as footprints and animal impressions) were identified on the surface of any tile. Therefore, the physical spaces for producing and drying of the tiles were also guarded to some extent. Altogether, this evidence suggests that there was some degree of respect afforded to the tiles by the producer(s) and/or the community over the long-term at Mitrou.

4. COMPARATIVE TILE CONSTRUCTION TRADITIONS

In this section, I review the evidence for tile production from three sites in the north-eastern Peloponnese (Corinthia and Argolid): Zygouries, Lerna, and Tiryns. These three sites offer the most evidence for a detailed discussion of tile production because

the excavations of Lerna and Tiryns have especially robust publication records, and I have studied the Zygouries assemblage on several occasions. Also, by focusing on these three sites, I can consider assemblages with both short-term (Zygouries) and long-term (Lerna, Tiryns) traditions. The available evidence for the production of all other EH II ceramic roofing tile assemblages is included in the subsequent sub-section (see 4.4).

4.1. Zygouries

The prehistoric settlement of Zygouries was excavated in 1921-1922 by Carl Blegen and a team of American and Greek archaeologists (Blegen, 1928). During the 1921 season, a small number of ceramic roofing tile fragments were recovered from a single sounding. Because of the early date of excavation and the fragmentary state of the tiles, Blegen never recognized the ceramics' original function. As a result, only a selection of the roofing tiles initially recovered were saved and placed in storage. Thus, the total number of excavated tiles was certainly much greater than that of the current assemblage: 195 (Pullen, 1985: 207).

While reviewing the ceramics for his Ph.D. dissertation, Daniel Pullen first identified these fragments as ceramic roofing tiles. In that dissertation and a subsequent article, he provided a preliminary analysis of the tile assemblage and the associated architecture (1985: 199-208; 1986). In 2012, 2017, and 2018, I studied this material and recorded the evidence for tile construction. Nearly half of all of the tiles in the assemblage possess edges or corners with associated markings that provide evidence for reconstructing the tiles' production methods.

All 195 tile fragments were recovered from a single sounding under the floor of the EH II Late House of the Snailshells. Because no tiles were found elsewhere at the site, these tiles likely roofed a single structure – perhaps a corridor house – that was built prior to the latest EH II Late phase of the site (Pullen, 1986). Because no complete tile was recovered or saved, the dimensions of a complete tile cannot be reconstructed. However, all indications suggest that the complete tiles likely possessed a similar form to all other EH II tiles – a rectilinear, flat slab of baked clay. The largest preserved fragment, 1921-14:004, is 10.6 x 7.4 x 1.3 cm.

At the time of Pullen's study, 25 tile fragments also retained traces of black or red Urfirnis (Pullen, 1985: 207); only 22 currently preserve this paint. The decision to coat the surface of the tiles with Urfirnis was likely aesthetic. Not only did the paint enhance the visual appeal of the associated building's roof, but it further distinguished that structure as unique or important. Aside from the Urfirnis, the tiles are also noticeably paler (10 YR 9/1) than the Mitrou examples (2.5 YR 6/6) and possess different mineral inclusions (Mitrou, most common: orange and white sub-angular mineral; Zygouries, most common: grey, blue, and red sub-rounded and subangular mineral).

The difference in temper and clay colour substantiates the supposition that the tiles were locally produced. Attas et al. have identified likely local production of pottery at Zygouries in EH II with their comparative scientific analysis of Argive and Corinthian pottery (Attas, 1982; Attas et al., 1988). Such local pottery was found in Bothros VIII which immediately pre-dates the pre-House of the Snailshells deposit and in levels dating to the phase after the pre-House of the Snailshells deposits (scientific analysis: Attas et al., 1988: 86; Zygouries: Blegen, 1928: 100-101). Although pottery from the pre-House of the Snailshells sounding was not included in the scientific study, the local production of ceramics in preceding and subsequent phases suggests that this craft tradition was continuous. Consequently, the relevant knowledge for clay preparation and firing was likely known and practiced when Zygouries's tiles were produced, facilitating the adoption of tile manufacturing methods.

Despite the differences in outward appearance and decoration of Mitrou's and Zygouries's tiles, the evidence for production demonstrates consistency between the two assemblages. Indeed, all of Zygouries's tiles appear to have been produced with the "mould-and-cut" method that was described for the Mitrou's tiles. The edges that abutted the mould are identified by similar hollowing and bunching on the upper surface near the edge and seepage at the bottom of the edge. The sides that were cut also possess vertical projections without hollowing. Finally, the corners of the tiles were pinched and fingerprints are found near the mould edges. Unlike Mitrou's tiles, however, Zygouries's tiles were not exclusively formed on a sandy production surface; the majority seem to have been formed on pebbly, loose dirt. The lack of sand on the underside of the tiles is likely due to the inland location of Zygouries where sand was not as readily available.

Despite the general correspondence with Mitrou's tile traditions, occasional inconsistencies are present. Three of the 22 corner tiles, for instance, do not retain evidence for pinching or other manipulation of the corner. Additionally, some tiles retain fingerprints along the *cut* edge of the tile. The relative rarity of this occurrence suggests that this lifting technique was far from the norm at Zygouries. Finally, 10 tiles demonstrate a "breakage" of the clay on the bottom portion of the edge. This breakage is named and described by Wiencke in her discussion of Lerna's roofing tiles (2000: 197-198, 253-254). Such

"breakage" occurred because the tilemaker did not cut through the entire thickness of the clay. As a result, the craftsman had to snap or break the clay to separate the attached tiles. Although absent from the Mitrou tile assemblage, this feature does not necessarily indicate an alteration to the established production sequence. It could also have been the result of inattentiveness or swift work by the tilemaker.

