

**A MONUMENTAL STRUCTURE  
AND COPPER METALLURGY  
IN THE IRON AGE:  
EXCAVATIONS AT KHIRBAT EN-NAHAS, AREA R  
2009 FINAL REPORT**

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## **INTRODUCTION AND HISTORY OF RESEARCH**

Area R is the signifier arbitrarily given by the Edom Lowlands Archaeology Project (ELRAP) to the largest building at Khirbat en-Nahas excluding the fortress and its immediate surroundings (Figure 1). The monumental structure appears as a square structure on the map published by Nelson Glueck (Glueck 1935: 166), and may be one of those buildings he suggested may have been, but most likely was not, a defensive tower (Glueck 1935: 27). In 2006, the structure and metallurgical levels below were first probed by ELRAP, under the supervision of Yoav Arbel in consultation with Principal Investigators Dr. Thomas E. Levy and Dr. Muhammad Najjar (Arbel et al. 2006). In October and November of 2009, the Edom Lowlands Archaeology Project further excavated Area R, under the supervision of Marc Beherec in consultation with Principal Investigators Dr. Levy and Dr. Najjar. The 2009 excavations revealed all of the interior rooms of the main structure with the exception of the majority of a central courtyard and also further probed the metallurgical levels below the courtyard of this structure, including a mostly-intact copper smelting furnace. This is the report of the findings of the 2009 field season.

Khirbat en-Nahas was visited by Nelson Glueck during his 1934 survey of Eastern Palestine. He published a map which shows a large square building, which can only be the Area R structure, in the east of the site (Glueck 1935: 166). “Overlooking the small wadi on the east side is a whole row of ruined buildings. The outer walls of some of them are still fairly intact. It is possible that some of them may have served as watch-towers, although this is unlikely in view of the general nature of the site, which did not require any protection from the east, and which depended for security against any major attack from the west upon the key fortress of Kh. Hamr

Ifdan” (Glueck 1935: 27). Glueck is silent on these structures in his popular book, *The Other Side of the Jordan* (Glueck 1940).

Area R is located near several other areas excavated by the German Mining Museum and the Edom Lowlands Regional Archaeology Project. Area T, another monumental structure, is found about 25 meters to the east. Area S, a metallurgical area and associated building is adjacent to the Area R perimeter wall. The German Mining Museum excavations are located about thirty meters southeast of Area R, on the opposite side of Area S. A small wadi passes behind Area R.

The 2006 probe of Area R revealed Room 1 and trenched the southwest of Room 2 (the “Gallery” of the 2006 report) of the Stratum 2 monumental building. They also revealed the northwest exterior walls of the building and segments of the structure’s perimeter wall. In addition, they sampled the metallurgical levels of Stratum 3, below the courtyard. These excavations are detailed in the 2006 Area R final report (Arbel et al. 2006).

The intentions of the 2009 excavations were twofold. First, a better understanding of the monumental structure was sought. Secondly, the excavation strove for a clarification of the nature of the metallurgical deposits beneath this structure. These goals were considered necessary to the ELRAP aim of elucidating the nature of control over the site and the role copper production played in the development of society in the region (Levy et al. 2001).



Figure . Aerial photo of Khirbat en-Nahas, taken in 1999, showing Area R. Photo source: ROHR Productions.

Personnel for the 2009 excavations consisted of University of California, San Diego students, volunteers, and local Bedouin workers. Marc Beherec, the author of this report, served as supervisor. Eric Olson filled the role of assistant supervisor. Yoav Arbel offered his professional advice during the first two weeks of the season. Kyle Knabb filled in as supervisor on October 6, 2009, because of the supervisor's illness, and Erez Ben-Yosef substituted as supervisor on November 19, 20, and 22, while the author conducted excavations at Wadi Fidan 40 and Wadi Fidan 45 (Beherec 2009). Kathleen Bennalack served as assistant supervisor on November 28 and 29 due to Eric Olson's illness. Students and volunteers included Lucinda Beck, Liam Branigan, Kamron Fabira, Frank Ho, Jonathan Hu, Breanne Kebely, Carol Seibert, Craig Smitheram, and Jesse Wooton. Local workers included Haroun Altalalf Amarin, Salem

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## **EXCAVATION METHODOLOGY**

Area R was excavated according to standard archaeological procedures in the southern Levant and documented following the digital recording system of the Edom Lowlands Archaeology Project (Levy and Smith 2007). These methods differed somewhat in the metallurgical layers beneath the Area R courtyard from the methods employed within and around the monumental structure.

