

Figure 2. Surezha high mound and terrace, showing location of ops. 2, 9, 10, and newly opened op. 11 in Area B.

deeply buried beneath anywhere from 5 to 30 m of later deposits. However, the abandonment of the Surezha high mound in 3400 BC, and the absence of later occupations there, afford us the rare opportunity to easily reach the building levels of an early town settlement dating back more than seven thousand years.

The 2019 field season took place from September 15 to October 15, 2019, co-directed by Gil Stein and Michael Fisher along with project staff members John Alden, Maria Antoniou, Savanna Buehlman-Barbeau, Sam Harris, Lucas Proctor, Ramin Yashmy and Karol Zajdowski. Our government representatives were Rozhgar Rashid and Nader Babakr. Site excavations were carried out by sixteen workers from the Erbil Department of Antiquities and the village of Surezha. We are grateful to the general director of Antiquities, Mr. Kayfi Ali, and Mr. Nader Babakr, director of Antiquities for Erbil Governate for permission to excavate at Surezha, and for the numerous ways in which they have facilitated our work.

For the last three years, we have focused our excavations on area B—ops. (10 × 10 m trenches) 2, 9, and 10 at the southern base of the high mound (figs. 3, 4, 5). In this area, Late Chalcolithic 1 (LC1) deposits are accessible immediately beneath the present-day ground surface. The LC1 period forms the transition between the first emergence of towns in the preceding Ubaid period and the emergence of the first cities in the LC2 period (corresponding to the Early Uruk period in southern Mesopotamia—ca. 3900 BC). However, for all its potential importance, the LC1 remains poorly understood because it is usually so difficult to reach the



deeply buried deposits from this period, and because its material culture can be difficult to distinguish from the preceding (Ubaid) and succeeding (LC2) periods. Fortunately, at Surezha, the very early deposits of the LC1 can be reached immediately beneath the surface in area B, allowing us to make a broad contiguous horizontal exposure of 300 sq m of architecture, open-air spaces, and streets dating to the LC1 period.

Our excavations have exposed what appears to be a major architectural and functional difference between the eastern and western parts of area B during the LC1 phase. Op. 2 at the east end of area B seems to be entirely composed of domestic architecture—houses, courtyards, and open-air work surfaces. By contrast, the architecture of op. 9 in the center of area B, and op. 10 at the west end, together compose a large, mudbrick-walled enclosure that appears to have been non-domestic in function (figs. 3 and 4).

OPERATION 2

Op. 2 is a 10 × 10 m trench at the eastern end of Area B, with the 2019 excavations supervised by Michael Fisher and Ramin Yashmy. Op. 2 is a domestic area with a long, continuous occupation that spans the vast majority of the LC1 period (op. 2 phases F through C) and extends back in time into the Ubaid period (op. 2 phases H and G). The houses of the LC1 period phases closely follow the wall alignments, NE–SW orientation, and function of the earlier Ubaid domestic architecture, which had been exposed in the southwest 5 × 5 m of the trench in 2013 and 2016. The LC1 house exposed in op. 2 comprises a series of small rooms oriented around the south, east, and north sides of a central room or courtyard measuring 3.5 m (NW–SE) by 6 m (NE–SW). There appears to be great continuity in stratigraphy and architecture between the Ubaid and subsequent LC1 occupation in op. 2.

The 2019 excavations reached phase F across the remainder of the trench, in many cases to the bases of the phases F and E walls, representing the

Figure 3. Area B LC1 architecture. Op. 2 (on right) exposed domestic architecture, while contemporaneous deposits in ops. 9 and 10 (center and left) composed a large, non-domestic mudbrick enclosure with rooms along its eastern wall, and a small freestanding structure along the north baulk (at top).



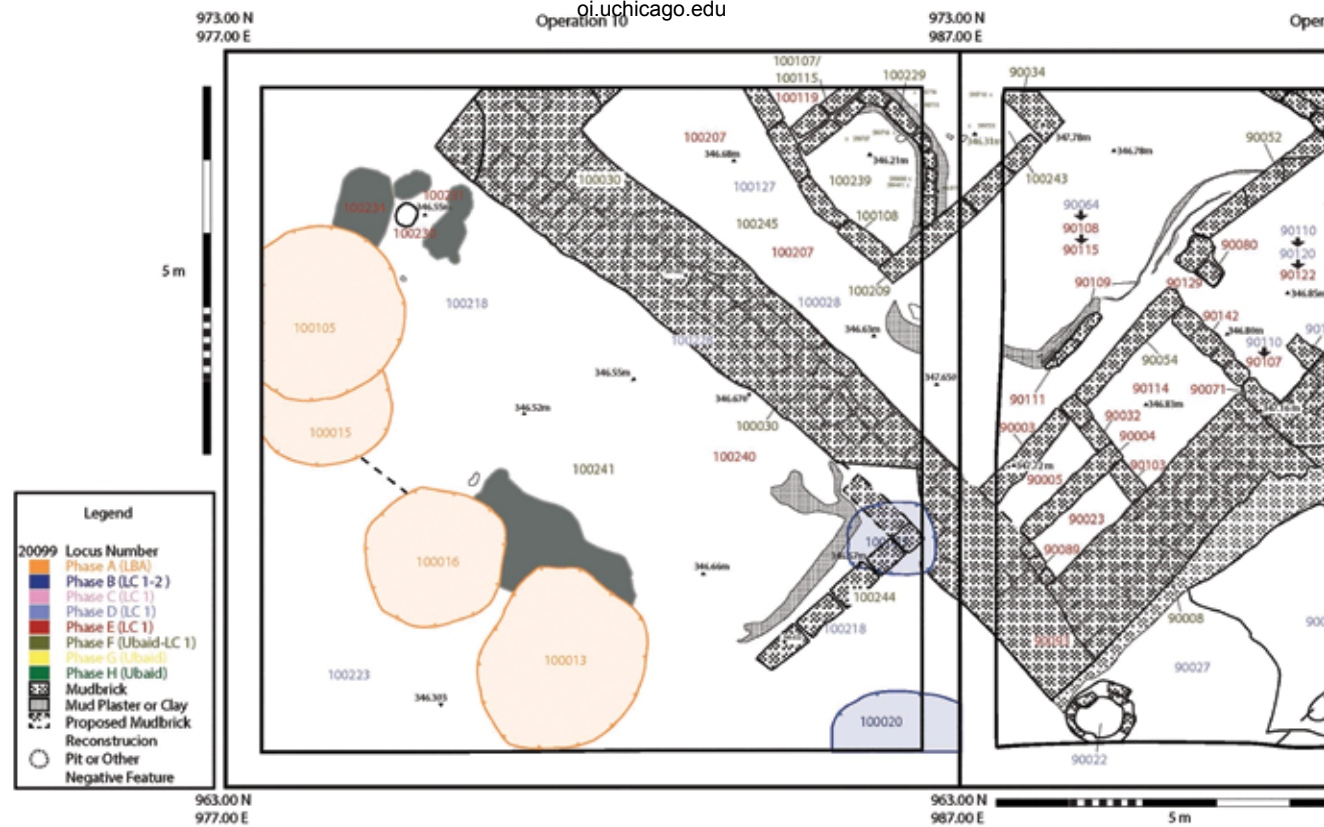


Figure 4. Area B LC1 top plan showing domestic architecture in op. 2 (right) and non-domestic mudbrick enclosure in ops. 9 (center) and 10 (left).