Overall, the evidence from Zygouries suggests that the producers worked within the same construction tradition as the producers at Mitrou. Except for the type of production surface and the application of Urfirnis on the upper surface, the *chaîne opératoire* is consistent. There is also internal uniformity in the production of the tiles from Zygouries with only a few exceptions.

4.2. *Lerna*

Lerna is located approximately 30 km southwest of Zygouries in the Argolid. The excavation of the monumental House of the Tiles at this site and the hundreds of fragments found *in situ* among the roofing debris demonstrated unequivocally the use of ceramic roofing tiles in EH IIB mainland Greece.

The full assemblage of tiles recovered from Lerna is attributed to several buildings, including an earlier corridor house, other structures, and the fortification (Wiencke, 2000). Although tiles seem to have first been used at the site during the Lerna III B/C transition (Wiencke, 2000: 197), the earliest significant assemblages available for analysis are from Lerna IIIC's Building BG (Wiencke, 2000: 197-203). Tiles were subsequently used until the end of Lerna IIID when the House of the Tiles was destroyed. This site, therefore, indicates a long tradition of local tile production (200+ years) that occupied the entirety of the EH IIB period. Unlike Zygouries and Mitrou, however, the ceramic roofing tiles were placed alongside pierced slate tiles on the roofs of some structures.

Representative examples of tiles from Lerna IIIC and IIID were published by Wiencke in 2000. This analysis includes the information provided in her discussions of the two assemblages and is augmented by my brief examination of a selection of these tiles (23 total).

Overall, there appears to be little consistency in the production of the tiles within the site's assemblage, but the tiles from the earlier Lerna IIIC phase demonstrate somewhat greater consistency in production methods relative to the later tiles at the site. Wiencke also notes a distinction between the IIIC and IIID tiles, contrasting the earlier tiles with a "coarser type" tile that demonstrates little uniformity (2000: 197-98, 253).

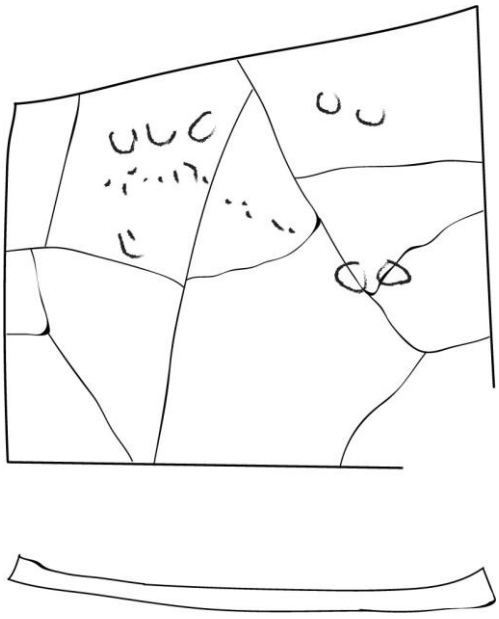

Figure 9. Lerna T1. Note the hollowing and "bunching" or vertical projections in the profile view (below) (after Wiencke 2000: Fig. I.45).

Indeed, Lerna IIIC tiles possess fairly uniform fabrics and rectilinear shapes. A typical tile (T1) for the assemblage has the following dimensions: 21.5 x 20 x 1.0 cm. Although complete tiles are not available at Mitrou and Zygouries for a comparison of length and width, the thickness of T1, 1.0 cm, corresponds to the average of all published Lerna IIIC tiles (the "Pre HT" tiles) and is consistent with the average of the Zygouries assemblage (Figure 9). The embedded sand on the bottom surfaces of many tiles also indicates a similar production surface as the Mitrou tiles.

Like Mitrou, Lerna's coastal location likely facilitated this construction choice.

Several of the tiles also possess the tell-tale signs of the "mould-and-cut" method that I identified at Mitrou and Zygouries. Tiles T1, T2, and T14, for instance, show complementary mould edges with hollowing and vertical projections and cut edges with bunching and angled edge profiles. Such finer details of the production sequence are often difficult to identify in the published illustrations, but they are evident with a close examination of the tiles. For example, "bunching" is mentioned in the catalogue entry for T1, but this is difficult to identify in the drawing (Figure 9) (Wiencke, 2000: 198).

Other tiles do seem to have used a mould, but one that had a different form compared to the narrow moulds used at Mitrou and Zygouries. This is demonstrated with T5 and T7 which have three angled cut edges, rather than two (Wiencke, 2000: Fig. I.46). These identified cut edges do not intersect the mould edges at a right angle and are irregular in shape – a feature produced by the craftsmen cutting the tiles without maintaining uniformity in the general shape. Because of the multiple cut edges, I reconstruct a wider mould from which individual tiles were cut in a checkerboard fashion.

