



A High Official's House Emerges

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Below, two AERA team members stroll through the ruins of an office-residence of a high official. We imagine his ghost sitting in the reception hall, as he did 4,500 years ago, in a pose similar to Vizier Mereruka's on the left. A ghostly supplicant bows before the official, while a scribe prepares to write. See page 2.

Discovery 2015: House of a High Official by Mark Lehner

Field Season 2015 launched on January 30th with an eager team of neophytes, instructors, and seasoned archaeologists. Fourteen students in our new AERA Field Training program worked on our two excavation operations at the Lost City of the Pyramids. Guided by fifteen teachers, the students labored and learned during eight weeks of archaeology boot camp. They were rewarded with a new set of professional skills, topped off by the thrill of major discovery. In each excavation operation, they added to this 4th Dynasty community of pyramid builders the house of an administrator. Here we report on the remarkable house discovered in Area SW1.*

Richard Redding watched as workers peeled away a thick blanket of sand to uncover a massive dry stone wall stretching far south. It was Season 2011 in the area we call Standing Wall Island (sw1), on the southwestern end of the Lost City site (also known as *Heit el-Ghurab*, or HeG, Arabic for Wall of the Crow, its most distinguishing feature). The dry stone wall ran south from along the west of two enclosures, side by side, that open south into a broad, sand-filled depression. After 30 meters (98 feet), the wall took a rounded turn east and then, after 25 meters (82 feet), another rounded turn back north forming a corridor along the eastern side of the double enclosures, like the loop of a paperclip (see map, opposite page). That's when Richard experienced an "aha!" moment. From years of studying the archaeology of animals, Richard recognized the hallmarks of a corral. Rounded corners, which animals negotiate around willingly, are standard in livestock management today and were used in ancient Egypt as well. Following Richard's corral hypothesis, we hypothesized further: The inhabitants slaughtered and butchered animals in the double enclosures.¹

We named the area Standing Wall Island in 2004 because we found the northern fieldstone wall of the two enclosures (ES1 and ES2) standing a meter high on an "island" of ancient settlement that rose between low depressions on the north and south. We called the depressions Lagoon 1 and 2. The long wall we uncovered in 2011 loops around Lagoon 2, enclosing a space of 1,110 square meters (about 11,950 square feet). We dubbed the larger compound the OK (Old Kingdom) Corral. The two northern enclosures backed onto Lagoon 1, while just to the east of ES2, a channel would have opened into Lagoon 1. After our 2011 clearing, we imagined that inhabitants introduced cattle through it, then slaughtered and butchered animals in the western enclosure (ES1). They hung meat to dry on lines tied between columns rising from sockets—our interpretation of a row of stone-lined circles in the courtyard. Next, they moved choice cuts to the eastern enclosure (ES2) for further processing, accounting, and distribution to other areas of the Lost City, especially to the "Western Town" neighborhood of large houses,

only 50 meters to the north, across Lagoon 1 (see map, page 13). Richard's analysis of animal bone from the Western Town showed that its inhabitants consumed prodigious quantities of prime beef.

In Season 2015 we felt the need to test the stockyard-slaughterhouse hypotheses. We could now take advantage of a water table lowered by a new dewatering system installed in 2012 across the low southeastern rim of the Giza Plateau, from the Sphinx to the Heit el-Ghurab.†

We did not find definitive evidence to confirm or deny the corral hypothesis. But, in the eastern enclosure (ES2) we found an extraordinary house. Some 4,500 years ago, an important official lived in the ES2 house and directed operations in sw1—the workings of the stockyard-slaughterhouse, if Richard's corral hypothesis is correct.

This official residence is the most striking example of other such houses we have uncovered: three at the 4th Dynasty Lost

† The new system replaced an earlier dewatering system installed in 2010 after the groundwater rose nearly a meter and a half since 2004, turning Lagoons 1 and 2 into actual lagoons, flooded with water and infested with reeds. See "Lost City Site, Dry!" *AERAGRAM* 9-2, page 16, Fall 2008.



*The students included inspectors in the Ministry of Antiquities and international students enrolled through the American University in Cairo (AUC) in our AUC-AERA Field Training program.

City settlement, a dozen houses in the Khentkawes Town, and a house in the Silo Building Complex, which we discovered in 2011–2012. All these houses share with ES2 a common floorplan feature—a central room in which pilasters define a southern niche. We believe these rooms served as audience halls where proprietors and officials received visitors and conducted business. For this inference, the evidence from ES2 was most compelling.

Revealing a House

At the beginning of Season 2015, we wanted to excavate all of ES1 and ES2. But field school students had to learn basic excavation and recording skills as they carefully removed debris from the collapsed walls. However, through teaching, learning, and practice, the team revealed enough of the walls in ES2 to map its ground plan. Although we did not reach floor level, the ground plan and features very near the floor provided telltale evidence of an official residence.