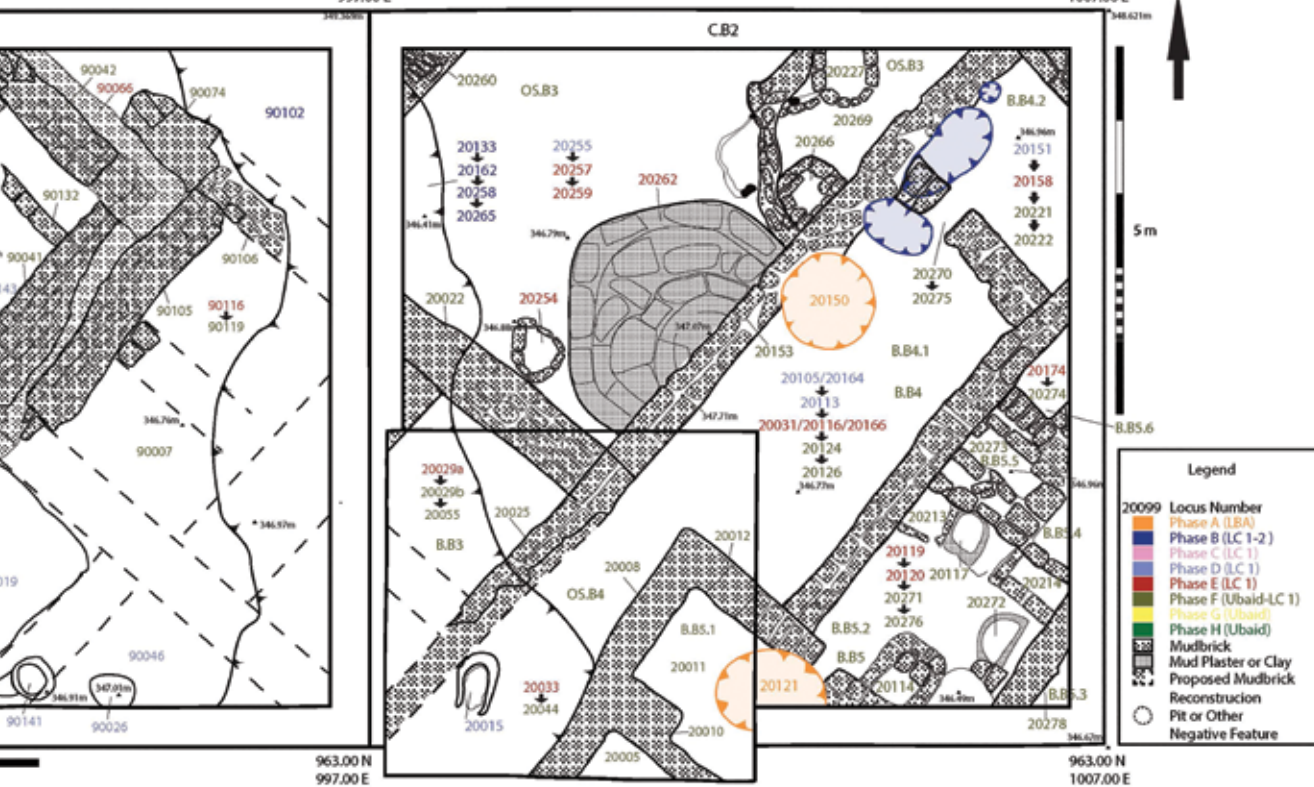
transition between the Ubaid and LC 1 periods. The western wall (locus 153) of this courtyard was constructed in the earliest stages of the

LC1, in phases E and F immediately on top of the earlier Ubaid houses (phases G and H). To the northwest of the courtyard and wall, 153 was a series of outdoor surfaces, with features such as a large mud platform built up against the exterior of the house compound’s northwest wall, flanked on either side by tannurs (ovens) and a small basin with a drain hole (fig. 4).

In phase E, the earliest LC1 deposit, the finds from within and on top of surface 20259, and from the overlying ash layer 20257, include a large number of impressed clay sealings as well as hand-squeezed, pre-formed lumps of cleaned sealing clay, figurines, jar stoppers, worked bone, and worked sherds. A notable diagnostic that appeared twice (20259; 20262) was the wide-line-incised pattern on body sherds. Incised sherds of this type seem to be a good local diagnostic for the earliest LC1 deposits on the Erbil plain. Overall for op. 2 phase E, the (very) approximate percentage of painted ware per context seems to range between 10 percent and 20 percent.

The house was in use for an extended period in the LC1 (op. 2 phases F through C), during which its rooms and their features underwent periodic small modifications as doors were bricked up and new interior walls or floor features were built. In the Southeast Room of the LC1 house, excavations reached the floor level on which Hearth 20114 was built, Floor 20276. This floor, comprising multiple, thin laminar surfaces, indicating regular, periodic water accumulation, provided the foundation or earliest use level for the various domestic features, including Basin 20213 and Bin 20214. This evidence suggests that the room served as a kitchen area throughout the LC1 use-life of the house.

With the conclusion of excavations in the LC1 deposits of op. 2, in the final days of the 2019 field season, we started clearing a new 10 × 10 m trench—op. 11, immediately to the north (upslope) of op. 2. This marks the first stage of the planned east–west line of three operations. (11, 12, 13), designed to double the size of area B in the next field season from the current 300 sq m of exposure to 600 sq m.