Wiencke also mentions evidence for "breakage" on some tiles (Wiencke, 2000: 197-198), but does not identify specific tiles with this feature, nor does she demonstrate it in the included drawings. I was unable to find any examples of breakage on Building BG's tiles with my personal inspection, suggesting that the breakage may not have been very common. Similarly, the presence of pinching or other manipulation of the corners is not mentioned, but I noted its presence on many "Pre-HT" tiles that I examined.

Finally, several human footprints and animal prints are evident on the surfaces of these tiles (Figure 9). Although Wiencke believes that the human footprints, at least, were the result of the producer treading on the clay to create an even surface (Wiencke, 2000: 253), this does not seem likely. There is no spreading motion evident in the impressions, and large areas of each tiles have an even upper surface that was formed without any evidence for treading. Instead, I believe that people and animals simply walked on the tiles as the clay was drying. Perhaps, the tilemakers utilized a large production area or drying surface located in a communal or well-trafficked area of town.

The earliest tiles at Lerna, therefore, indicate some overlap with Mitrou's and Zygouries's tile *chaîne opératoire*. A mould was employed for general forming, and individual tiles were then cut from this mould. However, there also existed a mould with a different shape from which tiles were cut, and considerably less care was seemingly paid to the tiles during production. For instance, the producers cut the tiles without any regard for clear right angles and individuals stepped freely on drying tiles. Although many of these details would not have been visible on the roof of the structures, this treatment stands in contrast with the careful treatment of the tiles at Mitrou and Zygouries.

The later tiles from Lerna, especially those associated with the House of the Tiles, reveal considerably less uniformity in production than the Lerna IIIC tiles (Wiencke, 2000: 253). This inconsistency is not only evident in markings, fingerprints, and cut marks, but also in the fabric, dimensions, and form. First, there is much greater variety in the type of production surface. Some tiles were formed on sand, others on dirt, and still others on stone. There is also a greater range in dimensions of the tiles. For instance, the average thickness is considerably greater (1.5 cm) and more variable (0.8-2.0 cm) than before. Wiencke observes, "if the tile makers were given instructions to produce tiles of particular dimensions, they did not observe them very carefully. Probably no template or absolute scale was applied to the clay sheets" (Wiencke, 2000: 253).

Also, several tiles do not even seem to have been made with a mould. This is indicated by round or tapered edges on some tiles that represent the ends of unformed clay sheets (e.g. T21, T45, T54). Most frequently, all four sides of the tiles were cut from a slab of clay into the desired shape. Many of these tiles also preserve "breakage" at the bottom of the edge, indicating perhaps a quick cutting of the tiles. The cutting occurs at different angles relative to the horizontal forming surface (inward and outward). Therefore, there was no consistent positioning of the producer relative to the drying tiles. Finally, the number of footprints and animal prints on the upper surface increases significantly relative to the earlier period.

In short, no single "tile tradition" is evident at Lerna in its IIID period. This suggests that the tiles were constructed in an *ad hoc* manner with no clear organization or oversight of labour to ensure uniformity and maintain a clear connection with the earlier tile tradition at the site. Even the placement of the tiles on the roof demonstrates no consistency in the use of the "top" and "bottom" surfaces of the tiles as the exterior surface of the roof (Wiencke, 2000: 254). This gives the impression that the production of the tiles and roof of the House of the Tiles was rather rushed and sloppy. Were technique and method sacrificed to build that corridor house as swiftly as possible? Or, is it the case that the inhabitants of Lerna forgot how to build tiles "properly" and decided to experiment with the production?

The haphazard collection of construction techniques may also represent a truly communal effort in the construction of the building with many individuals contributing to the reconstruction of a corridor house (Wiencke, 2000: 253-254). For this, several groups of individuals may have been asked to produce tiles with little instruction and the tiles subsequently baked *en masse*. Such organization of labour would have certainly accelerated production and might have had especially powerful meaning if the corridor houses served as fundamentally communal structures: everyone contributes to the construction to a building that was shared by all. Alternatively, a model of EH II social stratification in which the corridor house serves as the seat of a leader or elite family might indicate coercive power over the labour of the local population. Further consideration of these possibilities is beyond the scope of this paper.

4.3. *Tiryns*

Tiryns is located across the Argive plain from Lerna. It was a substantial EH centre with a monumental "Rundbau" structure that was found under the later Mycenaean palace. Tiles were recovered in three areas of the site, the Oberburg, Unterburg, and western Unterstadt, and are briefly described in an early publication (Müller, 1930: 85). More recently, Marzolff presented the evidence for the use of tiles at Tiryns and reconstructed the placement of tiles and schist slabs on the roof of the Rundbau and other buildings (Marzolff, 2017). My analysis largely uses the evidence that Marzolff and Müller present, but is supplemented by my observations from a small number of the preserved tiles.

Marzolff describes a robust assemblage of 810 tiles from secure contexts and an additional 16 tiles from insecure contexts (Marzolff, 2017: 183). In form, the tiles are typically rectangular or trapezoidal and possess an average length of 22.5 cm at each side (Marzolff, 2017: 184). Marzolff recognizes a distinction in the form and dimensions of tiles according to the location of discovery; the tiles recovered from the Oberburg are the thinnest (0.8 cm, average) and the tiles from Unterburg considerably thicker (1.2 cm, average) (Marzolff, 2017: 183). Dark Urfirnis covers only the oldest tiles (Marzolff, 2017: 184-186).