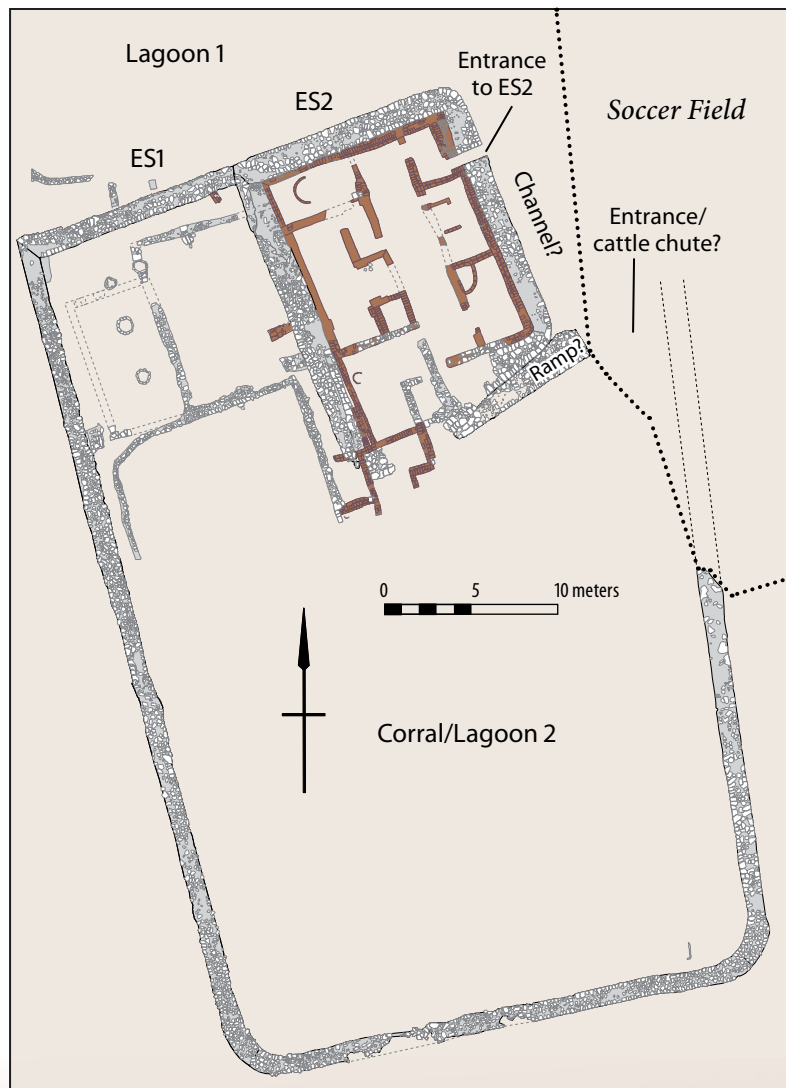
Residence and Office

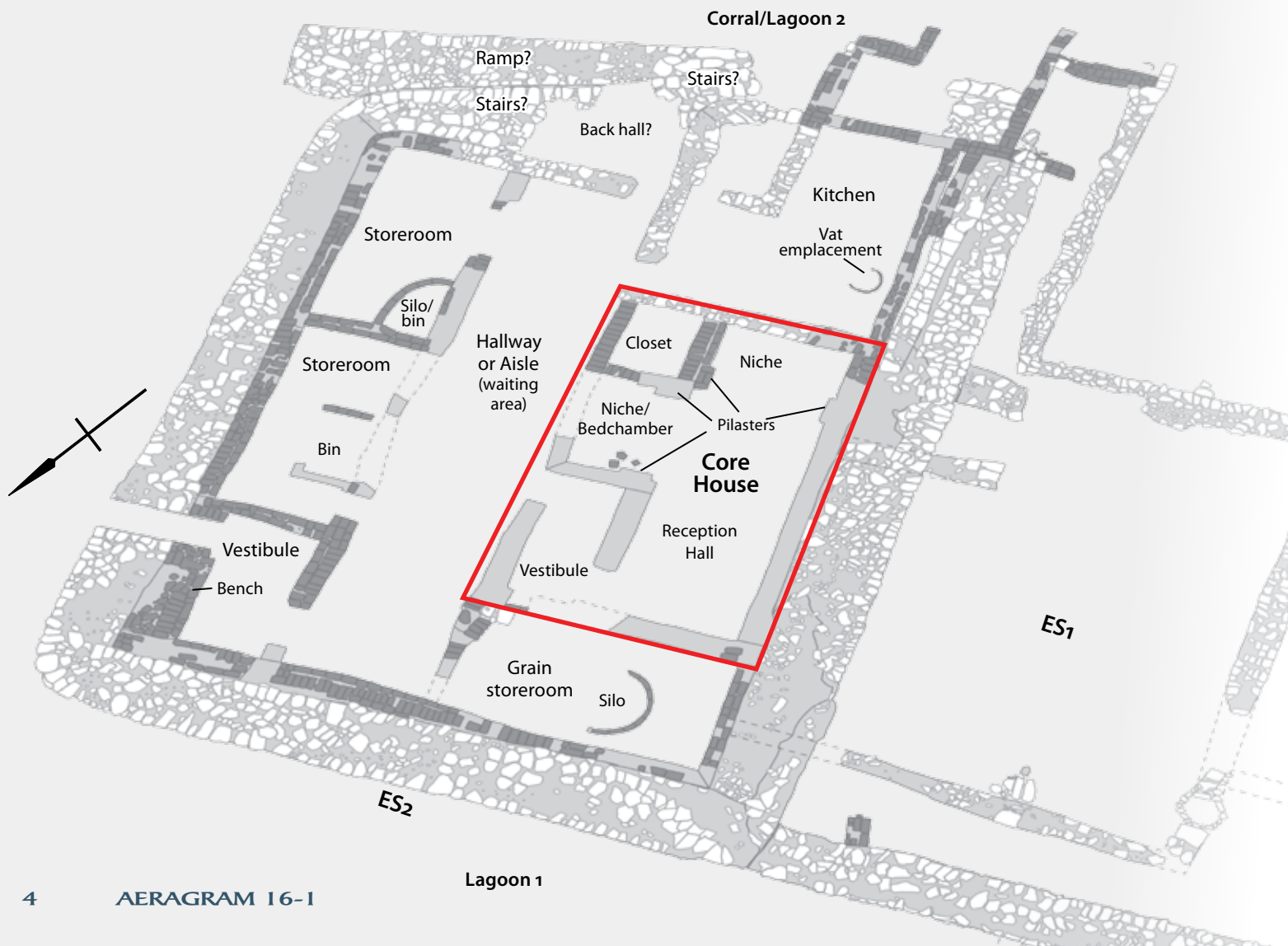
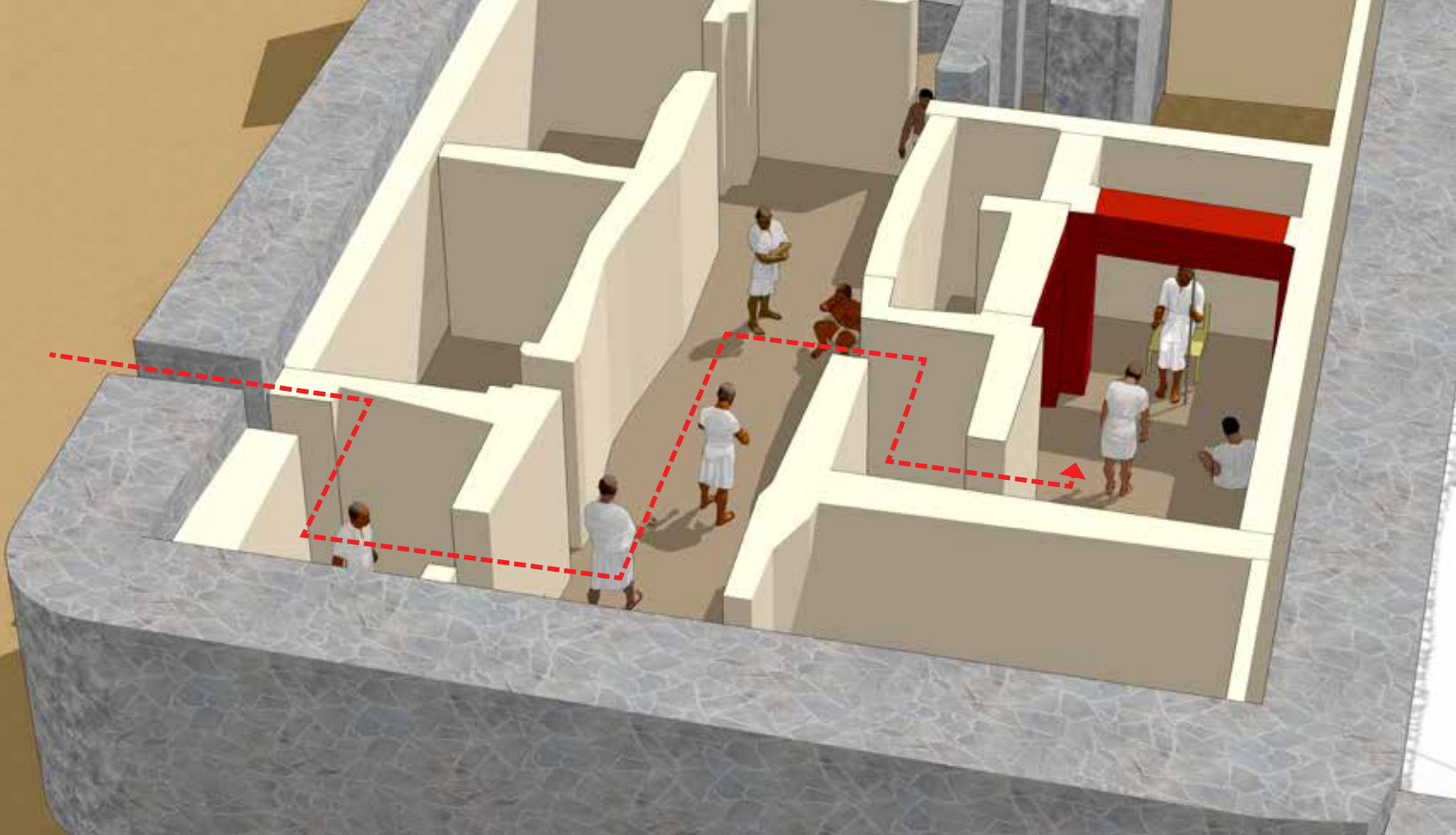
Builders made the ES2 house in mudbrick, like other houses in the Lost City site. But unlike those houses, later builders wrapped a thick limestone wall around the building,‡ perhaps

‡ This stone wall was but one of many renovations carried out at SW1. It was followed by the addition of a stone wall around the (continued on page 5)

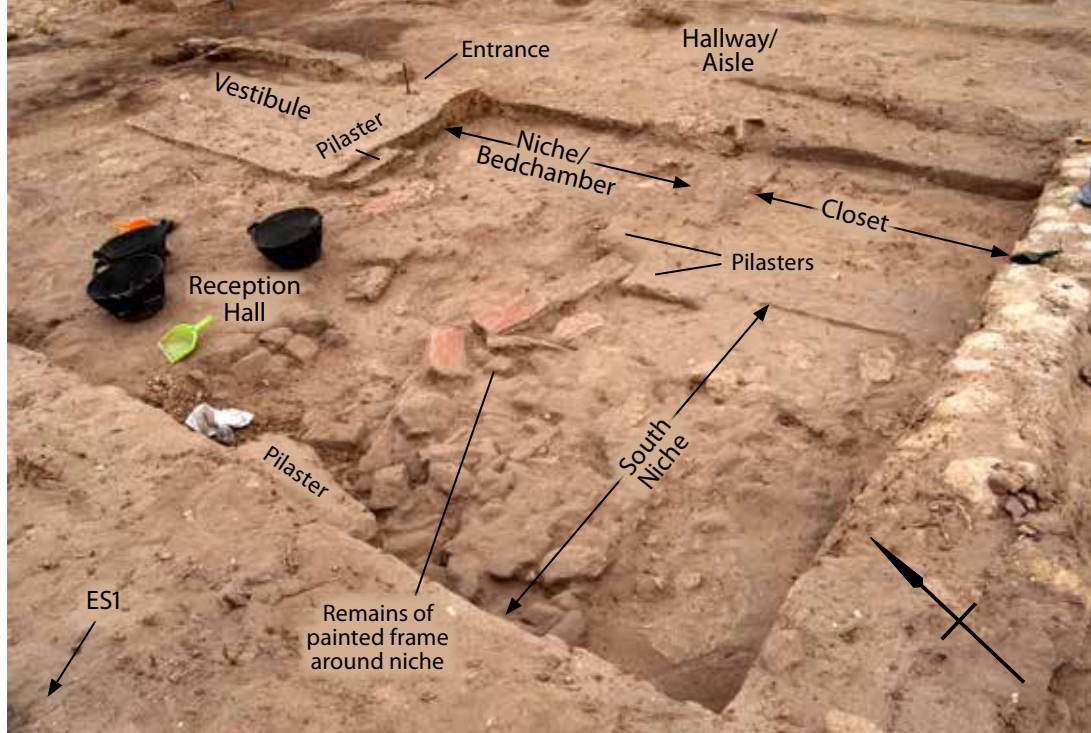
Right: Map of Standing Wall Island (SW1) at the Heit el-Ghurab site, showing results of all excavations to date. To see the location of SW1 within the site, see map on page 13. Map prepared by Rebekah Miracle, AERA GIS.

Below: SW1 with ES2 in the foreground. View to the southwest. Photo by Mark Lehner.





Facing page, top: A model of what ES2 might have looked like in its heyday when a high official lived here and administered the operations carried out in this area of the Lost City settlement. The model shows the official sitting on a chair in the red-framed niche of the core house receiving a supplicant who bows before him. A scribe seated on the floor is ready to record the business being transacted. In the hallway, visitors wait for their turn to meet with the official, while a guard hunkered down by the doorway monitors access. The dashed red line traces the path a visitor would take in order to see the official. We do not know the actual height of the mudbrick walls, but used Arnold's reconstruction of the priests' houses at the Khentkawes Town (see end-note 4) as a guide. We also do not know if the stone walls were built of stone to their full height. Nor do we know how the house might have been roofed.



Facing page, bottom: The map of the north end of SW1 (ES2 and ES1) shows the site after the 2015 excavations. The probable functions of spaces and features are labeled, but these are tentative, as collapse debris still covered much of the site when we reached the end of our field season. Note that north is to the lower left. Map by Rebekah Miracle, AERA GIS.

Above: The core house during excavation showing the vestibule, reception hall, niches, and closet. The painted molded plaster chunks in the collapse debris are probably remains of a painted frame that embellished the niche. View to the northeast. Photo by Yaser Mahmoud.

to cast it in more monumental terms, as its excavators suggested,² or to protect the mudbrick walls from water. For six to eight weeks, from late summer to late fall, Nile inundation water may have flooded Lagoon 1.³

If Lagoon 1 flooded, people could have delivered animals to SW1 on the south by boat, and grain to the so-called Royal Administration Building (RAB) on the northern edge of Lagoon 1. A house-like residence occupies the northwestern corner of the RAB, which features a large sunken court of silos, probably for grain. The mudbrick core and thick limestone girdle of the RAB match the one around ES2. While allowing boats to deliver grain north and cattle south, floodwater could also have threatened the mudbrick walls of RAB and ES2, thus the need for stone girdles.