OPERATION 9

Op. 9 is a 10 × 10 m trench at the central part of Area B, between op. 2 to the east and op. 10 to the west. The 2018 excavations in this trench were supervised by Sam Harris and Karol Zajdowski. Ops. 9 and 10 are distinctive in having a large mudbrick enclosure wall, with associated rooms, and a freestanding structure with at least three rooms, made of packed mud (*terre pisé*), rather than standard mud brick, inside the enclosure. All of these architectural features are non-domestic in character. This architecture differs significantly from the contemporaneous LC1 houses and outdoor work surfaces in op. 2 to the east (see figs. 4 and 5). At the same time, regardless of the differences in function, all the buildings in ops. 2, 9, and 10 share a common orientation for their walls and rooms so that the corners of all structures are aligned to the cardinal points of the compass.

The mudbrick enclosure in ops. 9 and 10 measures 11 m (NW–SE) by 9 m (SW–NE). It is composed of a series of walls approximately 1.5 m wide, constructed of 4–5 rows of rectangular bricks, and preserved to a height of at least 50 cm. The SW wall (op. 10 wall 30) and the SE walls (op. 9 walls 8 and 41) have been completely exposed, along with 4 m of the NE wall 42. The remainder of the NE wall and the entire NW wall are in the as-yet-unexcavated area to the north of area B. The walls of the enclosure were not built as a unit, but were instead constructed separately, and possibly at different times. The enclosure and its associated rooms remained in use for a long time over the course of the LC1 period, and the entire complex seems to have undergone at least two main phases of architectural modification over this timespan.

The 2019 season in op. 9 focused mainly on clarifying the late phase (D1 and D2) of the enclosure and its rooms, to define the surfaces associated with this architecture. Our goal was to remove phase D architecture in order to expose and define the underlying phase E architecture, which we currently associate with the earliest local Late Chalcolithic 1. Another goal of the season was establishing connections among op. 9 and op. 10 to the west and op. 2 to the east, both through a partial tear down of the baulks between these operations, and continued excavation in op. 9.

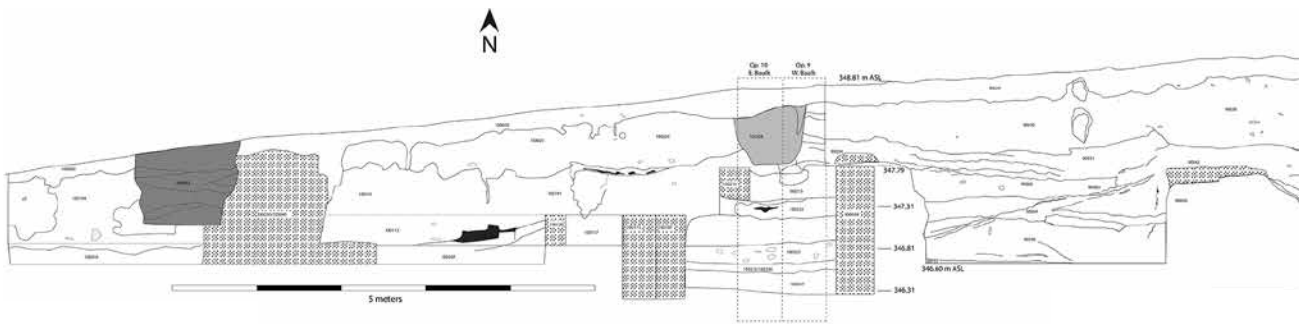


Figure 5. Area B Composite North baulk section of domestic architecture in op. 2 (right) and non-domestic mudbrick enclosure in ops. 9 (center) and 10 (left). Note 5 m wide and 3 m deep wedge-shaped infilled erosional gully running through the baulk between op. 2 (right) and op. 9 (center).

In the first stage, we removed the 1 m wide baulks that separated op. 9 from op. 2 to the east, and op. 10 to the west. This removal confirmed that a later fluvial “gully” running down the mound cut any architecture between ops. 2 and 9 throughout phase D and at least the tops of phase E (fig. 5), and, crucially, the clear establishment of architectural connections between the architectural complexes in ops. 9 and 10.

In the center of the mudbrick enclosure, the opening of the structure west of 90033/90034 began with the removal of intrusive pit 90087 (=10208/10045); this pit was notable for the inclusion of over 300 unbaked clay pegs or cones (SR 8160), which had also been found in 10003. These pegs were very fragile, and many did not retain their original shapes after excavation. We tentatively assign this pit to phase C, the period when the LC1 architecture had been abandoned but before the thick accumulations of phase B. Interpretation of the deposit is difficult, but the unbaked clay pegs may have had an administrative or counting function, perhaps related to feasting.

Inside the enclosure, five rooms were constructed against the interior of SE walls 90008/90041.

Figure 6. Area B Enclosure: Overlying Later LC1 phase D room walls partially removed to reveal the top of the Earlier LC1 phase E architecture with buttressed and plastered walls.



The mudbrick walls were one course wide and in some places were preserved to a height of at least 60 cm. The northeast room (room 1) was significantly different from the other three rooms along the interior of the SE wall of the enclosure (fig. 4). The room interior had been burned in an intense fire

that partially vitrified the mud plaster along the northeast corner. Afterward, the room was cleaned, mudbrick bench 90079 was constructed along its NW wall (Wall 52), and the room continued in use, with large amounts of small finds in floor and trash deposits, including two stamp seals and seal-impressed clay container sealings. At a



certain point, the room was abandoned. A large amount of clay, ceramic, and stone objects were found in related abandonment deposit loci 90069 and 90072—far more than in any other room in op. 9.

The block of five rooms enclosed by the monumental walls 9008, 90041, 90042, and (probably) 90093 formed part of what we consider to be a public building complex used in some form through all of later LC1 phase D and at least part of earlier LC1 phase E. The thickness of the outer walls (perhaps some 1.7 m), the long use-life and preservation of the building (as represented by the repeated plastering of the walls, including after an intense burning event that burned and baked the plaster and bricks of walls 90041 and 90042), and the artifacts from this area (including the lenticular vessel [SR 7171], stamp seal [SR 6806], and clay sealings from Room 1), all point to the probable non-domestic, special purpose of this building complex. The finds from the northeast room in op. 10 reinforce this impression. Excavations this year showed that the construction and orientation of at least some rooms changed between phases E and D, while the complex itself and the monumental exterior walls 90041 and 90042 remained in use, even as they apparently eroded on their exterior faces.

We were able to excavate and remove the southern half of the later LC1 phase D five-room block, exposing the tops of the earlier LC1 phase E enclosure wall and associated rooms (fig. 6). In excavating down to the top of the underlying phase E, one of the most interesting discoveries was that, in this earlier stage of the enclosure, the western face of the walls of the room block (i.e., facing the enclosure courtyard) had brick buttresses, and that the face of the wall and its buttresses had been repeatedly re-plastered (figs. 6 and fig. 7 for detail). In the Ubaid and

Figure 7. Close-up of Area B earlier LC1 phase E enclosure room wall exterior with brick buttress and multiple replasterings.