Within the monumental structure, first, stone collapse was removed from the surface being excavated. For logistical reasons, these stones were often piled on top of adjacent collapse before being carried and carted away to three stone piles. Stones from the northeast portion of the area were taken to a stone pile near backdirt adjacent to Area T. Stones from the rest of the building were first piled immediately behind the building and then, as manpower permitted, taken to a stone pile in the wadi northwest of Area R. Time did not permit moving all of the stones behind the building this season.

After the removal of the outer crust of wall collapse, it was generally possible to trace the original wall lines. When this was not possible, the first levels of fill were removed in arbitrary loci using picks and turiahs until the wall lines were visible. After this point, loci were

determined horizontally by room limits and vertically by arbitrary depths from the presumed floor level as indicated by comparison with the 2006 excavations, or according to stratigraphic changes when these were visible. When a point within approximately 1.5 meters of the presumed floor level was reached, all sediments were sieved with ¼” screens. Soil samples were taken periodically in random locations both in the fill and at floor levels. The dense amounts of building stones necessitated the use of picks and turiahs essentially up to floor levels. All backdirt was discarded in the large wadi behind Area T.

In the metallurgical areas, arbitrary loci were designated and excavated using a combination of turiahs and trowels. When walls were uncovered, loci were defined using these walls as limits. Apparent features were designated as loci and carefully excavated with trowels. All slag larger than approximately 2 ½ cm across was collected and weighed. Samples of small, medium, and large pieces were then collected before the remainder was discarded. A sample, consisting of one guffah-full of sediment, was taken from each locus defined as a slag layer and sieved through a 1/8” screen, with the entire contents being collected.

All loci were documented in three dimensions using an Electronic Distance Meter (EDM) and RECON handset. Bone, pottery, copper ore, slag, and similar materials were collected as bulk finds from these loci. Other small finds were point plotted using the digital instruments (Figure 2). When special finds were found in the sieve, an arbitrary point from their approximate location was recorded using the EDM, but their sieved provenience was noted in the paperwork.