Access to ES2 was through a zigzag entrance, which provided security and privacy. We have seen such entrances in other houses in HeG and in the Khentkawes Town. To enter ES2, one turned right into a vestibule. A guard seated on a narrow bench against the east wall could monitor comings and goings. A turn to the left put one at the northern end of a central aisle, a feature we have not seen in any other house at Giza.

The Core House

From the central aisle, another zigzag entrance offered access

(continued from page 3) corral and the north and west sides of ES1, enlarging that compound. As we study SW1 we have to keep in mind its incremental development, but at this point we have not excavated enough to understand how the complex evolved.

to the inner core of the ES2 residence, consisting of three rooms. The entrance vestibule opens into a large rectangular chamber, 2.6 meters (5 cubits) wide. Pilasters project from the sides of the southern end to define a niche, about 1 meter deep across the width of the room, a feature we have seen in the large central rooms of three other houses at the HeG, in twelve houses of the Khentkawes Town, and in the official residence in the Silo Building Complex. Between the pilasters in ES2, our excavators found large chunks of red-painted, molded plaster on mudbrick. In 2006 Yukinori Kawae made a similar find between the pilasters at the southern end of the central room in House 1 of the Western Town. These painted plaster moldings fell from an architrave that spanned the tops of the pilasters and completed a frame around the niche. Our evidence offers support for Felix Arnold's reconstruction of framed niches in the southern ends of the central rooms of the Khentkawes houses. Here, according to Arnold,⁴ the master of the house received visitors and conducted business.

In ES2 the master sat in the niche—akin to the dais in houses of New Kingdom Amarna—most probably on a chair, as does Mereruka, a high official of the 6th Dynasty, in the scene from his tomb at Saqqara (on the cover of this newsletter).⁵ The frame established decorum, set the official apart, and formalized the encounter with whoever entered. Visitors waited outside in courtyards or in the central aisle in ES2.⁶

Immediately east of the southern niche in ES2, team members found a second niche, also framed by pilasters. In the collapse debris between these pilasters, the excavators uncovered



Above Hanan Mahmoud, center, assisted by Mohamed "Shaltout" Abd el-Zahir, clears sand from around one of three limestone furniture supports found above the floor level in what might have been the bedchamber for the core house in ES2.

View to the southeast. Photo by Kirk Roberts. Left:

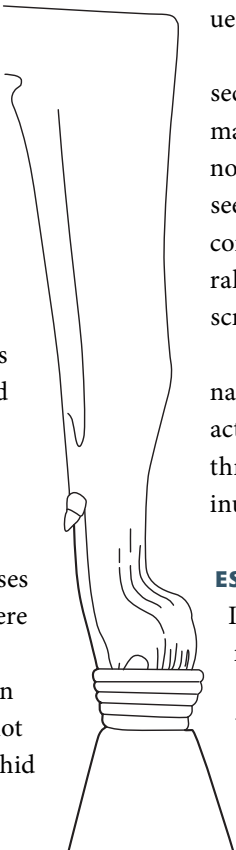
One of the pyramid-shaped furniture supports found in ES2.

Photo by Ana Tavares. Below: Detail of a chair leg resting on a support shown in Mereruka's 6th Dynasty tomb at Saqqara. Drawing after P. Duell, see footnote 5.

three small, truncated limestone pyramids with square rebates in the top. We know these objects served as supports for the legs of a chair or a bed (see photo above) and protected the wooden ends from damp and termites.⁷ We see these pyramidal furniture supports in tomb scenes, like that of Mereruka on the cover. In the 6th Dynasty governor's palace at 'Ayn Asil in the Dakhla Oasis, and in certain houses at the 18th Dynasty city of Amarna,⁸ excavators found sets of four truncated stone pyramids still in place where they once supported the legs of a bed or chair. The three limestone supports in ES2, along with a missing fourth, probably stood under the legs of a bed.

A small, closet-like room opened from one end of the eastern niche. Here, the master of the house may have stored valuables. Crypts and storage chambers off sleeping rooms are known from houses at Amarna. Proprietors kept valuables close to where they slept, like stuffing money under a mattress.

It may seem odd that a bedchamber would open onto a hall for conducting business. But this was not so odd for ancient Egyptians. A curtain may have hid the bed niche while the master carried on official business. At other times, the bedchamber may



have been open while the master held more informal meetings or received intimate guests. We can imagine visitors seated on mats or cushions along the sides of the hall, while the master presided from his formal frame of office, or from his divan in the bed niche. The ES2 residence would not have been the official's primary residence. He stayed here while conducting his business at the royal site for building the pyramids.

The Core House in the Context of ES2

The other spaces in ES2 offer both residential and institutional features. Two chambers east of the central aisle included bins for storage. A small silo, perhaps for storing the grain allotment for the official and his staff, stood directly across the central aisle from the entrance, where the guard in the first vestibule could keep an eye on it. A

chamber in the southwest corner of ES2 may have been the household kitchen.

The southern end of ES2 is unlike any other building we have found. The fieldstone girdle thickens around the southeastern corner (see cover, lower right hand corner) and ends at a chamber that served as a rear vestibule. It appears that stone steps lead up into this space from the south and west, from Lagoon 2, the hypothetical corral. This connection suggests that the ES2 residence-office was closely tied to activities in the corral and ES1. From this rear vestibule, steps may have continued up onto a rooftop.

Later builders added against the girdle on the south a second stone accretion that widens to the east. This trapezoidal mass rises to the east on a slope that may be original. We do not see the stone rubble we would expect from its collapse. It seems to stop at a squared end, which overlooks the chute-like corridor where we hypothesize cattle were driven into the corral. Here, out of harm's way and with a good view, an official or scribe could safely count the cattle.

Or, together these stone masses rose as a tower around the narrow rear entryway. From the top, a guard could monitor activities within the corral or watch for the arrival of livestock through the draw of Lagoon 1, on hoof or via boat during the inundation.

ES2 and ES1

If SW1 was a stockyard-slaughterhouse and ES2 the office-residence of the overseer, the butchers must have carried out their grisly work elsewhere, most likely in the ES1 enclosure. We have not excavated enough of ES1 to confirm or refute this hypothesis, but have found hints of butchering and the presence of cattle. At the southeastern corner of ES1, we found a number of nicely-fashioned flint knives, the

kind shown in slaughter scenes in innumerable Old Kingdom tombs, such as Mereruka's.⁹ In a series of test trenches across the corral/Lagoon 2, we looked for hoof-trodden surfaces. We found only clean sand, many meters deep. This is, perhaps, what we should have expected if cattle had been penned here. Since ancient Egyptians used cattle manure as fuel and fertilizer, people might have dug out the dung-rich surface, leaving the ragged southern edge of ES1 and ES2, and the ragged edge of a use-surface along the inside of the corral wall.

The Big Picture: SW1 and the Organization of a Town

The ES2 residence is one of four large houses that we have discovered thus far in the southwestern part of the HeG. Each features a large central room with a niche framed by pilasters at the southern end. Otherwise, each house is different. The discovery this season of the core house with a red-framed niche and furniture supports, led us to see the significance of these large houses as the seats of high officials. From their HeG residences the officials supervised different operations. Thus far we have a scribal workshop in House Unit 1,¹⁰ possibly a stockyard-slaughterhouse in SW1, and a bakery complex in the other large house that we found this season.

At HeG we can identify a number of house-like structures that might have been the residence of an overseer. Three in the Western Town include the pilaster-niche room befitting, we think, a high official. To the west, up the slope, and to the east, beyond the limits of our work, there may have been more large

The southern end of ES2, showing the stone masses that might be a stairway and a ramp. View to the southwest. Photo by Mark Lehner.



houses. In 2006 in the northeast corner of the HeG site, in an older phase that had been cut by a backhoe trench, we found parts of a large building that may have been a house.

From this work, a picture emerges of settlement and infrastructure organized around large houses of prominent people in charge of different institutions that supported the royal building works. The king solicited these powerful individuals to come to Giza to help build his funerary complex, assigning to them a title and official seal of office. We can imagine these men arriving at Giza with an entourage of people bound to them through kinship and other ties. Here they erect the house that will serve as their residence-office in the midst of operations vital to construction, administration, or the functioning of the settlement.

Once again, a field season has fueled our theories and advanced our understanding, this year with the discovery of office-residences of high officials. We look forward to Season 2016 when we return to these excavation areas to further test our hypotheses.