LC1, niched and buttressed walls often characterized ritual and other public buildings at northern Mesopotamian sites such as Tepe Gawra in Iraq and Hammam et Turkman in Syria.

To the east and southeast of the enclosure was a series of outdoor surfaces sloping gently down to the east and partially covered by wash deposits from the erosion/decay of the exterior (southeast) face of walls 90008 and 90041. These wash layers and outdoor work surfaces had been cut through by the bottom of the north-south gully that cut through the east edge of op. 9 and the west edge of op. 2 (see stratigraphic section—fig. 5).

OPERATION 10

Op. 10 is a 10 × 10 m trench at the western end of area B. In 2018 excavations were supervised by Lucas Proctor and Maria Antoniou. Excavations focused on the northern half of the trench in order to explore the large mudbrick-walled enclosure and its interior. Three aspects of the enclosure were investigated: (a) the SW wall 28/30 of the enclosure, (b) a street or passageway running along the north face of the wall inside the enclosure, and (c) a freestanding multi-roomed structure that bounded the street on its north side, and extended into the northeast corner of the trench (figs. 3 and 4).

The 11-meter-long south wall 100028/30 of the enclosure extends from the north baulk in the NW corner of op. 10, running southeast until it enters the east baulk, and apparently forms a corner on the other side of the baulk in op. 9 with wall 8, the southwestern wall of the enclosure in adjacent op. 9. Wall 30 was at least 3–4 courses wide, and preserved to a width of 1.40–1.50 m. The height of the wall is uncertain, since excavations did not reach its base. The red clay matrix of the wall bricks was badly eroded on its south face. Wall 100028 is a narrow construction, built from longer, narrower brownish-gray bricks that run along the north face of earlier wall 100030 and was apparently designed to reinforce it. Two small buttresses, one brick wide, abutted the north face of wall 100028. The area outside of the enclosure to the southwest of wall 30 appears to have been an open-air work surface with a pebble pavement, sloping down gradually to the south (figs. 3 and 4).

Inside the enclosure, a narrow passageway or street ran between the north face of wall 28/30 and the freestanding structure to the north, on the inside of the enclosure. The structure, located at the juncture of ops. 9 and 10 along the north baulk, had at least two rooms (the “west room” and the “east room”) divided by double walls 100106 and 100107 that abutted the north face of walls 100108/120. Walls 100108/120 are made of long narrow bricks laid one course wide. Only a small corner of the west room was exposed inside op. 10; the remaining parts of the structure lie in the as-yet-unexcavated area to the north of area B ops. 9 and 10. A larger area of the east room was exposed through the excavation of room deposit locus 100109. A later LC1 pit locus 100111 cut down into room deposit 109. Wall 108 continued into the east baulk that forms the boundary between ops. 9 and 10. The northeast corner of this structure was exposed in op. 10, where the east wall 100033 formed a corner with the north wall 100034, exposing portions of three out of the four walls of the structure (see figures 4 and 5).

The freestanding structure in ops 9/10 yielded a range of unusual artifacts (fig. 8)—notably two complete rounded-base polished stone bowls (SR9490 and 9491), a ground and polished stone ax (SR9718), and a complete baked clay muller (SR9707). Although the baked clay mullers with rounded mushroom-shaped heads and a curved, pointed distal end are typical of the Ubaid period, there is increasing evidence (e.g., from Tell Zeidan in Syria) that the use of mullers continued into the LC1 period. Fauna from the structure had different proportions of domesticated animals from those found in the op. 2 domestic area, along with wild gazelle and a surprising number of dog bones—several with signs of butchery, indicating that they had been consumed by humans.



Figure 8. LC1 objects from the rooms inside the mud brick enclosure. Objects, faunal remains, and micro-artifacts from these rooms and the free-standing structure in ops 9 and 10 differ markedly from the domestic assemblage found in op. 2.

The latest deposits excavated in op. 10 are a series of eight circular grain storage pits whose ceramics, such as button bases, date them to the later second millennium BC Middle Assyrian period. Heavy erosion had washed away the original ground surface from which these pits were dug, so that only the shallow pit bottoms were preserved.

MICROARCHAEOLOGY

In 2019, Sam Harris (University of Chicago) continued to collect micro-archaeological samples from rooms, courtyards, and open-air work surfaces in ops. 2, 9, and 10. Microarchaeology involves the collection and analysis of very small fragments (under 1 cm) of ceramics, bone, chipped stone, and shell that had been dropped and then incorporated into the floor surfaces. This micro-debris is valuable because it reflects the actual locations where ancient economic activities took place. The contexts selected for sampling were divided into a 50 cm grid, and samples of sediment were collected from the top 2–3 cm of the floor matrix in each grid square. The analyzed samples of the different types of materials can then be used to map the distribution of the materials across the floors and surfaces to reconstruct the patterning of ancient economic activities at the site.

From 2017 to 2019, 151 microarchaeology samples were collected from 30 individual contexts in Area B ops. 2, 9, and 10. These included rooms of domestic houses, courtyards of domestic houses, outdoor surfaces, a mudbrick platform, a cobbled outdoor workspace, and the rooms inside the large non-domestic mudbrick enclosure in ops. 9 and 10. Nearly all of the contexts sampled are presumed to date to the earlier and later phases of the LC1 occupation of Area B.

Although analyses are ongoing, the initial results show clear differences between the overall micro-artifact densities of different types of archaeological contexts such as indoor surfaces, outdoor surfaces, trash deposits, platforms, and courtyards (fig.10).

The most striking result of the micro-archaeological data collection was the stark difference in debris profiles between domestic contexts and those from the large, nondomestic building complex

in op. 9. A comparison of the “cleanliness index,” representing the density of the common classes of microdebris per liter in a sample, shows how dramatically more dense domestic spaces were than the rooms of the large non-domestic building. This indicates that the use of the nondomestic building was limited to specific activities and, probably, to specific people and specific times. Not all activity produces substantial micro-debris, but many common activities, from craft manufacture to tool use to food preparation and consumption, along with storage, can be expected to produce observable debris, and the substantially cleaner micro-debris profile argues strongly for limited and/or less frequent activity inside the nondomestic mudbrick enclosure.