Müller was the first scholar interested in the production of the EH II tiles (Müller, 1930: 85, Fig. 51). In his brief presentation of Tiryns's tiles, he reconstructs the following *chaîne opératoire*: pads of clay were formed on a sand surface with individual tiles cut from this using a wooden implement. This cutting created a vertical or bevelled edge (i.e. "bunching" or "vertical projection"). The cut, however, did not always penetrate the full thickness of the clay, leaving traces of the breakage at the bottom edges of several tiles.

Additionally, a horizontally protruding lip is sometimes found on the *upper* part of the tiles' edges. Müller explains the appearance of this features, "*Manchmal scheinen Brettchen in den Sand gesteckt und der Ton darübergedrückt zu sein, so daß die Bruchstelle dann oben liegt*" (Müller, 1930: 85). This explanation, however, falls short because it would be impossible for the horizontal projection to remain intact when the tilemaker removed the wooden implement from the clay. Müller also suggests that wooden sticks may have been placed in the clay pad so that, as the clay dries, the tiles shrink and break apart. If this was the case, breakage should also be evident on the top part of the edge. This method is also unnecessarily complicated and offers no discernible advantage over cutting.

Marzolff reconstructs a sequence of production that does not differ substantially from Müller's, but is more detailed and better illustrated (Marzolff, 2017: 186, Figs. 8-10). First, the producers created a large pad of clay that was formed on a surface with some sort of parting agent: sand, organic material, a textile mat, or other substrate. Individual tiles were then cut from this pad with a wooden tool that is under 3 mm in thickness. To account for the horizontal projection on the upper portion of some tiles' edges, Marzolff suggests that additional clay was added to the top to create an even surface.

My examination and interpretation of a selection of Tiryns's tiles largely agrees with Marzolff's reconstruction. Indeed, the tiles were formed on a variety of surfaces and most examples seem to have been exclusively cut, rather than formed in a mould. I argue, however, that the evidence for the horizontal lip was caused by a board or some other flat surface pressing down on the tiles after they had been cut. Where the board extended beyond the edge of the tile, clay was pressed outward forming a horizontal projection of clay from the top surface. Evidence for this technique is also supported by the presence of a vertical projection on the edge of some tiles in which the board failed to extend over the complete surface of the tile. Unlike the vertical projections produced by mould or by cutting, the top of this projection is flat and regular.

I also noted that some of the tiles do seem to follow the "mould-and-cut" technique. However, tiles with the full complement of characteristic "mould-and-cut" features are few.

Tiryns, therefore, possessed a long-held tradition of tile production that was neither static nor uniform. The tiles from Tiryns suggest some interaction with tile assemblages elsewhere by the general form, the use of Urfirnis, and the cut-and-broken tiles. How-

ever, the decision to place a board on the surface is a local innovation. Further study with a diachronic and contextual analysis is required to fully entangle the complexities of tile production at the site of Tiryns during the EH period.

4.4. All Remaining EH Tiles

Ceramic roofing tiles have been recovered at 18 additional sites by 12 archaeological projects. These tiles lack detailed publication or contextual information and, thus, cannot contribute significant data to this study. Although I also examined several tiles from Tsoungiza and Kolonna for evidence of construction methods, these tile assemblages are currently not published. Therefore, I provide only general observations about their production.

4.4.1. Tsoungiza

At Tsoungiza, 197 tile fragments were recovered from a variety of contexts – most of which were not primary depositions (Pullen, 2011: 282-284). It is possible that some of these tiles were produced as early as the end of the EH I period, but manufacturing can only be identified with certainty in EH II. The settlement (and its tile production) was abandoned in the middle of that period and then reoccupied in EH III. Ceramic roofing tiles have also been found in some of those EH III contexts, such as the fill of EU 10 (Pullen, 2011: 282-284). If these represent the production of new tiles, then tile technology likely returned with the settlement's reoccupation.

Little description of the tiles is available aside from distributions and quantities. One tile (**857**) was described as having been formed on a "tabby" weave mat, rather than a sand, dirt, or straw surface (Pullen, 2011: 605-607). No other tile is mentioned having a similar impression, and my examination noted that most were formed on a dirt, sand, or an otherwise non-distinct surface. Therefore, a weave mat production surface does not seem to have been commonly used at Tsoungiza. I also recorded possible red or black Urfirnis on the surfaces of several tiles.

In addition to the different production surfaces, the 33 tiles (16.7%) from the Tsoungiza assemblage that I examined demonstrate a variety of production techniques. This is not surprising, considering the long tradition (500+ years?) of local tile production. Some of the tiles certainly possess evidence for the "mould-and-cut" method of forming. Others, however, appear to have exclusively "cut" edges. Several tiles also have the horizontal projections on the upper surface like those described for the Tiryns assemblage (4.3). This suggests that some of Tsoungiza's tiles may have been flattened with a board or painted with a thick clay slip. Tsoungiza's tiles, therefore, cannot be characterized by a single production method.