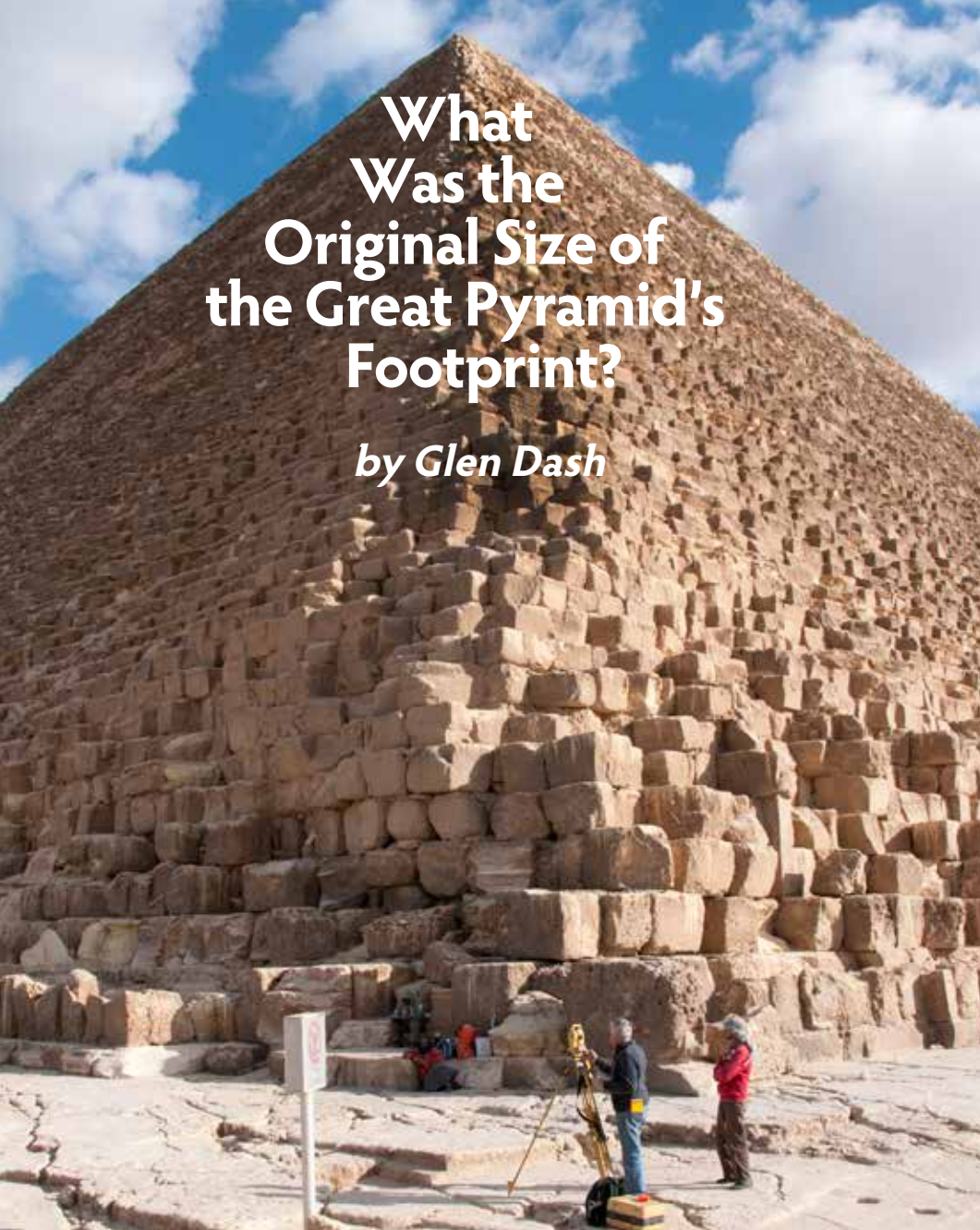
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What Was the Original Size of the Great Pyramid's Footprint?

by Glen Dash



How large a footprint did the Great Pyramid make on the Giza Plateau when it was completed? It is not an easy question to answer, as most of the outer edge of the pyramid's base is long gone. Scholars have had to hunt for evidence of the ancient baseline and then extrapolate their findings to locate the original corners. Not surprisingly, the surveys that have been conducted to date do not precisely agree.

With the question of the Great Pyramid's footprint still incompletely resolved, another attempt seemed in order. So this past season, with the permission and cooperation of the Ministry of Antiquities, the Glen Dash Foundation and AERA undertook a new, comprehensive survey of the base of the Great Pyramid. Here Glen Dash presents a brief overview of that work.

In 1880 and 1881, the noted Egyptologist Flinders Petrie¹ surveyed the base of the Great Pyramid, publishing his findings in 1883. His work was followed by J. H. Cole's,² J. Dorner's,³ and E. Nell and C. Ruggles's,⁴ published in 1925, 1981, and 2012, respectively.* But none of these surveys seemed completely satisfactory. Therefore, last year I proposed that AERA and my foundation undertake our own comprehensive survey of the



Above left: Where is the corner of the Great Pyramid? Where is its outer edge? This photo of the northwest corner illustrates the problem a surveyor faces in trying to measure the sides of the monument or determine its precise alignment. The Great Pyramid, stripped of most of its outer casing stones in the Medieval period, is left with ragged edges and ill-defined corners. Photo by Mark Lehner.

Left: Our first task was to find those places where the original casing of the Great Pyramid met its platform. Here on the north side is one of the few places where well preserved casing stones survive. Photo by Mark Lehner.

This portion of the west side of the pyramid exhibits some of the best evidence of where the casing stones once met the platform. The circles, drawn on the photo, indicate where Mark Lehner identified two such points. Photo by Mark Lehner.



base of the Great Pyramid using the best available technology and personnel. We carried out the survey in February 2015.

How Do You Measure the Base of the Pyramid?

The ancient Egyptians clad the Great Pyramid in more than 21 acres of hard, white casing stones that they hauled over from quarries at Tura across the Nile. The lowest course of casing stone was set on a carefully sculpted platform which once extended 30 to 50 centimeters (12–17 inches) outwards beyond the casing's outside, lower edge (the casing's "foot"). The photo at the bottom of the facing page shows the relationship between the platform stones and the casing stones. Behind the casing stones sits the rougher masonry that makes up the bulk of the pyramid as we see it today.

We define the base of the Great Pyramid as the place where the foot of the casing stones met the platform. However, we find few casing stones *in situ* today; most were removed centuries ago for building material. The Great Pyramid is approximately 230 meters (755 feet) to a side, but along its 920-meter (3,018 feet) periphery we now find only 54 meters (179 feet) of casing stone in place, and much of that is badly eroded. To determine the pyramid's original lines, we needed more information than we could get just by examining the surviving casing stones. We needed to carefully examine the platform for signs as to where the missing casing stones once stood.

The marks on the platform that could supply that information can be subtle. In setting out the goals for this project, I felt that only someone like Mark Lehner, who has worked at Giza for more than 30 years, would be able to reliably identify where a particular missing casing stone's foot once met the platform. To find those points, Mark started with the casing stones that remained, looking for places where the casing's foot met the platform. This leading edge, however, was almost always worn back. Sometimes there was an etched or cut line in front of it representing the original edge. More often, Mark looked for



The casing's lower edge, or foot, is worn back making the original lines of the pyramid difficult to identify. For the 2015 survey, Mark Lehner identified those points representing the pyramid's original lines using the knowledge and experience he has gained in working at Giza for more than 30 years. Here he locates points on the west side. In the background, Glen Dash observes Mark at work. Photo by Rebecca Dash.

Joel Paulson, surveyor for the Glen Dash Foundation Survey, sets up a survey reflector over one of our control points. Joel, of NV5, Inc., (San Diego, CA) is an Egyptologist and professional surveyor. Amr Zakaria, surveyor with the Egyptian Ministry for Antiquities, holds the base of a tape used to measure the height of the survey reflector. Photo by Ashraf Abd el-Aziz.



* Glen Dash's article "New Angles on the Great Pyramid" in *AERAGRAM* 13-2, pages 10–19, Fall 2012, reviews the history of efforts to map and survey the Great Pyramid. Glen also presents the data that Mark Lehner and David Goodman collected in 1984 when they surveyed the Giza Plateau and gives the dimensions and orientation of the pyramid based on an analysis of that data. All back issues of *AERAGRAM* are available for free download at our website: aeraweb.org.

more subtle clues, places where the surface of the platform had been worn or eroded due to the presence of the now missing casing stone or edge.

Finding the Points

At the project's outset, Mark walked the survey team around the pyramid, pausing to identify points where the casing's foot might have fallen. Each side of the pyramid presented its own challenges.

The North Side. The best-preserved casing stones are on this side. Here Mark found the evidence of where the casing's foot once met the platform at 16 points. These spanned a length of 51.3 meters (168 feet).

The West Side. The west side of the pyramid has more casing stones than the north, but they are badly worn. In some places Mark found a cut line in front of the casing stones demarcating the original edge. In other places, a subtle line formed by wear or erosion yielded clues as to its original location. Mark identified 30 points along 49.4 meters (162 feet) of casing that were worthy of measure. These flank the midpoint of the west side.

The East Side. The casing line on the east side was poorly preserved. Only two casing stones survived *in situ* and since the foot of both was broken away, neither provided useful data. All the points Mark found were south of the midpoint and consisted of little more than wear marks on the platform. Mark identified 25 points spanning a distance of 15.6 meters (51 feet).

The South Side. We found no direct evidence of where the casing stones once met the platform on this side. All we could do was measure the top outer edge of the casing stones and project where the casing stones once would have fallen on the platform below (top photo on facing page.) Fortunately, we found the top outer edge of the casing stones reasonably well preserved and, once again, Mark selected the points. He identified 13 points along 38.4 meters (126 feet) of casing.

In total, we identified 84 points along 154.7 meters (508 feet) of platform and casing well-preserved enough to record and utilize. Since the pyramid is about 230 meters on a side, 155 meters amounts to about 17% of the pyramid's total periphery.

Survey Control

Our next task was to recover our survey control monuments at the four corners of the pyramid. These are our reference markers and without them we would be unable to locate where our survey equipment was placed on the plateau, and likewise, where the features we wanted to record were located. Two of these survey control monuments consist of bronze markers which were set in place outside the northeast and northwest corners of the pyramid by Royal Astronomer David Gill in 1874. We found them in place and relatively undisturbed (photo of marker at the northeast corner on facing page). One



For a photographic record of each point we surveyed, Joan Dash holds a board with the point number, while Mohammed Abd el-Basset, surveyor with Egyptian Ministry of Antiquities, holds a rod with a reflector mounted on its top over the point. This point is on the pyramid's platform on the south side just to the west of the surviving casing stones. Photo by Ashraf Abd el-Aziz.

more marker, at the southeast corner, was set in place by the Survey of Egypt's J. H. Cole in 1925. Cole had found an empty socket here where one of Gill's markers once had been and set a new monument in place. Presumably, the Gill monument had been stolen by vandals. We found Cole's monument covered in debris and sand, which we cleared. We then discovered that the control monument at the southwest corner, originally set by Gill in 1874 and reset by AERA surveyor David Goodman and Mark in 1984, had been stolen as well. Fortunately, one of Flinders Petrie's nearby control monuments, consisting of a hole drilled in the rock and filled with blue plaster, did survive, so we used that as our southwest reference marker.