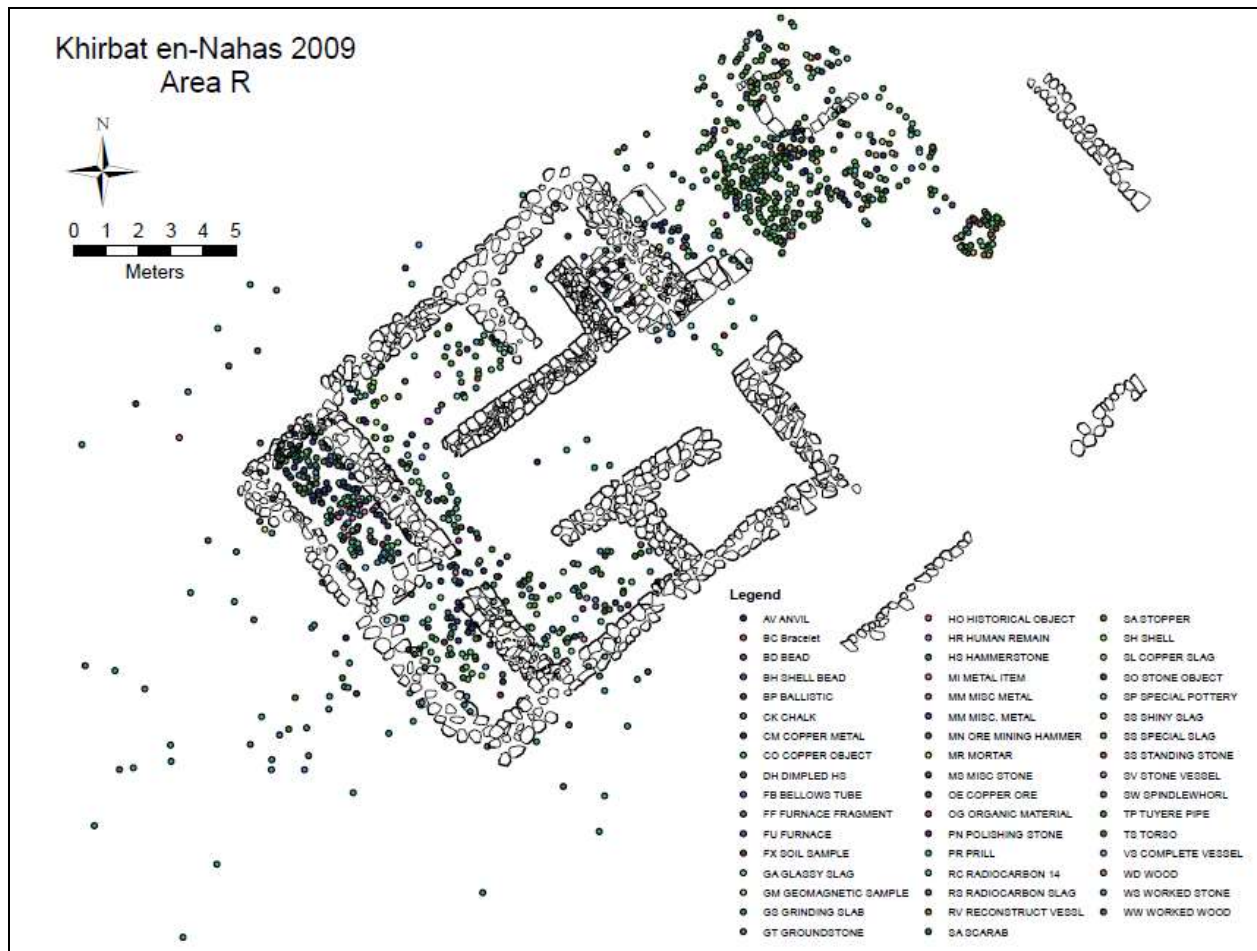


Figure : Area R architecture and finds. Map by Jon Hu, Craig Smitheram, and Kyle Knabb.

## STRATUM R1: ABANDONMENT AND EPHEMERAL REUSE

The uppermost levels in the structure at Area R testify to abandonment and ephemeral reuse of the monumental structure. Stratum 1a is represented by the uppermost level of wall collapse. Stratum R1b consists of the fill – yellow-brown aeolian silt densely packed with wall collapse, yielding to a darker brown silt also densely packed with wall collapse. Radiocarbon dating of the 2006 probe suggests this collapse and fill date to the last three millennia. Some reuse and to a limited extent rebuilding dates to the Nabatean period, and other reuse is modern Bedouin. Other reuse cannot be easily dated.

Nabatean reuse of the building is indicated by some ceramic finds in the uppermost levels of fill. A reconstructable juglet, identified by Yoav Arbel as Nabatean/Roman, was recovered in the topmost stratum of wall collapse and fill in Room 5 (locus R09L019; EDM: R09F0122). That a certain amount of rebuilding of the structure was carried out in the Nabatean period is shown by the find of a Nabatean pot base (EDM: R09F0077) found within wall locus R09L008, when the topmost course of that wall was removed for safety reasons.

At an unknown time a circular structure of indeterminate use was formed from the building collapse over Room 8 (R09L018). It is constructed of the uppermost level of loose building collapse, arranged in a circle about 3-5 stones wide, approximately 2.9 meters in diameter, open in the center (Figures 3, 4). The construction stands about 0.8 meters and about four stones high. The interior is about 0.9 meters in diameter, though the collapse makes it difficult to accurately measure. The floor consisted of the aeolian silt fill found across the monumental structure in the collapse of which it was built. No artifacts were encountered during the excavation of this structure.





Figure . The Stratum R1a circular feature (R09L018) from the air, before excavation.



Figure : Close-up of the circular feature, before excavation (2006 photo).

The use of the Stratum R1a circular feature remains unknown. Arbel and his associates note the similarities between this structure and similar features around Khirbat en-Nahas' Area A

gatehouse (Arbel et al. 2006). Remains of plastic crates within one of these features suggests use by modern Bedouin, though their date of construction remains uncertain. Carol Palmer, Helen Smith, and Patrick Daly (2007: 379) note the use of meter- to 1.5 meter-wide stone circles being used as pens for very young kids in Wadi Faynan. This is a likely explanation for the structures near the gatehouse, but the placement of the Stratum R1a structure atop a mound and away from any similar features, coupled with the thickness of the feature's walls and the effort used to construct it, seem together to make it unlikely that the feature was intended for this use.

However, recent Bedouin use of the area is testified to by the few modern objects found in the collapse. These include a piece of burlap (R09F0117), a metal strap (R09F0003), and a fire-starting implement identified by the Bedouin workers as an old candle (R09F1004). A spherical red bead, probably made of plastic and found on the surface near Area T (R09F1783), may also be testament to modern pastoral nomadic activity.

Although the accumulation of the Stratum 1 sediments date to the building's abandonment, many of the artifacts found therein likely derive from its construction and use. The numerous groundstone artifacts recovered were most likely reused as building stones. Many of the portable artifacts are believed to have fallen from the building's upper story or roof, and should be properly interpreted as belonging to the Stratum 2 monumental structure.