Overall, the micro-archaeological sampling at Surezha to date has provided us with some of the finest-grained data on activity area, domestic production, and the use of space in Late Chalcolithic northern Iraq, and indeed in the Late Chalcolithic of greater Mesopotamia as a whole. The data illuminate the important differences among three kinds of spaces: “private” domestic spaces, “open public spaces” of work and activity, and “restricted public spaces” to which access was limited (such as the large non-domestic mud brick enclosure in ops. 9 and 10).

The currently available data do not show good evidence for the specialization of production

or the differentiation of activity across domestic spaces. This suggests that major shifts in the organization of production evident by the fourth millennium had not yet taken place at Surezha in the fifth-millennium Late Chalcolith-



Figure 9. Complete and fragmentary baked clay “mullers” from the 2019 field season at Surezha. Mullers seem to have been used as pestles to grind soft materials. Although generally considered as diagnostics for the Ubaid period, the use of mullers apparently continued in the LC1 period as well in northern Mesopotamia at sites such as Surezha in Iraq and Tell Zeidan in Syria.

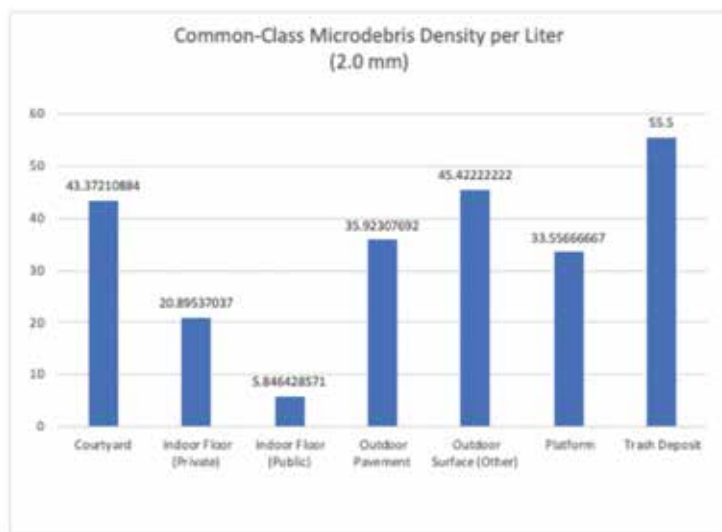


Figure 10. Density of micro-archaeological debris in different types of LC1 contexts. The clear contrast in densities between in indoor floors of rooms inside the op. 9-10 mud brick enclosure versus the indoor floors of the house rooms in op. 2 suggest clear differences in activities between the domestic and non-domestic parts of the LC1 settlement at Surezha.

ic 1, although further exposures may change this picture. Outdoor workspaces were probably shared by community members and multiple households. Some food preparation was centered in the home kitchen, while some took place outside the home, lending support to the suggestion that the Late Chalcolithic 1 societies of northern Iraq were composed of nuclear families with interdependency and communal labor between households.

ZOOARCHAEOLOGY

Analysis of the Surezha animal bone remains is being conducted by Max Price (Massachusetts Institute of Technology). The 2018 and 2019 season produced 4,074 animal remains from ops. 2, 9, and 10. These three 10 × 10 m exposures lie adjacent to one another along an E–W axis on the southern base of the mound. Recovery techniques were primarily hand picking, with dry sieving in primary and secondary contexts. Almost all fauna derived from LC 1 contexts.

Surezha's extensive Ubaid, LC 1, LC 2, and LC 3 deposits permit a glimpse at an evolving economy. The LC 1 deposits, including domestic and non-domestic, are especially well represented. Faunal remains from five seasons at Tell Surezha (2013, 2016, 2017, 2018, 2019) were analyzed with two main research questions in mind: How did animal exploitation change during the development of complex societies on the Erbil plain? Is there evidence for a shift toward a more specialized, wool-focused pastoral economy?

Several patterns are noteworthy. First, sheep and goats are the main taxa, but by no means dominant. Sheep outnumber goats 1.6:1. Moreover, sheep bones were more common than goats. Second, pigs were well represented at 26%, but somewhat less than in the Ubaid and LC 3 phases (see table 1). However, sample sizes for these other phases were small. Third, there is a higher-than-expected number of dog and wolf remains in the assemblage. Several canine bones display cut marks, indicating that the animals were likely butchered and eaten.

<i>Identified Taxa</i>	<i>Ubaid</i>	<i>Ubaid %</i>	<i>LC 1</i>	<i>LC 1 %</i>	<i>LC 2</i>	<i>LC 3</i>	<i>LC 3%</i>
Ovis/Capra	50	50%	500	44%	17	83	48%
Ovis	(4)	—	(69)	—	(2)	(9A)	—
Capra	(1)	—	(56)	—	(8B)	(2)	—
Sus	32	32%	327	29%	0	67	39%
Bos	15	15%	158	14%	0	22	13%
Gazella	3	3%	28	1%	3	1	<1%
Canis	1	1%	95	9%	0	1	<1%
Equus			1				
Vulpes			1				
Cervidae			3				—
Total	101	100%	1113	100%	20	174	100%

Table 1. Surezha Chalcolithic fauna identified to the genus/species level.

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<i>Payne Wear Stage</i>	<i>Ubaid</i>	<i>LC1</i>	<i>LC 1-2</i>	<i>LC 2, LC 2-3, LC3</i>
A				
B				
C	5	4	6	
D	2	11	2	3
E	0	2		.5
F	1	1		.5
G	1.5	2	1.5	
H	1.5	2	.5	
I		1		
Total	11	23	10	4

Table 2. Kill-off profiles, using Payne's (1973) wear stages. Only mandibles with dP4 or M3 counted. The ".5" in cells indicates mandibles between wear stages (e.g., G-H would give a count of .5 to G and H).

Adding the 2019 data to those of other seasons, the picture of an evolving animal economy comes into clearer focus (table 2), especially for the LC 1. With the addition of the 2018–19 fauna we have sufficient material to analyze sheep and goat culling patterns in the LC 1 using mandibular tooth eruption and wear. The data show a heavy focus on prime-aged caprine (six months to two years), indicative of a herding strategy mainly focused on meat production for local consumption. There is little evidence for a preponderance of the older animals (three years and above) that one would expect in a specialized wool-producing economy, at least as far as the kill-off profiles are concerned. The caprine age data are consistent with a subsistence-oriented, generalized herding economy, rather than a specialized surplus-producing system in the LC1 phase at Surezha.