Surveying the Great Pyramid's Sides

With our survey control monuments identified, we could proceed with the survey. To record points, Joel Paulson trained his total station on a target held by either Mohammed Abd el-Basset or Amr Zakaria. Joan Dash kept track of the points being surveyed, writing a unique point identification on a white board she held (photo above). Ashraf Abd el-Aziz, AERA archaeologist and inspector with the Egyptian Ministry of Antiquities, took a photograph of each point as it was being recorded.

We assigned each point a number from AERA's point registry, and, following standard survey methods, recorded its position on a coordinate system established by Mark and David in 1984

known as the Giza Plateau Mapping Project (GPMP) control network.^{5, 6} Eventually, we plan to publish the location of each point we measured along with Ashraf's photograph of it.

The map on the lower right shows the points where we found evidence of the pyramid's original baseline. Using statistical techniques, I will be working on finding the best fit lines that match these points and then extrapolating these lines to the corners. Where the extrapolated lines cross will indicate the approximate positions of the original corners of the pyramid. Once the corner locations have been identified, I can estimate the original size and orientation of the pyramid.

Because of the pyramid's current state we will never know its exact dimensions. However, from my preliminary analysis, I can say that we will be able to locate its corners to within a few inches with a 95% certainty.

More Survey Data

Along with recording places where the casings fell on the platform, we also recorded and photographed more than 1,200 points on and around the Great Pyramid. All this evidence should help us better understand this last surviving wonder of the ancient world. I will be reporting on our survey findings in future issues of the *AERAGRAM*.

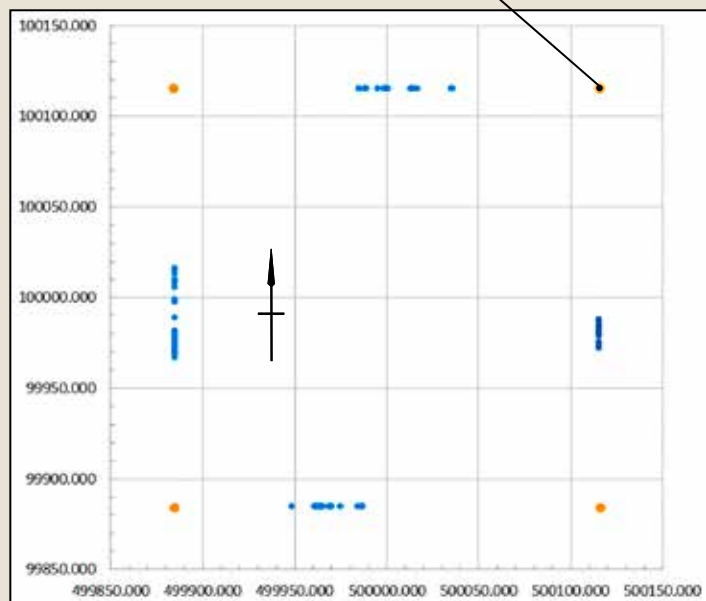
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Right middle: Bronze marker set in place outside the northeast corner of the Great Pyramid by Gill in 1874. This one and markers at the other three corners of the pyramid served as reference markers for the Glen Dash Foundation Survey. The total station tripod stands over the marker as Glen crouches, pointing out a feature. In the background, Rebecca Dash photographs Glen at work, and beyond, tourists meander about the pyramid. Photos by Ashraf Abd el-Aziz.

Right bottom: The points we located and mapped for the baseline survey are shown as blue dots on the GPMP survey grid for the Giza Plateau. In setting out the control network, the center of the Great Pyramid was assigned a location of North=100,000 meters and East=500,000 meters. Our control markers at the corners of the pyramid are shown as orange dots.



On the south side of the Great Pyramid there was no direct evidence of where the casing stones met the platform. In order to project where the casing stones once would have fallen on the platform below, Glen Dash measures the top outer edge of the casing stones, assisted by Rebecca Dash. Photo by Mark Lehner.



The Gallery Complex Gives Up Some of Its Secrets

Four massive blocks of long, narrow structures fill the center of our map of the Heit el-Ghurab site (also called the Lost City; shown on the facing page). During the town's heyday the Gallery Complex—as we call it—would have been a sight to behold, spanning nearly 2 acres.

Ever since discovering this vast complex, we have puzzled over its purpose. What was it? To shed light on its function, an AERA team excavated an entire gallery (III.4*) in 2002, exposing the final occupation layer. From this work came the hypothesis that the galleries were barracks for laborers.¹ Ten years later we excavated the adjacent gallery (III.3), aiming to determine how it was built, how it evolved over time, and to test the barracks hypothesis.² During this 10-week 2012 field season, a team, supervised by Dan Jones and Ashraf Abd el-Aziz, cleared all of Gallery III.3 to its latest occupation level. They continued down to the foundations and below in seven strategically-placed trenches (outlined in red on the detail map, facing page).

Here we report on the results of the 2012 excavations, along with new insights that have emerged as a result of subsequent work at Heit el-Ghurab (HeG). In 2013 Mark Lehner pointed out that HeG was not only a “company town” for building pyramids, but also part of a port that received goods from Egypt and abroad, casting new light on the function of the galleries.³ This past Season 2015 we gained insights into how institutions and operations may have been organized in the town (see article

*Gallery blocks are labeled as Sets I through IV from north to south, and individual galleries as 1 through 8 from west to east.

starting on page 2), which offers a possible model for the galleries. Before going into these recent developments, let us first look at the results of the 2012 excavations and their implications.

Gallery III.3 Layout

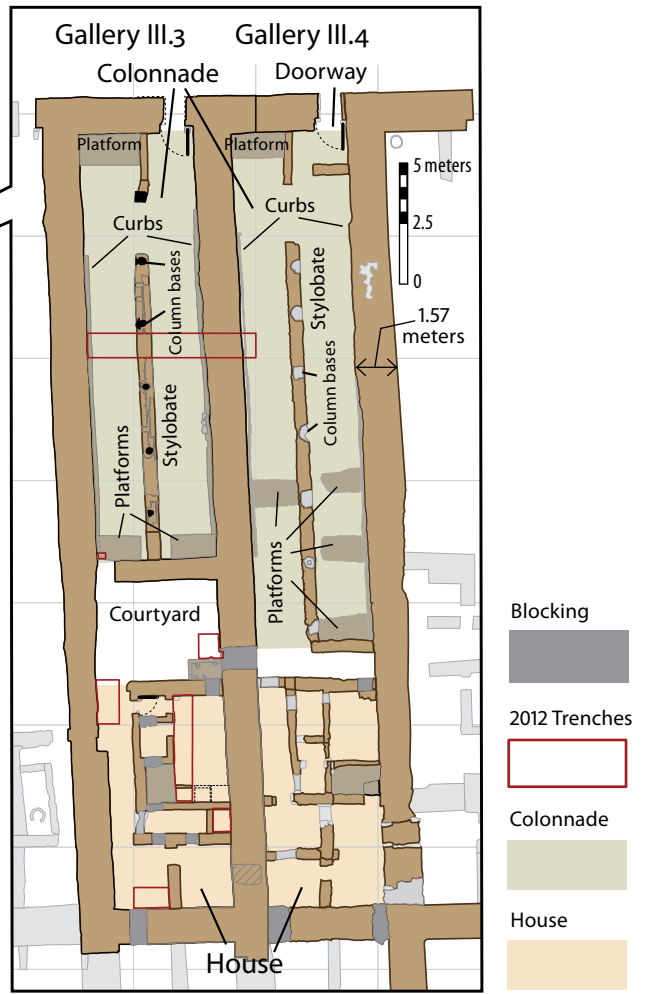
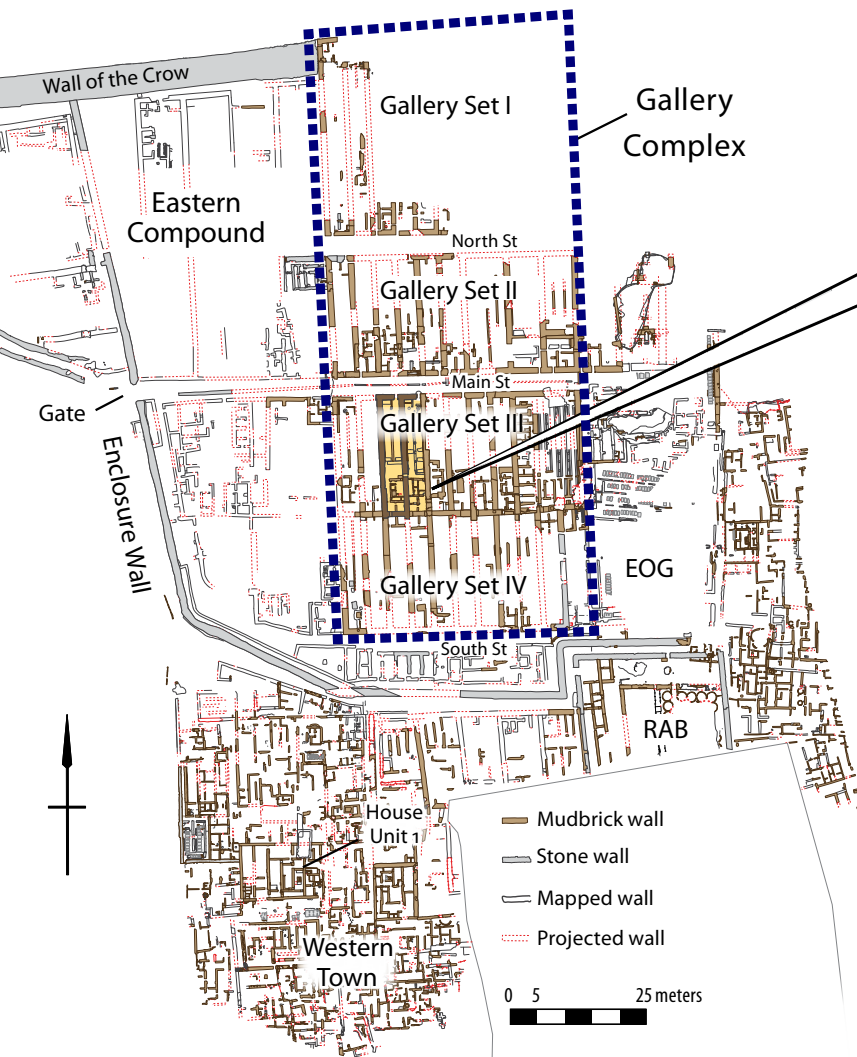
The final occupation level has a layout similar to that of Gallery III.4. The main entrance, at the northeast corner, opens into Main Street. A long open hall occupies the northern portion; a house-like structure takes up the southern end; in between lies a small courtyard. The long hall is divided approximately in half lengthwise by a low wall, a stylobate, that once held columns, creating a colonnade. In the northwest corner, on a low mud-brick bed platform, a guard could sit and sleep, shielded from the door by a narrow wall, but with a line of sight to any movement in the hall. At the south end of the colonnade two sloping platforms rest on opposite sides. The house portion at the south end comprises a series of small interconnected rooms.