4.4.2. Kolonna, Aegina

Tiles were excavated during several campaigns of excavation at Kolonna (Walter and Felten, 1981: 12-21; Gauss and Kiriatzi, 2011: 103-104, 236-239, 333-334, Fig. 105, 145). A brief discussion of the tile assemblage is presented in Walter and Felten's monograph (1981), and additional descriptions, photographs, and drawings of two tiles are included in a recent scientific study of the site's ceramics (Gauss and Kiriatzi, 2011). The latter study also proves local production for the site's tiles.

The ceramic roofing tiles were found distributed throughout the EH II settlement of Kolonna (Stadt II and III). Their association with the large EH II corridor houses, the Färberhaus, Weisses Haus, and Haus am Felsrand, however, is more well-known. Walter and Felten mention that the individual tiles were cut from pads of clay set on a sandy surface (Walter and Felten, 1981: 12-21). Although all of the tiles from Kolonna that I examined were produced on a sand surface, it is unclear if Walter and Felten's overall reconstruction is founded on a close examination of the tiles or if it reflects the general impressions and assumptions of the excavators. They also provide approximate dimensions for the tiles as 25 x 40 x 1.5 cm. This described width is quite large compared to other EH II tiles, but tile KOL263 from the later scientific analysis possesses dimensions that are closer to the average at Lerna, Mitrou, and elsewhere: 23.7 x 24.5 x 0.9-1.5 cm.

With my examination of the published drawings and several tiles, I can confirm that many were formed with the mould-and-cut method. KOL 263, for instance, has the typical horizontal projection at the bottom edge that resulted from clay seeping from under the mould (Gauss and Kiriatzi, 2011: Fig. 105). The authors also describe a slight ridge on the edge of the clay (Gauss and Kiriatzi, 2011: 348). This "ridge" is consistent with the vertical projection and hollowing of mould-made tiles.

Figure 10. Tile KOL 212 from Kolonna. Note the rounded horizontal projection on the edge (viewer's left) (after Gauss and Kiriatzi, 2011: Fig. 145).

The other tile fragment from the scientific study, KOL 212, has a rounded, horizontal projection on the top edge (Figure 10). The rounded edge of this projection is unique to Kolonna (as far as I can tell) and is evident on several examples. All tiles that I examined that have this feature also have red or black Urfirnis (like KOL 212) and/or were recovered from the earliest phase of tile production (Stadt II). With these tiles, the paint always ends at the rounded projection at the top of the edge. At Zygouries, in contrast, the Urfirnis covers the full edge of the tiles. Perhaps the rounded projection on the Kolonna tiles indicates a distinctive method of application of the Urfirnis with a clay slip also applied to smooth the upper surface of the tile.

Despite these minor differences, the production methods for the tiles that are published and examined are largely consistent with those employed for Mitrou's tiles.

4.4.3. Southern Argolid Exploration

The Southern Argolid Exploration project recovered 23 EH II tiles from seven sites (A6, A33, B24, F5, F6, F20, F32) (Pullen, 1995: 39-40). Pullen provides several illustrations and detailed descriptions of these tiles from which this overview is derived.

No complete tile was recovered from the survey, and the maximum dimensions of the recovered fragments are quite modest; for instance, the greatest measured length and width along the edges are 14.5 and 15.5 cm, respectively. The thicknesses of the tiles range from 0.7 to 2.0 cm with most clustering into one of two groups: tiles thinner than 1.3 cm and tiles thicker than 1.3. Such dimensions are consistent with tiles found elsewhere.

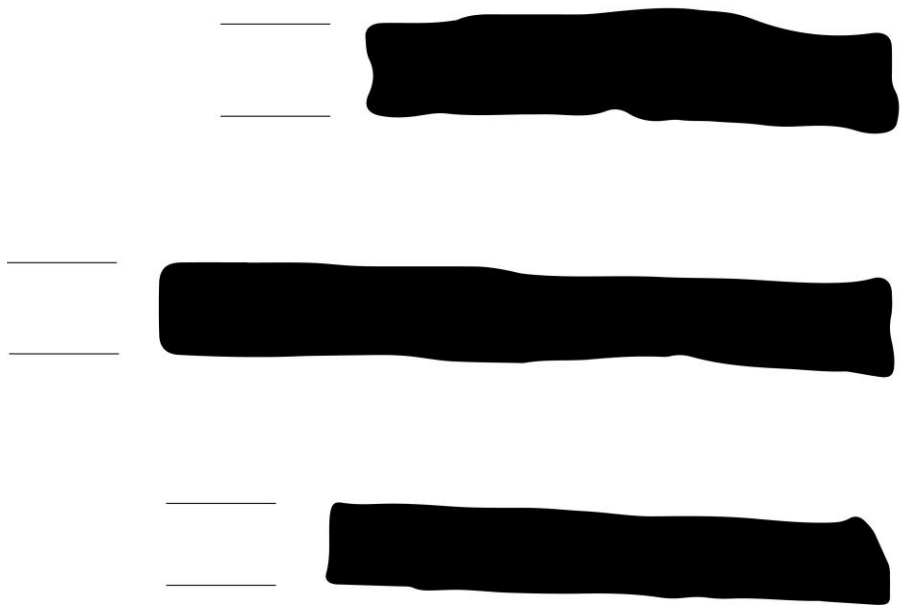

Figure 11. Tiles 670 (top), 671 (middle), and 672 (bottom) from the Southern Argolid Exploration. The tiles' edges are on the viewers' right (after Pullen, 1995: Fig. 37).