The excavation of ops. 2, 9, and 10 indicates functional differentiation between the domestic architecture in op. 2 and a large mud brick enclosure—apparently non-domestic (public or ritual?) architecture—in ops. 9 and 10. The fauna from these contexts can, in conjunction with other artifactual analyses, shed light on the significance of these areas in the LC 1 period. On a very basic level, comparison of the fauna between the different trenches shows some variation, especially in the amount of canine remains, which were more frequent in op.10 (table 3).

Comparison of the deposits found within the op. 10/9 mudbrick enclosure with the contexts within the domestic architecture in op. 2 showed some interesting spatial-functional contrasts. First, the number of dogs/wolves was much higher (22%) in op. 9/10 intramural contexts. The proportion of cattle (20%) was also somewhat higher than expected, while pigs, sheep, and goats were somewhat lower. Among the wild animals identified, gazelle were much more common in and around the op. 9/10 mudbrick enclosure (n=25) than they were in the op.2 domestic contexts (n=3). On a preliminary basis, the available data suggest that special foods (gazelles, dogs, and perhaps a higher amount of beef) were consumed in and around the large mudbrick enclosure of ops. 9/10. By contrast, slightly larger amounts of pigs, sheep, and goats were consumed in the domestic area of op. 2.

ARCHAEOBOTANY

Analysis of the archaeobotanical remains from Surezha is being conducted by Lucas Proctor (University of Connecticut). Archaeobotanical remains were processed with water-based flotation, and the light fractions examined for charred remains of wood charcoal, seeds, and other plant fragments. Identification of botanical remains from the eighty samples analyzed to date suggests that the inhabitants of Surezha practiced rain-fed agriculture focusing primarily on drought-tolerant pulses and cereal crops, such as barley and emmer wheat.

<i>Identified Taxa</i>	<i>Op. 10 LC 1</i>	<i>Op. 9 LC 1</i>	<i>Op. 2 LC 1</i>
Ovis/Capra	138 [37%]	137 [45%]	178 [50%]
Ovis	(20)	(2)	(34)
Capra	(13)	(13)	(10)
Sus	114 [30%]	76 [25%]	116 [33%]
Bos	50 [13%]	65 [24%]	38 [11%]
Canis	62 [16%]	13 [4%]	20 [6%]
Gazella	10	15	3
Cervid	1		1
Vulpes	1		
Equid	1		
Total WILD	[4%]	[5%]	[7%]
Total	377	306	356

Table 3. Taxonomic comparison of 2018–19 operations from LC 1 period only.

Dung spherulite, wood charcoal, and macrobotanical analysis confirms that dung fuel was abundantly used throughout the Ubaid and Late Chalcolithic periods at the site, while wood charcoal was rarely encountered. Samples examined from primary fuel-related deposits, such as hearths and ovens, and secondary/tertiary refuse deposits, including pits and middens, had the greatest concentrations of dung spherulites, suggesting that particularly in these samples, charred botanical remains are most probably derived largely from dung fuel burning.

Based on the composition of the macrobotanical assemblage, we can infer that animal herds were pastured on steppe areas away from the site, but do not appear to have been grazed on the stubble of agricultural fields given the lack of cereal culm or barley chaff from the Late Chalcolithic assemblage. Agricultural production and grazing practices appear to have been largely stable during the Ubaid, LC1, and LC 2–3 periods. The primary cultivars produced at Surezha in the Chalcolithic were hulled wheats and barley, with free-threshing wheats, several varieties of pulses, and flax as important secondary crops. These results broadly agree with the few available archaeobotanical data from Ubaid/LC1 sites across northern Mesopotamia, suggesting that regional specialization in agricultural production was limited. The identification of flax seeds, combined with artifactual evidence for spinning and weaving equipment, hints at a possible domestic craft production of textiles. Several samples from a probable feasting pit present unique information on the consumption of other food resources during the LC1-2, thanks to the preservation of a large cache of fig, caper, purslane, and turnsole seeds via mineralization. Plant-based information on feasting is rarely encountered in the archaeobotanical record due to preservation bias.

A preliminary assessment was conducted for the most recent batch of exported samples from the 2019 season, focusing on the mudbrick enclosure and the free-standing structure inside it (ops. 9 and 10). Five samples from these rooms were examined. Four of the samples contained relatively little in the way of preserved carbonized remains. In op. 10, however, sample HN 100220—from a laminar ash dump in the freestanding structure inside the mudbrick enclosure—was the richest of the five examined samples, containing 27 identifiable taxa and a total of 289 identifiable specimens (table 4). This sample is dominated by cereal grains and chaff, with a particular emphasis on barley

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SR #	8204	8206	8214	9816	9810
Op	9	9	10	10	10
Locus	83	87	220	237	243
Lot	287	286	361	393	396
Flotation by	LSP	LSP	LSP	LSP	LSP
Phasing	LC1	LC 1-2	LC1 C	LC1 C	LC1 C
Deposit Class	Tertiary	Secondary	Secondary	Feature	Tertiary
Deposit type	General room buildup	Trash pit	Ash scatter/dumping	Floor/ indoor surface	General room buildup
Date collected	22-Sep-19	22-Sep-19	30-Sep-19	7-Oct-19	7-Oct-19
Date floated	1-Oct-19	1-Oct-19	2-Oct-19	7-Oct-19	7-Oct-19
Flotation Volume (L)	4	5	5	5	5
Light Fraction Vol (mL)	<1	1	11	1	<1
> 4 mm weight (g)	0	0	0.096	0.072	0
4-2 mm weight (g)	0.078	0.033	1.002	0.091	n/a
2-1mm weight (g)	0.109	0.151	1.126	0.045	n/a
< 1 mm weight (g)	0.124	0.152	0.723	0.047	n/a
Total weight (g)	0.311	0.336	2.947	0.255	0.154
sorted by:	LSP	LSP	LSP	LSP	LSP
Triticum monococcum			1		
Triticum monococcum spikelet fork			1		
Triticum dicoccum glume base			1		
Triticum sp.			11		1
Triticum sp. sprouted			1		
Triticum sp. rachis			2		
Hordeum sp.		2	51		
Hordeum sp. "sprouted"			3		
Hordeum sp. tail grain			4		
cereal grain indet. (whole)			40		
cereal grain indet. (frags)	4	10	37		7
Triticum spikelet forks			1		
Triticum glume bases	2				2
cereal embryo			3		
Awn fragments			1		
Vicia ervilia (ct. by cotly.)			12		
cf. Lens sp. (ct. by cotly.)			2		
Pisum sp (ct. by cotly.)			4		
Large Legume indet.		1	13		
POACEAE indet.		4	21	2	1
Aegilops sp.			1		
Aegilops sp. glume base (frags)			1		