Construction

After the builders prepared the area, surveyors probably sited the thick gallery side and end walls by marking the outlines on the ground with pegs and strings, a common practice in ancient Egypt for large structures.⁴ This would account for the more or less consistent alignment of walls as well as the fact that the gallery lengths and widths are uniform and that from one gallery set to the next the corresponding north-south walls line up with each other.

Galleries III.3 and III.4 at the end of excavations in 2012, seen looking north. Gallery III.4, excavated in 2004 and backfilled with sand, was uncovered in order to compare the two galleries. Note the differential preservation across the area; from north to south (the bottom of the page) the walls are preserved to greater and greater heights. At the north end of the galleries, very little of the walls remained. Photo by Yaser Mahmoud.





Gallery III.3 and III.4 based on excavations in 2012 (III.3) and 2002 (III.4). The map shows the features of the final occupation. Map prepared by Rebekah Miracle, AERA GIS.

Map of Heit el-Ghurab (Lost City) site. Galleries III.3 and III.4 are highlighted in yellow.

The gallery blocks have no continuous outer wall around all four sides, but instead were laid out as a series of party walls shared by adjacent galleries. Our 2012 team determined that the wide (1.57 meters, 5.2 feet) party sidewalls and north end walls were constructed in a single continuous operation as an upside down L (see map above right). The long part of the L formed the north-south wall of two adjacent galleries; the foot was the north wall for the gallery to the east, the “heel” a door jamb for the one on the west. In III.3, workers also continued the sidewalls to the south to form part of Gallery IV.3. They completed III.3 with the south end wall and also bonded a cross wall into the east sidewall.

Raising the Outer Walls

The 2012 trenches revealed the interior faces of the Gallery III.3 walls. In spite of the uniform alignments, spacings, and thickness overall, we saw in these walls a mixture of different materials and techniques blending from one into the next (see

table and photo on the next page). Builders used anything at hand. Here they dumped rubble between mudbrick facings. There they piled broken mudbricks, limestone, and pottery fragments.*

How did overseers supply building materials? Much of it probably came from demolition of older buildings. Across the Gallery Complex, we found evidence to suggest that authorities built Gallery Sets II, III, and IV at the same time they reconstructed other parts of the HeG site, soon after they demolished earlier structures. They reconfigured the Royal Administrative Building (RAB) interior and built a set of bakeries on an industrial scale in Area EOG. This radical remodeling appears to have been sudden. Authorities were gearing up for some massive undertaking. They must have used the by-products of quarrying and stone working, perhaps mostly from older buildings they were demolishing.

* We should note that when the ancient Egyptians built thick walls—and pyramids and mastaba tombs—it was quite normal for them to use a hodgepodge of fill: stone, mudbrick, and rubble between casing of better-laid bricks and blocks; some structures were more irregular in the core than others.

Roofing the Gallery

We are not certain how high the galleries stood or how they were roofed. The extraordinary thickness of the walls suggested to architect-archaeologist Günter Heindl⁵ that each long wall supported double-springing barrel vaults. He noted that at 1.57 meters (3 royal cubits) the walls are far thicker than need be to carry a flat roof of palm log, reed matting, and mud daub, but massive enough to support the weight of a vault.

Günter envisioned arches rising from the base of the thick sidewalls, forming a high vault over the galleries, possibly as high as 7 meters (23 feet) above ground level. The barrel vaults may have been covered with a flat roof, the spaces between the arches filled. Inside, narrow wooden columns that once lined the colonnades would have supported raised lofts. A series of holes in the roof would have allowed air to flow through and light to penetrate.

In Galleries III.3 and III.4 a barrel vault would probably not have extended over the house. The baking areas—the rear rooms—were most likely left open for ventilation, while some of the other chambers may have been covered. The network of walls could have supported a flat roof of logs and mud, but the closet-sided rooms would have been extremely dark if roofed. The builders may have covered them with a screen of palm fronds, through which some light could pass.

Finishing the Interior

After the Gallery III.3 shell was completed, workmen built up the floor with layers of fill, laid narrow mudbrick walls to define chambers in the house, and created architectural features in the colonnade, including the stylobate, curbs along the sidewalls, a guard's bed platform, and the short partition wall next to it (shown on facing page).

Thereafter inhabitants made few changes to the original layout. They neither removed nor added walls, but in the house and courtyard they renovated architectural features, described in the sidebar on page 16. In the colonnade, they added two low, sloping platforms over a resurfaced floor at the southern end. We have interpreted similar features in the adjacent gallery as sleeping platforms. From here, a person on each of the twin platforms could see the length of the colonnade. Anyone entering the small courtyard would have to step over the western platform.

The few changes suggest people used Gallery III.3 in essentially the same way over time. However, interactions between Gallery III.3 and its neighbors may have changed, as access to adjacent Galleries IV.3 and III.4 was blocked.

A Template

Prior to 2012 we had noted similarities between III.4 and galleries we had partially excavated in earlier field seasons. It seemed that some sort of template guided the construction. With III.3

Varied Composition of Gallery III.3 Walls

- ◆ Rubble construction with chunks of limestone
- ◆ Rubble core faced with mudbricks
- ◆ Mudbrick courses
- ◆ Whole and half bricks, laid as headers, stretchers, on sides
- ◆ Mudbrick fragments, limestone pieces, pot sherds, etc.
- ◆ Hewn stone of limestone, granite, and alabaster with pieces of pottery



Close up of the trench cutting through the wall between Galleries III.3 and III.4, which reveals the rubble construction with irregularly shaped limestone pieces. Low curbs run along both sides of the wall. Photo by Yaser Mahmoud.

and III.4 laid bare, it appears that there was one indeed. The table on the next page lists the common elements of the two galleries.* They are remarkably similar, even down to the elevation of the floor at the south end and the location of the north walls of the houses. But III.3 and III.4 also differed. The III.3 colonnade is about 4 meters shorter than that of III.4, leaving an open space between the hall and house, while in III.4 there is only a narrow hallway. But the greatest differences are seen in the house components. While they each have a corridor along the west side and baking facilities in the back rooms, the chambers are laid out differently, possibly to accommodate specific needs or preferences of the occupants.

The template suggests that people used the different galleries for the same purposes. What were these?

The Galleries and the Port

Because HeG belonged to a major port on the Nile, Mark Lehner proposed that galleries served as 1) warehouses for goods arriving by ship or barge; 2) storerooms for nautical supplies; and 3) temporary housing for crews of men who could serve in expeditions by land and water, or drag heavy stones from quarries to the pyramids.⁶

The Gallery Complex certainly shows similarities to ancient warehouses. We see elongated open halls grouped together in

* Some elements of this template appear in other galleries, discovered through excavation or mapping. Most of our map of the Gallery Complex (page 13) is based on walls visible on the ruin-surface and excavations of 5 × 5 meter squares in some galleries. The evidence shows house-like structures in the rear, southern ends, and stylobates where we have excavated the more open northern ends of Gallery Sets I–III. We have excavated little of Gallery Set IV, but the walls showing on the ruin surface suggest the template was turned around, so that the galleries fronted south onto South Street.

blocks in ancient Near Eastern storehouses, such as the Roman *horrea* at Ceseara,⁷ the New Kingdom mortuary temples of Ramses II and of Merenptah at Luxor,⁸ or, closer to home, the block of galleries west of the Khafre Pyramid.⁹

In the gallery colonnades, goods from ships could have been piled on the floors, while crews might have slept above. We lack the upper parts of the HeG galleries. But, if a flat roof covered each gallery in an entire block of galleries, it would have

formed a vast terrace, where men might have slept or perhaps done handwork. The lofts above the colonnade, if the galleries were covered with vaults, also offered sleeping quarters. Goods might have been stored on the roof or the loft too.

Cargo may have arrived in wooden shipping crates, such as our Italian and American colleagues found at the Middle Kingdom Red Sea port of Wadi Gawasis.¹⁰ Some commodities would have come in smaller containers, like the looped-handled combed ware jars used for oil, wine, or resin—the common Levantine shipping container of this time.

We see hints of such exotic items in our fine-grained analysis of the material excavated from the Gallery Complex. We have 18 fragments of combed ware pottery from the Levant; not a lot, but the oldest and most numerous examples from an Egyptian settlement site. In his analysis of charcoal from the entire HeG site, Rainer Gerisch found olive and cedar from the Levant and oak, pine, and other woods from the Eastern Mediterranean shore. In the rear cooking chambers of Gallery III.3 we found a possible olive pit and a complete hippopotamus hip bone. These items, exotic to the HeG, prompted us to think about troops of hunters, crews of ships, as well as haulers of stone, and the HeG as part of the major Nile port of its time.

The galleries could also have been the staging area for crews preparing for an expedition. Here they gathered together supplies and equipment that they would need for their next voyage.

Houses, Headman, and their Teams

How were the crews in the galleries organized? For some time we have seen in each gallery the principal parts of a house, albeit stretched out: off-axis entry; more open front court, or, in Galleries III.3 and III.4, a colonnade; more private quarters toward the rear; cooking chambers in the far back. We think that the pyramid builders modeled the galleries, like the large houses discussed in the article starting on page 2, on the household, when no other model existed.