## **STRATUM 2: THE MONUMENTAL STRUCTURE**

The most visible aspect of Area R is the monumental building, an almost square structure measuring 14.75 meters long and 13.16 meters wide. The rooms of the monumental structure were numbered counterclockwise as they were encountered, starting with the southwestern corner room which was excavated in 2006 (Figure 5). They are described in detail below. This

structure consists of five rooms (Rooms 1 and 5-8) and a stairwell (Rooms 3-4) surrounding a central courtyard (Room 2). The walls of the structure, both interior and exterior, are generally about one meter (two to three stones) in thickness, constructed of dry-laid stone (Table 1, Figure 6). The interior walls interlock with the exterior walls. The most common building stones are dolomite and shale from nearby formations, broken to the appropriate size and shape along their natural bedding planes. In extremely rare instances apparent tool marks are visible on one or more surfaces of these stones. One example are the probable tool marks on one surface of a 0.54 meter by 0.34 meter by 0.30 meter stone about 1.2 meters above floor level in the northeast corner of wall locus R09L086 (Figure 7). Much less common are sandstone boulders. When used, the sandstone takes the form either of unworked, solution eroded boulders, or reused groundstone. Although the closest rock formations are granite, this is the least common building stone. When granite is used, it also usually appears as unworked boulders. Smaller stones are used for snecking; these are almost uniformly dolomite and shale.





Figure : Post-excavation aerial photo of Area R, including room numbers of the Stratum 2 building.



Figure : The northwest corner of Room 5, displaying construction technique of wall locus R09022.

**Table 1: Stratum R2b walls.**

<b>Locus</b>	<b>Description</b>	<b>Length</b>	<b>Width</b>	<b>Surviving height</b>
R09L148	Northeastern (front) perimeter wall. Includes R09L103 (2006 locus).	22.3 m.		
R09L145	Northwestern (side) perimeter wall.	32.6 m.		
R09L146	Southwestern (side) perimeter wall. Includes R09L114 (2006 locus).	12.1 m. visible	0.9 m.	

R09L147	Southwestern (back) perimeter wall.	6.4 m. visible	0.9 m.	
R09L016	Northwestern entrance flaring wall.	2.05 m.	0.97 m. (2 stones).	1.95 m. (8 courses).
R09L091	Western exterior (front) wall (includes leaning wall segment R09L026).	5.91 m.	0.82 m. (3 stones).	2.13 m. (12 courses).
R09L022	Northern exterior (side) wall (includes R09L120).	14.75 m.	1.0 m. (3 stones).	2.32 m. (15 courses).
R09L008	Interior wall between Rooms 3 and 4.	3.05 m.	0.94 m. (3 stones).	1.79 m. (13 courses).
R09L007	Interior wall between Rooms 4 and 5.	5.2 m.	1.3 m. at joint with exterior wall R09L022, 1.03 m. at joint with interior wall R09L006 (3 stones).	2.3 m. (12 courses).
R09L006	Interior wall between Room 2 and Rooms 4 and 5.	7.13 m.	0.98 m. (3 stones).	1.89 m. (10 courses).
R09L039	Interior wall between Rooms 5 and 6.	4.8 m.	1.04 m. (3 stones).	2.54 m. (17 courses).
R09L121	Exterior, southwestern (back) wall of Room 6.	5.15 m.	0.98 m. (3 stones).	1.5 m. (11 courses).
R09L086	Interior wall between Rooms 6 and 7.	4.30 m.	1.03 m. (3 stones).	2.42 m. (17 courses).
R09L150	Exterior, southwestern (back) wall of Room 7.	2.37 m.	1.1 m. (3 stones).	2.0 m. (11 courses).
R09L116	Southeastern exterior (side) wall.	15.3 m.	1.14 m. (3 stones).	2.5 m. (16 courses).
R09L089	Interior wall between Rooms 7 and 8.	4.8 m.	0.97 m. (3 stones).	2.12 m. (15 courses).
R09L095	Interior wall between Rooms 1 and 8.	4.52 m.	0.91 m. (3 stones).	2.8 m. (16 courses).
R09L023	Interior wall between Rooms 2 and 1 and 8.	7.0 m.	0.97 m. (3 stones).	2.8 m. (18 courses).
R09L138	Southeastern entrance flaring wall (2006 locus).	2.03 m.	1.17 m. wide (2 stones).	1.77 m. (10 courses).





Figure : Possible tool marks running diagonally across one face of a dolomite building stone in the northeast corner of wall locus R09L086.

### **The Perimeter Walls**

Surrounding the monumental building on all four sides is a perimeter wall, called the fence in the 2006 excavation reports. The perimeter wall measures 32.6 meters long on the sides of the building, and 22.3 meters wide across the front and back. Where the top of the wall is clear enough to be accurately measured, on the west side and in the back, the wall measures 0.9 meter wide. Two segments of this wall (loci R09L103 and R09L114) were excavated down to their foundations in 2006. Collapse and fill were removed from the top of the back wall (locus R09L147) in the 2009 field season, but only a segment of this wall could be followed. Three corners are visible on the surface, but the northwest corner could not be located. No entryway

has yet be found in the perimeter wall, despite the fact that one of the excavated wall segments (R09L103) runs directly across from the entrance to the building, where one would expect the entrance to lie. The perimeter wall appears to be unbroken around the building, suggesting a stile or ladder, likely of perishable material, was used to enter the courtyard, increasing the defensibility and privacy of the structure. Very little collapse was observed around the perimeter wall, suggesting that its height was not much greater than what survives.