SR #	8204	8206	8214	9816	9810
Avena sp. (wild)			3		
Bromus ssp.			13		
Stipa sp.			1		
Lolium cf. rigidum		5	48		
Hordeum spontaneum			4		
Arnebia cf. decumbens			1		
Astragalus sp.		2			
Trigonella sp.		1			
Trigonella astroites			6		
Malva ssp.			1		
Asperula sp.			1		
bread/dung etc.		3	18		
Indet. seed (> 1 mm)			17		
Indet. seed (< 1 mm)		2			
Indet. material > 1 mm	2				
GASTROPODA	2	1			1
OSTRACODA	2				
Animal bone	1	2	1		
1-2 mm frags. indet.	38	0	xx		x
wood > 4 mm weight (g)	0	0	0.049	0.072	0
wood 4-2 mm weight (g)	0	0	0.171	0.081	0.013
wood 1-2 mm	0.007	0.001	0.08	0.022	x

x = present but not counted.

Table 4. Archaeobotanical remains from five samples recovered in 2019 from the free-standing structure inside the large mudbrick enclosure of ops. 9/10.

(Hordeum sp.). Both einkorn (*Tr. monococcum*) and emmer (*Tr. dicoccum*) chaff were identified. Sprouted examples of both wheat and barley were identified, which point to either spoilage of stored crops or malting for beer making. Given the low number of sprouted grains, the fact that both wheat and barley were sprouted, and the lack of any other supporting evidence from this context, spoilage would seem the most likely cause.

This sample also featured an unusually high number of economic legumes, including bitter vetch (*Vicia ervilia*), probable lentil (cf. *Lens*), and common pea (*Pisum* sp.). Greater abundances of pulses have been noted at some contemporaneous Ubaid/Late Chalcolithic 1 sites in the upland Sharizor Plain to the southwest of Surezha. The wild/weedy composition of the sample strongly favors grasses, and in particular brome grass (*Bromus* ssp.) and stiff ryegrass (*Lolium* cf. *rigidum*). Stiff ryegrass has been commonly encountered in the Surezha assemblage, but, while brome grass is present in other samples, its relative abundance here is unusual. Finally, this sample also contained a greater quantity of large, identifiable wood fragments than has been the case for the Surezha assemblage to date, which holds promise for further exploration of fuel use and the local vegetation of the Erbil plain.

CERAMICS AND INSTRUMENTAL NEUTRON ACTIVATION ANALYSIS (INAA) OF DALMA WARES

The 2019 analyses of the Surezha ceramics were conducted by John Alden (University of Michigan) and Gil Stein (University of Chicago), while archaeometric analyses using Instrumental Neutron Activation Analysis (INAA) and thin-section petrography were conducted by Leah Minc (Oregon State University) assisted by Savanna Buehlman-Barbeau (Oregon State University). In all, 293 excavated pottery lots were processed, totaling 10,567 sherds, of which 3,105 were diagnostic forms such as rims, bases, or sherds with surface treatment such as painting, incision, or impressed decoration (table 5).

At Surezha, painting as a form of ceramic decoration persisted throughout the LC1 period, continuing a tradition of surface treatment and motifs that continued and evolved from its origins in the earlier Ubaid period. The 2019 excavated ceramics from area B ops. 2, 9, and 10 show that painting was common in both the early and middle LC1 phases at Surezha, and it persisted through to the end of the LC1. Painted sherds form 55.6% of all diagnostics. (n=3105). Even when the comparison is limited to rim sherds as a way to standardize comparison, painted rims still form 42.6% of all rim sherds (n=1522). This is noteworthy because in other regions of northern Mesopotamia, such as the Euphrates and Balikh valleys and the Khabur headwaters region around Tell Brak, painted decoration disappeared rapidly in the early stages of the LC1 period. The continuing presence of painting in the LC1 at Surezha suggests that the Erbil plain maintained its own highly localized traditions of ceramic production that differed in significant ways from neighboring, contemporaneous regions. The Erbil plain also differed from neighboring regions through the absence of “sprig ware,” internally cross-hatch-incised bowls, flint scraping as a manufacturing technique, Coba bowls, and “wide mouthed flower pot” bowls, even though these forms are common diagnostics of the LC1 period elsewhere in northern Mesopotamia.

An additional distinctive characteristic of the LC1 ceramics at Surezha was the presence of small amounts of chaff-tempered handmade Dalma wares as a foreign ceramic style characteristic of the Zagros Mountains in northwestern Iran just south of Lake Urmia and adjacent to the present-day border between Iraqi Kurdistan and the Iranian provinces of Azerbaijan, Kurdistan, Hamadan, and Kermanshah. Both Dalma impressed wares (also called “Dalma surface manipulated wares”) and Dalma painted wares have been identified in the uppermost LC1 deposits at Surezha (fig. 11). Recent Iranian excavations show that the strata containing Dalma wares at the sites in northwestern Iran have Accelerator Mass Spectrometry (AMS) radiocarbon dates between 5000 and 4500 BC. This is consistent with the AMS C14 dates for the LC1 period at Surezha. In our excavations to date, we have identified only 97 Dalma diagnostic ceramics (mostly impressed/surface manipulated wares), less than 1% of total sherds in the late LC1 deposits where they were present.

Despite their small numbers, the Dalma wares are significant because they provide some of the earliest evidence for Late Chalcolithic inter-regional interaction between the Erbil plain and the

Table 5: Summary of LC1 ceramic counts and weights from the 2019 field season.

Operation	Total sherds	Total diagnostics	Total rims	Total bases	Total painted rims	Total painted body
2	2235	667	255	24	93	272
9	2730	856	323	47	129	323
10	5602	1582	489	154	233	675
TOTAL	10567	3105	1067	225	455	1270



Figure 11. LEFT: Dalma-style impressed and painted chaff tempered ceramics from Surezha (Erbil province, Kurdistan region, Iraq) RIGHT: Dalma-style impressed and painted chaff tempered ceramics from the type site of Dalma tepe (south of Lake Urmia in Azerbaijan province, Iran). Dalma tepe sherd photos courtesy of Penn Museum, University of Pennsylvania.

highlands of northwestern Iran. To investigate the nature of this interaction, in 2018 we began a program of Instrumental Neutron Activation Analysis (INAA) and petrographic thin sectioning, conducted by Leah Minc, assisted by Savanna Buehlman-Barbeau at the Oregon State University Radiation Laboratory Archaeometry Center. In 2018 and 2019, their INAA analyses examined thirty-four sherds of Dalma impressed and painted wares from Surezha, along with the local Erbil plain style yellow buff wares, eight kiln wasters and five unfired clay objects as proxy measures for local clays at Surezha. In addition, the Penn Museum loaned our INAA project forty-two painted and impressed wares from the University of Pennsylvania excavations at the type site of Dalma Tepe in the Lake Urmia Basin of northwestern Iran. This allows us to compare Dalma-style ceramics from Surezha with material from the Dalma heartland in Iran.