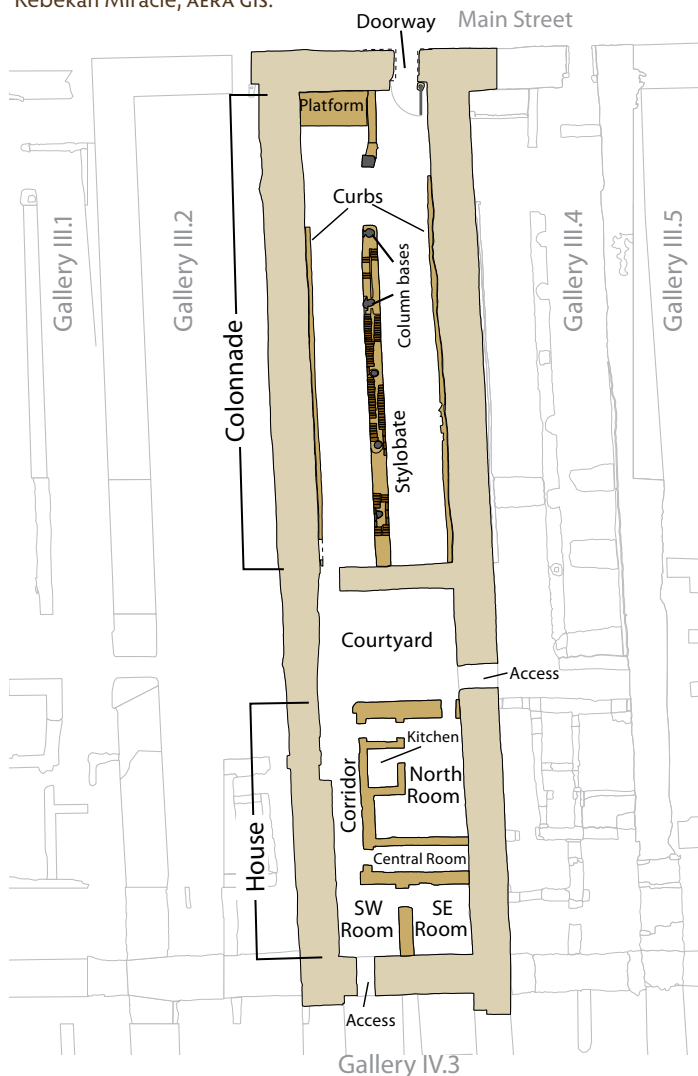
These structures most likely housed crews of young men, who formed gangs and phyles known from builders' graffiti and nautical scenes. The same crews, with the same names, served in royal building projects and expeditions on land and water. The papyri recently discovered at Wadi el-Jarf, an Old Kingdom port complex on the Gulf of Suez, inform us that a headmen named Merer, with the title Inspector, oversaw a team that worked on Khufu's pyramid, quarried and transported limestone, and helped with port operations at Wadi el-Jarf.¹¹

We can imagine headmen arriving at Giza with their own crews. The first teams that stayed for some period finished the interior of their gallery shells, perhaps tailoring them to their specific tasks; for example, setting them up for the types of vessels that teams might have manned—sea-going ships, Nile boats—or for the goods they handled—alabaster, copper, cedar timbers, gold, shipping crates, ceramic storage jars, etc. Storing

Elements of the Gallery III.3 and III.4 Template

- ◆ Two major components:
 1. house-like complex at the south end
 2. long open hall, a colonnade, in the northern portion
- ◆ Cooking/baking facilities in the house component
- ◆ Wall (stylobate), one brick high, along central axis of the colonnade with bases for columns
- ◆ Doorway in the northeast corner
- ◆ Rise in elevation from north to south end of gallery, with same elevation at the back ends
- ◆ Guard's (?) sleeping platform in northwest corner
- ◆ Curb along the sidewalls of the colonnade

The original layout of Gallery III.3. The outer walls were laid first and then the interior walls and features were added. Map prepared by Rebekah Miracle, AERA GIS.



these various types of cargo or ship's gear, such as ropes, nets, and sails, between expeditions, might have called for different configurations in the galleries, which might in turn account for the variations in these structures.

Renovations may have come over time as the tasks of the gallery teams changed. Now a team goes to the eastern Tura quarries to fetch casing stone for the pyramids, one of the tasks of Merer and his men. Next they build a harbor in the Delta, or embark on a seafaring expedition to Byblos, in what is now Lebanon, for timber, olive oil, resin, and wine. Different crews might rotate through one gallery, prompting renovations.

The galleries have puzzled us for many years. But our new understanding of HeG as a port and as a town organized around houses—with headmen and their teams—offers new ways to view these structures. We are just beginning to test these ideas and explore their implications with our data from 2012 and earlier excavation and mapping. Much work lies ahead.

Home Reno Projects, Gallery Style

The Gallery III.3 house underwent multiple renovations during three phases after its initial use (original layout on previous page). These changes may reflect accommodation to new tasks or gallery teams.

Phase A. The north room was converted into a more private space, probably for an overseer, by sealing off the opening into the courtyard, leaving just one entrance, to which a door was added. At the same time workers began baking bread—lots of bread—in the southwest room.

Phase B. The bread-baking pits were plastered over. In the narrow central room workers cut doorways through the walls, perhaps to allow for freer movement or for more light in the interior. A low platform went in on the west side of the north room in the area adjacent to the tiny kitchen.

Phase C. The new openings were blocked, sealing the sidewalls of the central room, which was converted into a kitchen. Three bins were added to the north room, perhaps for food prep.



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JON JERDE. THE SPACE IN BETWEEN

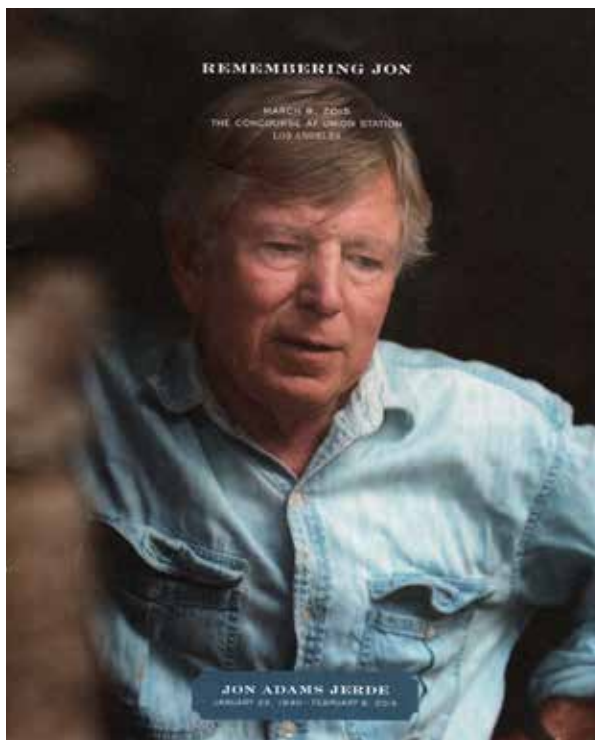
We are sad to note that Jon Jerde, renowned architect and 30-year AERA Board Member, passed away on February 9, 2015. Jon helped dress Los Angeles for the 1984 Olympics and designed mixed-use urban development projects around the world. Horton Plaza, where Jon curved the cubic city blocks of San Diego, was a breakout project. His other well-known designs include Universal City Walk in Los Angeles; Mall of America in Bloomington, Minnesota; and Fremont Street Experience in Las Vegas. Jon's large master plans for Roppongi Hills in Tokyo and Namba Parks in Osaka were groundbreaking for integrating private and public spaces and for introducing vertical park systems.

I first met Jon in 1985 when Bruce Ludwig took me to the Jerde Partnership in Los Angeles to give my standard lecture of that time. I was transitioning from Sphinx-specific work to a broader focus on the whole Giza Plateau. I showed a Kodachrome slide of the Equinox sunset over the right shoulder of the Sphinx on line with the south side of the Khafre Pyramid and the sanctuaries of the Sphinx Temple. I showed the summer solstice sun setting midway between the Khufu and Khafre Pyramids, making the hieroglyph for *akhet*, “Horizon,” the sun disk between two mountains, on the scale of acres. *Akhet Khufu* was the ancient name of the Khufu Pyramid. The Egyptians sometimes used the name for the whole of the Giza Plateau. When I finished talking, Jon said these alignments show that the space between things is more revealing than the things themselves, even when those things are the Great Pyramid and Sphinx.

Jon and Janice Ambry Jerde and I became best friends. We had many good times and adventures in Los Angeles and Egypt. When we founded AERA, Jon became one of the first board members and regularly hosted our annual board meetings at his office on the oceanfront.

Jon and I shared an interest in Buddhism. Jon was not a meditative man, but it seemed to me his work reflected a basic paradox of Buddhism. I once read in Zen literature that enlightenment is like falling off a log spontaneously. How can you try to do it? How can you design spontaneity?

Jon loved bustling people places, like the *Khan el-Khalili* market in Cairo, or the Venice, California, oceanfront. While such places originated with some design and building, as a living collective whole, such places self-organized from many choices of individual shoppers and shopkeepers. Design is the very opposite of self-organization. Jon's professional challenge



was to design places that people would fill with the fluid, adaptive order of the marketplace.

I had the experience of watching Jon create, trance-like, with pen and watercolor. Beautiful patterns of curves, circles, and pathways emerged—designs that would keep the spirit of spontaneity, a sensitivity to that initial creative moment, as Jon's fellow architects co-created and transformed the patterns into living, functional architecture.

We talked often about design and emergent order. I found our sharing of ideas and principles across disciplines refreshing and inspiring. We spoke of the persistent, powerful pressures of people in self-organized crowd movements vs. the political power and planning of princes and governments.

Over the years, AERA grew into a larger project to find and excavate the Lost City of the Pyramid Builders. The AERA team took on this task because of our interest, not so much in things, like the Sphinx and Great Pyramid, as in the relations between things, and between the people who produced things great and small—from pyramids to pottery.