Judging from the illustrations and description, the tiles appear to possess a relatively standard form and method of production. The tiles are plain (no Urfirnis) and were formed on a bed of vegetation, rather than sand or dirt. This organic material has been identified as the remains from wheat, barley and oats. Several tiles, such as tile 672, appear to have breakage on the bottom of the edge (bottom: Figure 11). The cutting is also evident by the angle of that edge and the bunching at its top. Other tiles (e.g. 671, 674, 675) seem to have been made with the mould-and-cut technique and possess seepage of clay along the bottom and a hollowing near the mould edge (middle: Figure 11).

4.4.4. Asine

Ceramic roofing tiles were found throughout much of the excavated EH settlement at Asine, and at least four buildings were roofed with these tiles (Frödin and Persson, 1938: 233, Fig. 170; Pullen, 1985: 186-187, 192). Frödin and Persson provide a basic description of the tiles: "the tiles are square, smooth slabs without any groove or hole for fastening" (1938: 233). Dimensions of three complete tiles are also recorded: 21.5 x 18 x 1.5, 25 x 23.5 x 2.0, and 28 x 22.5 x 1.7 cm. According to the authors, these represent the variety found among the complete assemblage. They are all somewhat thicker than the average, but consistent with many examples throughout mainland Greece.

The excavators offer few details about the production of Asine's tiles and, instead, defer to Müller's description of Tiryns's tile construction (Müller, 1930: 85). It is possible that the Asine tiles were produced using the methods described by Müller. However, it is also likely that the excavators did not examine the tiles with great attention and assumed that, because of their similar outward form, Asine's tiles were produced in the same manner as Tiryns's tiles.

The sole published image of a tile offers some clues about the construction process (Frödin and Persson, 1938: Fig. 170). The tile appears to have a single mould edge with a slight vertical projection and wiping marks that continue onto the side of the projection. There is also manipulation of the two corners. The other three edges seem to have been cut and possess curved and angled edges. Thus, this tile complements several examples from Lerna with only one mould edge. Unfortunately, I cannot determine if this example is representative of the full assemblage.

4.4.5. Ag. Dhimitrios

At Ag. Dhimitrios (Triphylia), 11 ceramic roofing tiles were recovered from the EH settlement on a hill near the Classical citadel of Lepreon (Zachos, 1987: 160, 213; 2008: 77). Seven of the tiles were found within House B, a structure that dates to the site's Phase IIa (Zachos, 2008: 50). Zachos correlates this phase with EH I Late-EH II early (Zachos, 2008: 89-93). With this date, Ag. Dhimitrios joins Tsoungiza as the earliest identified roofing tiles in mainland Greece.

Little detail or description is offered about these tiles, and the four photographs of individual tiles do not permit identification of production techniques. It is worth noting, however, that several examples preserve evidence for red or black Urfirnis on the upper surfaces.

4.4.6. Berbati

Saflund mentions "several fragments of terracotta tiles" that were found in the destruction debris of Room N at Berbati (1965: 119), a substantial room (4.1-4.9 x 3.15-3.6 m) in House N/P that is defined by wide stone walls. It is worth noting that this room and its pottery are dated to EH III (Lerna IV or Kolonna Stadt V-VI) (Pullen, 1985: 192-196) – an unusually late period for tile production (Wiencke, 2000: 650). Tsoungiza is the only other site where tiles may have been produced after the end of EH II.

The dimensions of one complete tile from the room are described, 63 x 32 x 0.9 cm. Wiencke has rightly pointed out that this is an unusually large size for a tile and suggests that that example may not, in fact, have been correctly identified (2000: 650). Despite the large length and width, the thickness of this example is consistent with most recovered and documented EH tiles.

4.4.7. Vassa

At the fortified EH site of Vassa in the eastern Corinthia, one tile fragment was recovered from a surface survey of the site's central cairn (Tartaron et al., 2006: 156-157). No additional details about this fragment are provided.

4.4.8. Rouph

At Rouph (Athens) ceramic roofing tiles and pierced schist slabs were recovered from the second (β) phase of the settlement, EH II Late (Petritaki: 1986, 153-155; Wiencke, 2000: 650). The architectural remains from this phase are quite substantial, but no complete building or room was excavated.

From these excavations, two complete(?) tiles were recovered. One of the ceramic roofing tiles was also painted black (Petritaki, 1986: 154). The dimensions of the complete tiles are recorded, 22 x 17 x 1.0 and 15 x 12.5 x 1.0 cm, along with the thickness of another, 1.1 cm. Although these tiles are quite small for EH II tiles, Petritaki mentions that there is variety

in the dimensions of tiles recovered at Rouph. Like the tiles, the two published schist tiles are also quite small, 13.5 x 12 x 1.2 and 10 x 8 x 1.8 cm.

Details regarding the tiles' production are minimal, but Petritaki mentions that the sides of the tiles were cut, and a groove, "*αύλακα*," is sometimes visible from the cut (1986: 153-155). The precise relationship between the groove and the cut is unclear, but I have observed on other tiles that, when there is excess of clay in a mould, a groove-like appearance on the edge is sometimes visible because of the significant horizontal seepage at the bottom and a pronounced vertical protrusion at the top.