Attached to the outside of the perimeter wall are two unexcavated structures, the functions of which are unknown. Along the northwest wall, a low structure, measuring about eight meters by six meters, is attached to where the perimeter wall is believed to extend beneath collapse (R09L152). To the south, a much larger building, measuring 12 by 15 meters, makes use of the perimeter wall (R09L153). Further structures continue to the south of this, possibly part of the same building complex. Other than the fact that these two structures are connected to the perimeter wall, their relationship to the Area R building remains unknown.

### **The Courtyard and Entranceway**

The perimeter wall demarcates a semiprivate exterior area without the building. In front of the building, this consists of a rectangular space about nineteen meters across the front of the building, extending to eleven meters from the entrance. A floor of beaten earth likely filled this area; fine yellow-brown aeolian silt was encountered across the courtyard at the floor level of the structure.

Attached to the exterior wall is an installation which might be best described as a throne or dais (Figure 8). This is a large, high bench, believed to have served as the seat of an elite official, located about 1.8 meters along the wall from the northern flaring wall at the entrance of



the building. It is constructed of two large limestone or dolomite stones, one set atop another, set against the building's exterior wall. The top stone measures 1 meter by 0.65 meter by 0.38 meter. The stone below measures 0.98 meter by 0.83 meter by 0.31 meter. The bottom stone is offset forward slightly, creating a step which seems to have served as a seat. Large cobbles were placed behind the large lower stone to hold up the lower stone. Small flat stones were also used to help prop up the upper stone. The stones do not interlock with the stones of the wall, so the bench must be seen as an addition to the main structure. The bench is in the light during the morning hours, but in the shade of the wall during the afternoon and heat of the day. The bench is set at an elevation which makes it possible for one sitting upon it to look over the perimeter wall, or for a standard, statue, or person upon the installation to be viewed by others outside the wall.



Figure : The Stratum R2a elite bench, showing its relationship to the northern entrance flaring wall.

The structure was entered through a passage clearly designed to be imposing. Measuring 1.95 meters wide, it is the widest passage in the structure by about half a meter. Flaring walls were constructed on either side of the passage, making the entranceway 2.05 meters long. The door jamb consists of a large single block of stone, measuring 1.01 meter long by 0.35 meter wide, placed across the front entrance (Figure 9). Against the thick walls, on either side of the entrance, were large stone blocks, probably meant to be guards' benches. It is likely that the passage was constructed in order to hold gates, though no evidence of these was found.



Figure : The door jamb at the Stratum 2 building entrance.

## Room 1

Room 1 is located in the southeast corner of the monumental building. It was excavated in 2006. It was measured in 2009 as 4.35 meters long by 2.45 meters wide. It is entered from

the Room 2 courtyard through a passageway 1.5 meters wide in the room's northwest corner. This entrance is immediately to one's left as one enters the building from the exterior. Room 1 is bounded by wall locus R09L023, which separates it from Room 2, locus R09L095 which separates it from Room 8, and exterior wall loci R09L116 and R09L0139. For details of the finds within Room 1, cf. the 2006 final report (Arbel et al. 2006).

## **Room 2**

Room 2 is the central courtyard. When Area R was first probed in 2006, this room was referred to as the Gallery. The exterior entrance, like the entrances to all the rooms except Room 4, opens into this courtyard. Room 2 measures 9.61 meters long by 3.70 meters wide. After the wall lines were made visible through the removal of collapse and fill, the majority of this courtyard was left unexcavated. However, in 2006 a section was dug across the front of the room, from the entrance of Room 1 to the entrance of Room 3. In 2009, a second section was dug across the back of the room, from the entrance of Room 5 to the entrance of Room 8. A scarab (R09F0475, Figure 10) was found in the sieve from sediments taken from this latter section.



Figure : The Room 2 scarab (R09F0475).

### Room 3: The Stairwell

After entering the monumental structure, the entrance to a stairway can be found immediately to one's right. This mirrors the building plan of the Area T monumental structure (Muniz et al. 2006). The entrance to the stairway measures 1.26 meters across. The staircase is constructed of stones set on a solid stone and sediment base. Stones used in the steps are generally large rectangular stones, twenty to fifty centimeters long, placed side by side, with each step consisting of three to four long stones. When the stones are too small, one stone is sometimes set upon another. The steps are each about fifteen to twenty centimeters high. The

stones were in turn covered by a thick layer of mud plaster, four to five centimeters thick, which is preserved in places on the lower seven steps. Ten stairs are preserved (Figure 11). The room was excavated down to the top of the stairs.