Principal components analysis of the Surezha ceramics (Dalma wares and local buff wares), based on twenty-seven elements, suggests that there were two main paste groups—one with higher aluminum (Al) concentrations indicating greater percentages of clay (Surezha-1), and one with lower Al and correspondingly greater percentages of mineral inclusions (Surezha-2). The parallel profiles of these two groups suggest a classic “dilution pattern,” in which the increased concentration of some major element (usually introduced as temper) reduces the concentrations of other minor and trace elements. In this case, the diluting factor is probably quartz (silica) sand, an element not measured by INAA. In other words, both compositional groups were produced at Surezha, but the small contrasts between them reflected differences in the use of the sand temper that was added by

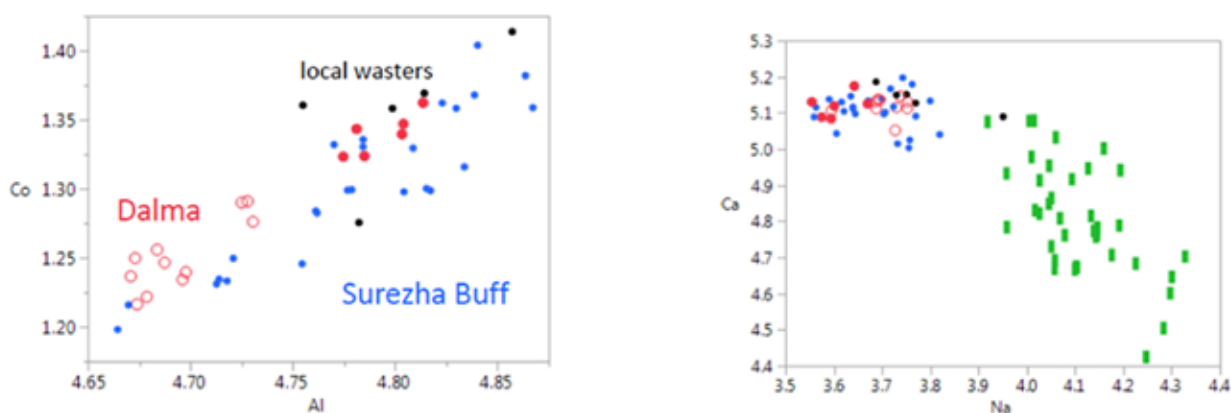
Total incised	Total other diagnostics	Painted rims to total rims ratio	Diagnostics to total sherds ratio	Total painted to total diagnostics ratio	Total ceramic weights	Mean ceramic weights
4	19	0.365	0.298	0.547	73.1	0.0327
2	32	0.399	0.314	0.528	93.6	0.0343
12	19	0.476	0.282	0.574	139.3	0.0249
18	70	0.426	0.294	0.556	306	

pottery to some vessels in the course of manufacture, rather than actual variation in the constituent clays. Comparison of the geochemical composition of the Dalma-style sherds from Surezha with the predominant local yellowish buff ware ceramics from Surezha and with overfired kiln wasters from the site showed clearly that all three sets of ceramics were manufactured from the same constituent clays characteristic of the Erbil plain (fig. 12, left).

All but one of the thirty-four Dalma ware sherds found at Surezha appear to fall well within the compositional profile of the two local Surezha clay paste groups. The remaining example appears to be an outlier of Surezha-1. This fit suggests that these Dalma-style ceramics were produced locally on the Erbil plain, rather than imported over long distances from western Iran.

The most important outcome of the INAA analysis is that the chemical composition of the ceramics from Dalma Tepe is clearly distinct from that of the Dalma-style material found at Surezha (fig. 12, right). As a group, Dalma Tepe sherds are higher in sodium content and generally lower in calcium content than Surezha. On this basis we can be reasonably confident that there was little or no actual exchange of ceramics between the two sites, and the Dalma-style wares at Surezha were manufactured locally on the Erbil plain. Eliminating the possibility that the Dalma-style pots had been transported from highland Iran raises the as yet unanswered question of how and why small amounts of this foreign style of ceramics were being manufactured and used on the Erbil plain in the early fifth millennium BC.

INAA analyses of Dalma style Painted and Impressed wares from Dalma Tepe (Iran, n=42) and Surezha (Erbil, n=34)



Dalma-style (red) & local Surezha – Style (blue) – at Surezha

Site of Surezha (red and blue) compared with site of Dalma tepe (green)

Figure 12. INAA compositional analyses of ceramics from Surezha and Dalma Tepe (Iran).

LEFT: Ca-Al plot shows that the Dalma-style ceramics from Surezha have clays that match local styles of pottery and kiln wasters from Surezha, indicating that all were locally manufactured on the Erbil plain. RIGHT: Ca-Na plot shows that the Dalma-style ceramics from Surezha (red and blue dots at upper left portion of the plot) are compositionally different from the Dalma-style ceramics excavated at Dalma Tepe in Iran (green dots at right side of plot). Data from: Minc 2019 preliminary INAA report; Minc and Buehlman Barbeau 2020 INAA report.

CONCLUSIONS

In the 2019 field season at Surezha, our focus on ops. 2, 9, and 10 in area B at the south end of the high mound allowed us to expose a contiguous area of 300 square meters of the LC1 settlement. We have recovered architectural, artifactual, micro-archaeological, and zooarchaeological evidence for functional differentiation between the eastern and western parts of Area B. Op. 2 consisted of an area of domestic houses, while ops. 9 and 10 comprised a non-domestic area consisting of a large mudbrick enclosure whose rooms, free-standing building, and courtyard area were used for some as-yet-unidentified purpose—possibly ritual. Ceramic evidence suggests some form of contacts across the mountain passes into northwestern Iran, but INAA comparisons of Dalma-style wares from Surezha with those from the type site of Dalma Tepe itself show that these contacts were most likely cultural influences or possibly the seasonal presence of highland migratory pastoral groups rather than actual ceramic exchange. Taken together, the LC1 levels at Surezha suggest the development of an increasingly differentiated complex society that was developing new cultural connections with the neighboring area of highland Iran in the fifth millennium BC.