4.4.9. Raphina

Theochares reports two tile fragments from the fill of the one-room House Delta at Raphina in eastern Attica (1953: 111). No other tiles are recorded from any of the other structures at the site and details about the tiles are not provided.

4.4.10. Askitario

Theochares reports a small number of fragments from the fortified settlement of Askitario in eastern Attica (1954: 105). These were found in the main excavation area where eight contemporary and closely spaced structures were identified. No other information about the tiles is provided.

4.4.11. Koropi

In the vicinity of Koropi (Attica), the remains of several EH buildings were excavated. Ceramic roofing tiles were found associated with the structures that were excavated near the health center on Leof. Vassileos (Kakovagianni, 1993; Andrikou, 2013). Kakovagianni writes, "*Προφανώς πρόκειται περι λειψάνα οικίων. Στεγάζονταν και με κεραμίδια και είχαν θυρόφυλλα που περιστρέφονταν σε μεγάλους πέτρινους όλμους*" (1993: 165). No additional information, description, or images of the tiles are included. Reports from the later excavations at the site do not mention additional tiles (e.g. Kakovagianni, 2009; Andrikou, 2013).

4.4.12. Orchomenos

Bulle describes the use of tiles for the pavement of the floor of the round building, D1, at Orchomenos in the EH period (1907: 23-24). These tiles were broken and arranged to fit tightly on the floor. Additional fragments were also found in the later Bothrosschicht (Bulle, 1907: 106). Few details were provided about the tiles other than a common dimension of 22 x 35 cm.

5. INTERPRETATIONS

The overview in Section 4 demonstrates a non-uniform tradition of tile production in EH Greece. In the following, I consider what this means for Mitrou and the evidence for interaction by the tilemakers at the site.

Mitrou represents the northernmost settlement where tilemaking technology was adopted (Figure 1). The tiled roof was transferred to that site in a later phase of EH II (=Lerna IIIC) – a period contemporaneous with the greatest intensity of tile production in mainland Greece. For the acquisition of this technology at Mitrou, some of the site's inhabitants certainly interacted with individuals from settlements farther south and witnessed the roofs at one or more of the 21 other settlements with ceramic roofing tiles.

Table 2. Reported Dimensions of Tiles (average of the published/observed data, or largest preserved fragment) (cm).

	Length	Width	Thickness (avg.)	Thickness (range)
Mitrou	26.5	> 23.4	1.61	0.7-3.0
Zygouries	> 10.6	> 7.8	1.12	0.6-1.6
Lerna	26.5	21.7	1.40	0.6-2.0
Tiryns	22.5	22.5	1.04	0.8-1.2
Tsoungiza	> 12.5	> 13.0	1.40	0.6-2.0
Kolonna	23.7	24.5	1.20	0.9-1.5
SAE	> 14.5	> 15.5	1.35	0.7-2.0
Asine	24.4	21.3	1.73	1.5-2.0
Ag. Dhimitrios	?	?	?	?
Berbati	63.0	32.0	0.90	?
Vassa	?	?	?	?
Rouph	18.5	14.8	1.00	1.0-1.1
Raphina	?	?	?	?
Askitario	?	?	?	?
Koropi	?	?	?	?
Orchomenos	?	?	?	?

I argue that the adoption of tiled roofs at Mitrou indicates a process of intensive interaction with the contemporaneous settlements that possessed tile roofed structures. This is made clear by the close correspondence of Mitrou's tiles to the form and dimensions of the tiles from the Argolid, Corinthia, and elsewhere (Table 2). Because of the placement of the tiles on roofs and away from close inspection, these similarities must represent more than a passing familiarity with the concept of tiled roofs. The great uniformity of these dimensions demonstrates clear interaction among all the local tilemakers and at least a general understanding of what a tile "should look like."

Table 3. The Use (recorded) of Ceramic Tiles with Urfirnis and Schist Tiles.

	Red	Black	Schist
Mitrou			
Zygouries	X	X	
Lerna			X
Tiryns		X	X
Tsoungiza	X	X	?
Kolonna	X	X	
SAE			
Asine			
Ag. Dhimitrios	X	X	
Berbati			
Vassa			
Rouph			X
Raphina			
Askitario			
Koropi			
Orchomenos			
Akovitika			X

Variability in the outward appearance of the tiles is largely limited to the presence or absence of red or black Urfirnis on the upper surface (Table 3). Such painted tiles comprise only a small percentage of the overall number of tiles in any assemblage, and it seems likely that the painted examples were placed alongside unpainted tiles on the same roof to create a vibrant, multi-coloured architectonic surface. At least three sites also record the use of schist slabs alongside the ceramic roofing tiles. The addition of schist slabs added yet another colour and texture to the EH roof. Such a rich, quilted appearance must have been particularly striking to the observer, because these buildings were typically placed among other structures that were predominately roofed with thatch or flat surfaces.

In the EH IIB village at Mitrou, however, several (if not all) buildings appear to have been roofed with unpainted, pinkish-red tiles. The mere use of tiles would have certainly allowed Mitrou to stand out relative to nearby settlements, but the sitewide distribution and lack of visual embellishment indicate that tile roofs may not have been used for intra-community competition with this architectural component.