Figure : The Room 3 staircase.

#### **Room 4**

Room 4 is most likely a continuation of the Room 3 stairway. It was found full of large chunks of slag and tap slag, piled as high as the wall separating it from Room 5, wall locus R09L007. The space within this room measures just 1.8 meters wide – about half a meter wider than the stairwell in Room 3 – by 3.0 meters long. It is believed that the stairwell continued through Room 3, around wall locus R09L008, through the 0.98 meter wide passageway into Room 4, and through Room 4 up to the second story. Alternatively, a platform may have been erected here on top of the slag fill. Tap slag was also used as fill beneath the steps in the Area T building (Muniz et al. 2006). The room was excavated down about half a meter into the slag layers. As it became clear that this tap slag were piled up as part of the construction of the Stratum R2b building, excavation was abandoned after this point.

#### **Room 5**

Room 5 is entered through a passageway at the northwest corner of the Room 2 courtyard. It is on the opposite end of the courtyard to the right as one enters through the exterior entrance. The entrance measures 1.27 meters across. The room itself measures 5.05 meters long and 2.88 meters wide. Room 5 was excavated down to the level of the crushed slag upon which the building was constructed. A probe through the northeastern half of the room excavated through this slag down to a depth of about thirty centimeters.

High in the sediment of Room 5 (locus R09L034), a tiny chalk votive vessel, measuring less than three centimeters tall, was recovered (Figure 12). This was damaged during excavation, but two pieces were recovered.





Figure : The Room 5 votive vessel (R09F0225).

Within the doorway between Room 2 and Room 5 is the only cooking installation identified in Area R (R09L144). This was uncovered while digging the section through Room 2, which extended into the doorway of Room 5 (R09L129). The feature was identified first as an oval pocket of hard-packed blue ash, about 50 centimeters across (Figure 13). Small chunks of dark brown clay were observed and collected mixed amid the stone wall collapse, which extended down to the top of this ash pocket. This clay did not appear to be baked, and was initially believed to be part of the floor. After cleaning the wall next to the ash pocket, this brown clay was visible adhering in an arc on the wall, traceable to about 10 centimeters above the ground level (Figure 14). Nothing else could be determined regarding the shape of the installation because of its poor state of preservation. Small bone fragments were found in the ash. A sample of the ash was collected.



Figure : Ash of the possible cooking installation (R09L144).





Figure : Clay from the possible cooking installation adhering to wall locus R09L039 (R09L144).

## Room 6

Room 6 is located in the northwest corner of the building. The entryway, which is about 1.30 meters wide, is in the northwest corner of the Room 2 courtyard, across the courtyard and slightly to the right as one enters the building. The room itself measures about 5.05 meters by 1.74 meters. It is unusual for its narrow width, which is about  $\frac{3}{4}$  of a meter narrower than Room 7, which is immediately next to Room 6. The back wall of Room 6 (R09L121) is also approximately 10 centimeters narrower than the back wall of Room 7 (R09L150). Both walls

interlock with wall locus R09L086, which divides Room 6 from Room 7. It would seem likely that one of these walls dates to a later building phase, but it cannot be determined which.

Within Room 6 was an unusual ash pocket (R09L057, R09L063) extending from a point in the collapse down to about floor level. Within this ash were bone and a large amount of pottery, including portions of a cooking vessel and a large pithos. This feature was found just within the unexcavated doorway, and is about a meter in diameter.

### **Room 7**

The back wall of Room 7 is the only wall which does not show the remarkable preservation of the rest of the building. Just 2.37 long of this wall, extending from the northwest corner of the room, survives, whereas the wall was probably once 4.88 meters long. This wall is, however, more than 10 centimeters wider than the back wall of Room 6. Both walls interlock with wall locus R09L086, which divides Room 6 from Room 7. It would seem likely that one of these walls dates to a later building phase, but it cannot be determined which.

Room 7 is notable for its small finds. These include a large number of metal objects. Also found in this room, though at a level significantly above the floor, was one of the Area's two scarabs (R09F1635, Figure 15).



Figure : The Room 7 scarab (R09F1635).

## Room 8

Room 8 is opposite Room 5. It is accessed through a 1.4 meter wide entry way, in the southeast corner of the Room 2 courtyard. The entrance is at the end of the courtyard on one's left as one walks through the building from the exterior entrance. The room measures 4.33 meters long by 2.35 meters wide.