Despite the superficial similarities in the form and dimensions of the EH ceramic roofing tiles, there is clear variation in the production of tiles across time and throughout mainland Greece. Mitrou is particularly noteworthy for its uniform tile tradition. There, the tilemakers exclusively formed the tiles with the "mould-and-cut" method that I describe in Section 3. Although no other tile assemblage demonstrates as great consistency in production, this technique predominates at Zygouries and, possibly, Kolonna on Aegina.

Several sites with quite long-lived tile traditions, such as Lerna, Tiryns, and Tsoungiza, also have tiles that demonstrate this method of production, but only for a selection of tiles in the assemblages. Because it is expected that technologies and methods change after several centuries of production, the evident variation of construction techniques at these sites can likely be attributed to the lengthy period of manufacturing. Alternatively, tiles may have been infrequently produced and, thus, reintroduced on multiple occasions at these sites. This is especially possible if the roofing tiles were reserved for only a select group of structures at the settlements. New tiles would not have been needed except for occasional repairs or for the rare, large-scale building project.

With several structures at Mitrou roofed with tiles, tilemaking was likely a more frequent occurrence at that site, providing the tilemakers with on-

going opportunities to practice the construction knowledge that was taught to them. This would have helped to maintain a single method of manufacture during the two, local sub-phases of EH IIB. Additionally, the consistently straight cuts on the tiles, the lack of breakage on the cut edges, and the absence of footprints or animal marks on the surface of the tiles together suggest a degree of respect given to the tiles by both the producer(s) and the inhabitants of the village. At Mitrou, therefore, tile roofs may have served as a point of pride and distinction relative to neighbouring villages in East Lokris.

The consistency of production at Mitrou and the lack of consistency elsewhere also make it unlikely that there was a traveling tilemaker who was responsible for the production of all of Mitrou's tiles. The archaeology of such mobile potters in Bronze Age Greece has been explored in recent years. Lis et al., for instance, have adopted the *chaîne opératoire* model to identify a group of Aeginetan potters in Late Helladic III Greece who made cooking pottery in mainland Greece using local clay sources (including at Mitrou) (2015). Although Mitrou shares the mould-and-cut method with tiles from several other sites, no site other than Mitrou demonstrates the consistent use of this technique in several phases of production. The production method, therefore, *may* have been initially disseminated to Mitrou by a mobile tilemaker, but it is unlikely to have been maintained at the site by one. It is also possible that Mitrou's tilemaker learned the technique by traveling elsewhere in Greece.

Because there are several unique steps in this production sequence, the distinctive mould-and-cut technique must have been taught *en bloc* to individual tilemakers in mainland Greece. This demonstrates a clear teacher-student relationship (however short-lived) and implies a degree of sustained and meaningful interaction between individuals. This conclusion has important implications for understanding Mitrou's networks of interaction. Although Mitrou demonstrates indirect interaction with settlements from the Argolid and Corinthia in the context of tile production and use, there are no identified imports from those regions at Mitrou in EH IIB (Zachou, pers. comm.). Thus, there is no certain evidence that Mitrou participated in an economic network with the region in which most EH II tile-roofed structures were built. Thus, knowledge and technique seem to have been transferred along paths that were distinct from the established trade routes. Future study of the extant tile assemblages and the forthcoming publication of Mitrou's stratigraphy, architecture, and ceramics will certainly augment our understanding of Mitrou's interaction with other settlements in Greece.

The diversity of production methods also offers a potential means to refine chronology of the EH II period and to correlate sub-phases between sites. The equivalent construction methods at Zygouries and Mitrou, for instance, suggest a relatively close date of transmission of building knowledge between these two sites. Indeed, the architecture associated with the tiles at both sites are from EH IIB, but predate the latest phase of that period, indicating possible contemporaneity. Chronologically, Mitrou's EH IIB ceramic remains appear to correspond with those of Lerna IIIC (Zahou, pers. comm.). Wiencke also notes that the development of Zygouries's earliest EH II ceramic deposits (Bothros VIII) corresponds to a transition from Lerna IIIB to IIIC (2000, 645). The subsequent (more extensively excavated) phase of settlement at the site seems to be equivalent to the final period of EH II. The pre-House of the Snail-shells deposit (i.e. a deposit post-dating the bothros, but prior to final phase of EH II settlement [Blegen, 1928: 100-101]), therefore, was likely equivalent to Lerna IIIC, or thereabouts. Excavations of Lerna IIIC levels also yielded several tiles with a similar mould-and-cut technique that are associated with long-lived Building BG, but these appear alongside several other methods of tile production. Thus, it appears that there is some chronological correspondence to indicate the dissemination of this specific construction method to sometime during Lerna IIIC. Isolating the use of the mould-and-cut method to that EH II sub-phase with certainty, however, requires additional study of the ceramic and tile assemblages from sites with the mould-and-cut tiles.

6. CONCLUSION

By focusing on tile construction, I hope to have shown that the roofing tile phenomenon of mainland EH Greece was neither homogenous nor chronologically uniform. Although Mitrou maintains a consistent method of production in multiple phases of occupation, construction practices varied among and within individual settlements. The results of this study helped to reconstruct the patterns of interaction in which this technical knowledge was exchanged. At Mitrou, interaction was multi-scalar and multi-functional; and, the identified economic exchanges did not necessarily follow the paths of individuals and the movements of their ideas.

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