Room 8 is notable for being the only room with which a lintel was found in association. This lintel (R09L052) measures 1.38 meters long, 0.25 meters wide, and 0.20 meters thick and is made of bedded shale (Figure 16). It broke longitudinally across a natural bedding plane after it was moved. The lintel was found on the surface near the doorway.



Figure : The Room 8 lintel, in situ.

### **STRATUM 3: METALLURGY**

Beneath the monumental building complex, a series of metallurgical loci were excavated. It is clear from the 2006 probe in Room 1 (Arbel et al. 2006) and the 2009 probe in Room 5 that crushed slag extends to a depth of at least thirty centimeters beneath the building. All the rooms of the structure were excavated to the top of this slag level. For logistical reasons, arbitrary loci were defined beneath the courtyard in front of the building in order to investigate the metallurgical activities which preceded the construction of the monumental structure. A secondary goal of this endeavor was to elucidate the nature of the structures which were partially uncovered in 2006.

#### **The Stratum 3 buildings.**

During the 2009 field season, two walls from 2006 were further excavated, and three new walls were uncovered (Table 2). Excavations traced the northern extensions of 2006 wall loci 1837 (R09L106) and 1851 (R09L104) and found where they appear to end. Three additional walls were also uncovered (R09L094, R09L109, and R09L110).

The building techniques used in the newly uncovered walls are similar to those of the 2006 walls. All are made of roughly-shaped granite, dolomite, and sandstone, placed in a single line without much regard for form. Corners are also similar to the previously uncovered wall corners in that the stones are stacked diagonally, giving the corners a rounded appearance.

Unfortunately, however, what has been uncovered does not clarify what these structures were used for or even reveal the plan of any rooms. Most of these walls were excavated to less than the height of a meter, and the small exposure prevented the revelation of any complete rooms. However, it has been learned that these areas were used for metallurgical activities, and that furnaces were built against the walls, which are extremely heat-damaged.

**Table 2: Stratum 3 walls.**

<b>Locus</b>	<b>Length</b>	<b>Width</b>	<b>Excavated height</b>
R09L094	4.3 m.	0.45 m. (one stone).	0.6 m. (four courses).
R09L104 (2006 locus 1851)	5.0 m.	0.45 m. (one stone).	0.67 m. (three courses).
R09L106 (2006 locus 1837)	4.6 m.	0.42 m. (one stone).	1.31 m. (seven courses).
R09L109	2.1 m.	0.4 m. (one stone).	0.4 m. (two courses).
R09L110	0.8 m.	0.35 m. (one stone).	0.2 m. (one course).

### **Installations and furnace remains**

During the excavation of the metallurgical loci beneath the Area R courtyard, a large number of furnace fragment remains were uncovered. In most cases, these were very poorly preserved, but hinted at the construction techniques of the ancient furnaces (Figure 17). For example, locus R09L123 is a large concentration of slag and furnace fragments next to wall locus R09L106 measuring 2.0 meters by 0.85 meters. It was pedestaled to 0.44 meters. Locus R09L124 is a similar cluster of badly preserved furnace fragments and slag measuring 1.53 meters by 1.10 meters, pedestaled to a height of 0.53 meters, next to wall locus R09L094. Both these loci represent the remains of installations constructed next to walls. An installation of unknown function, consisting of a single course of cobbles and tapslag (R09L154), extends from locus R09L123 at a right angle to the wall locus against which R09L123 is constructed.





Figure : Furnace remains (R09L123 and R09L124) and an installation of unknown function (R09L154) beneath the Area R courtyard.

Well-preserved furnace elements were also uncovered. One of these is a nearly-complete tuyere pipe found on top of a bed of charcoal (R09L071), above the R09L123 furnace remains. The pipe is set immediately next to wall locus R09L106, with the opening of the pipe pointed at an oblique angle of about 140 degrees to the wall (Figure 18). The axis is at 270 degrees from magnetic north. The pipe measures 0.31 meters long, 0.15 meters wide, and stands 0.13 meters high. Geomagnetic samples were taken from the slag adhering to the mouth of this pipe in order to test whether the pipe is *in situ*, though no other intact furnace remains were observed. Other large tuyere pipe fragments were also found next to walls, which may have been used to support their furnaces.



Figure : An apparently intact tuyere pipe (R09L071).



Figure : Tuyere pipe fragments next to wall locus R09L094 (R09L093).





Figure : Close-up of the tuyere pipe fragments in Fig. 19 (R09L093).

### **The Furnace**

The most important find the metallurgical deposits this season was the mostly complete base of a furnace (R09L142). This furnace was excavated in levels just below the 2006 excavation levels; indeed, it was recognized that a furnace might exist here in 2006 which could not be excavated due to time constraints. The furnace is a saucer-like structure with a basin measuring 1.01 meter by 0.80 meter across (Figure 21, 22). The hard clay walls are five centimeters thick. It survives to 0.31 meter high at the spot where it appears to begin to curve upward to allow the escape of smoke. This is significantly broader than the 0.40 meter diameter proposed for the contemporary (10<sup>th</sup>-8<sup>th</sup> century BCE Late New Kingdom) furnace at Timna, Site 30, excavated by Beno Rothenberg (1990: 46; Figure 23). The base of the furnace is

surprisingly free of slag, though slag was found adhering to curved pieces of furnace, believed to be the neck of the furnace, found within the furnace basin.



Figure : The furnace basin (R09L145), with the stone and slag installation (R09L151) and wall (R09L104) in the background.



Figure : Close-up of the furnace basin.

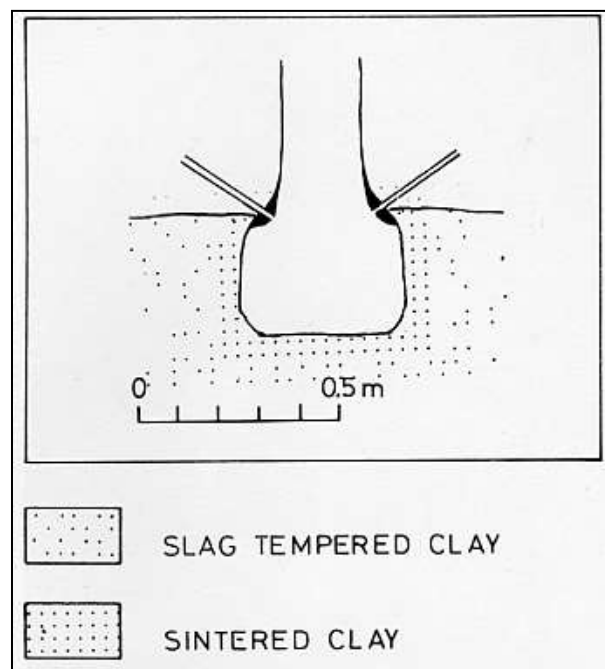


Figure : Beno Rothenberg's proposed reconstruction of the 10th-8th century BCE furnace at Timna, Site 30, Layer 1 (Rothenberg 1990: 46).

The remaining top of the furnace is immediately next to a rectangular installation composed of small stones and chunks of slag (R09L151, Figure 24). Two dimpled hammer stones were reused in the construction of this installation. This installation bridges the gap between wall locus R09L104 and the furnace itself. The purpose of the installation remains unknown, though it seems not unreasonable to suggest it served either to support the furnace or as a foundation for metallurgical activities. This installation and the furnace were both covered by a thick layer of ash, slag, and baked clay furnace material (R09L135).



Figure : The stone and slag installation (R09L151).

## **SUMMARY AND CONCLUSIONS**

The 2009 excavations at Khirbat en-Nahas, Area R, revealed a monumental Iron Age structure and the metallurgical and structural remains below it.

The monumental building consists of a large room (Room 2), measuring 9.61 meters long by 3.70 meters wide, surrounded on three sides by smaller rooms. The structure is in turn surrounded by a perimeter wall. Both interior and exterior walls are about a meter thick. No windows were found in the building, though clerestory windows must have been necessary to supply light. In the northeast corner of the structure, a staircase gave access to rooms that presumably existed on a second story. That a second story existed is suggested by the vast quantity of building stone collapse removed during excavations. This collapse was found in every room as well as on the exterior of the structure, and continued from the surface down to floor levels. This building plan is in keeping with courtyard buildings found contemporaneously across the Southern Levant (Netzer 1992). Glueck (1935) is probably correct in suggesting that the structure is not a defensive tower; it is more likely a defensible elite residence. Excluding the two rooms that probably constitute the stairway, five rooms were identified and excavated around the courtyard. Finds were rare in these rooms, but what was found suggest wealth related to the metal production which took place at the site.





Figure : Overview of the northeast portion of Area R, showing the relationship of the entrance to the monumental structure to the structures and metallurgical layers below the courtyard.

This structure was built atop a layer of crushed slag. This site was likely chosen in part because of the commanding view the slag mound gave to the structure built on top, though some of the crushed slag was likely dumped to level the ground, forming a foundation on which to build the structure. In situ metallurgical layers also exist on the spot, however. The most important find in the metallurgical debris is the largely intact basin and partial wall of a copper smelting furnace. This furnace varies significantly from contemporary furnaces known from the other side of the Arabah, enriching our knowledge of Iron Age copper working practices.

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