When we began our field school, our motto was: “We are not looking for things, we are looking for information”—information about the people who built the pyramids. This information exists not in an artifact, but in context, in the web of relations between both architecture and material culture. One “great” discoverer cannot make this kind of discovery. This kind of discovery takes a co-creative team. Context—the space between things—is far more revealing than the things themselves.

In the marketplaces he designed around the globe, Jon is still very much with this world. He is with us in the connections between mutual friends and family. As a best friend and mentor, Jon is part of my thoughts and experience. As a board member, supporter, and counselor, Jon is with us in AERA's ongoing work and legacy.

~ Mark Lehner

Hidden Details Come to Light with RTI

Hold a coin or other inscribed object in the raking beam of a flashlight. Now move the beam slowly around the object. As the light travels across the surface, it brings different features into relief. You see a detail pop for a moment and then flatten. Then another detail jumps out and recedes. You see detail that you would miss if you looked at the object in static light.

Reflectance Transformation Imaging (RTI) works on this same principle. It lights an object from different directions to bring out detail. But RTI is far more sophisticated than a flashlight beam.

The RTI specialist takes a series of digital photos of the subject with a stationary camera. For each shot, light is projected from a known direction, resulting in a set of photos with different highlights and shadows. RTI software then synthesizes the lighting information to create a mathematical model of the surface of the object.

Once the data is processed, the fun begins. Opening the image in the RTI Viewer on screen, the researcher can re-light the

RTI specialist Sarah Chapman of the University of Birmingham, UK, photographs a small Horus falcon amulet. This protective amulet was found under the mandible of a child in a burial in the North Street Gate House area of the Lost City site (also called Heit el-Ghurab). It is shown on the far left, re-lit from three different directions with the RTI Viewer. To experience a 3D image of this amulet created using RTI software, please see <http://www.aeraweb.org/news/rti/>.

object interactively with “virtual” light from any direction. Computations carried out by the RTI software enhance shape and color attributes, allowing the researcher to see detail not seen with direct observation. Additionally, RTI software can produce 3D imagery that allows a viewer to rotate an object 360.° To view a 3D image of the small Horus falcon at left, please visit our website: <http://www.aeraweb.org/news/rti/>.

This season RTI specialist Sarah Chapman of the University of Birmingham, UK, introduced AERA to RTI and its potential. Over the course of three weeks she photographed objects and sealings from past seasons as a trial run of the technique.

Below, Ali Witsell, of the AERA sealings team, explains what type of information she can discover about a clay sealing from viewing RTI imagery on her home computer in the States.

Sealing Analysis from 6,000 Miles Away

Our field seasons never allow enough time for us to register, document, and thoroughly study every sealing fragment we recover during excavation. Much of the analysis has to wait until we are

Left: Traditional images of Sealing 4907 from the Lost City site, showing both the front (obverse; above) and back (reverse) sides. While conventional photography software does offer the ability to manipulate lighting to bring out details, the limitations can be frustrating when trying to capture the hieroglyphic details needed to illustrate a piece for publication, or the number or order of the impressions made by a cylinder or stamp seal.

back in the States, thousands of miles from Giza. Since all the objects we recover must stay in the lab, we are dependent on our notes, drawings, and photographs. Unfortunately, with conventional photography we rarely, if ever, capture all the detail we need. Because of a sealing’s many facets, each piece needs to be lit from multiple angles to capture the detail and nuance necessary for full analysis—a very frustrating and time-consuming process—especially when photographing small details in hieroglyphs that might prove crucial to a translation. No matter how many photos you’ve taken in the field, when you get back home you find that you haven’t managed to get the right angles. But RTI offers an opportunity to help bridge that gap. The ability to make different details stand out from thousands of miles away is almost as good as holding

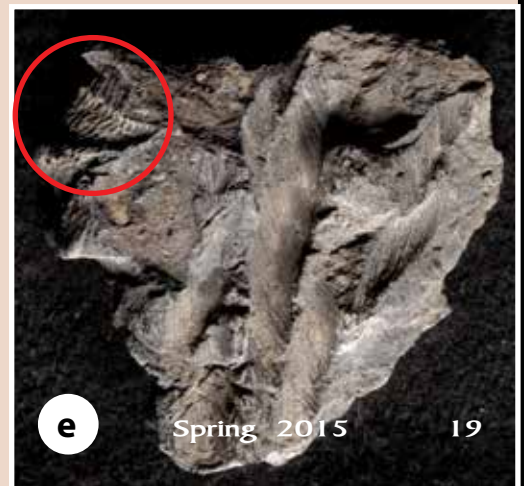


the object in your hand, being able to turn it in the light to see details missed with standard photography.

Take Sealing 4907, for example—a sealing fragment from the Lost City site impressed by a small circular stamp seal, shown in the RTI image of the sealing's front (a, above). Using the RTI Viewer software, the user can change the lighting angle by dragging their cursor around the large green circle in the upper right hand corner of the frame to manipulate the light source (b). The changing angle of light allows us to see both more fingerprint detail and more information about how each impression overlaps the others. Understanding how the impressions overlap helps determine which piece of the seal is preserved in each impression and, consequently, how those parts fit together when we reconstruct what the entire seal might have looked like. Also, when the lighting is changed to fall from the left, we see an additional impression along the left edge (red circle, c) that is not present in the static image, bringing the total number of impressions to six. Each impression is a chance to learn more about the seal's layout.

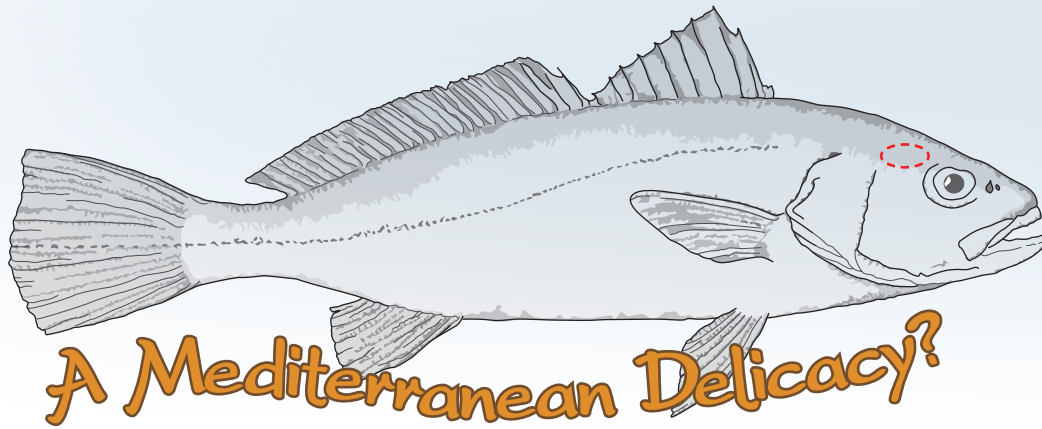


In the RTI image showing the reverse of the sealing (d), RTI enhances details of the twine on which the clay was pressed before it was stamped. This, in and of itself, is not that exciting; impressions of twine on the backs of sealings are very common and don't go very far in helping us narrow down what type of object was sealed. But by flipping the lighting angle to the opposite side, an impression of woven textile pops out along the upper left hand corner (e; also shown in detail of b). We could not see this detail in the static photo alone. This detail helps us narrow down the sealed object to either a textile bag or jar (where textile was stretched across the mouth of the jar to keep its contents from spilling out, then secured by wrapping twine around the outside of the jar neck and sealing it with clay). The important implication of a jar or bag sealing is that both of these items are transportable—as opposed to a sealed door, for example—raising the possibility that this container and its contents were shipped into the Lost City site from another settlement.



The ability to catch these small, but very telling, details remotely is an exciting prospect. When it comes to the analysis of tricky artifacts like sealings—where interpretations have far-reaching implications for historic reconstructions—the devil really can be in the details!

~ Ali Witsell



A Mediterranean Delicacy?

The Lost City (or Heit el-Ghurab) site lies more than 100 miles from the Mediterranean coast. So AERA faunal analyst Richard Redding was surprised to find two otoliths (ear bones) of a deep sea marine fish, the meagre, amongst the material he analyzed this past season. Over the years he has identified thousands of fish bones from our excavations, racking up a list of at least 15 genera that the residents ate. All are Nile dwellers except for two marine fish that tolerate fresh or brackish water and stray into the Delta and even farther south. But the meagre, *Argyrosomus regius*, could only have come from the Mediterranean.

A magnificent fish resembling a bass, the meagre can grow to 2 meters (6.5 feet) in length and 50 kilograms (110 pounds). It spends much of the year in the deep waters of the Mediterranean, but in the spring it migrates to shallow waters along coastal estuaries for spawning. The Giza specimens would have been netted well offshore or caught during spawning along the Nile estuary opening. In either case, meagre could not have been delivered to Giza fresh, given the distance, but must have been either dried or salted.

Meagre and other Mediterranean fish were traded widely throughout the Syro-Palestinian area, but were not part of the ancient Egyptian diet.¹ Marine fish only occur in sites along Nile branches in the Delta, usually near the coast. Indeed there was no reason to import fish when the Nile was so well stocked.

If sea fish did not figure in the ancient Egyptian diet, what was meagre doing at Giza? The answer probably lies in the otoliths' findspot: a midden that was almost certainly the trash dump for the largest house we have thus far discovered at the Lost City site,² the home to a high-ranking scribe.³

Above: An adult meagre. The dashed-line circle indicates the approximate location of the otolith, or ear bone. Right: The two meagre ear bones from the Lost City site. Photo by Richard Redding.

The flesh of the meagre is described as “luscious and dense,”⁴ and was likely a special treat for high-status residents of the house. As a rare, exotic food, it may have been akin to wild game, which by the 4th Dynasty seems to have been the prerogative of the elite.⁵

We cannot say exactly how meagre made its way inland. Perhaps it came with crews who had been trading in the Levant and netted this fish off the Egyptian coast. Or perhaps meagre was a special gift from an official at an estate on the Delta that had ties to Giza.

The otolith might seem like an unusual find, but it is not. As the hardest part of the fish body it preserves well. The meagre's otoliths are particularly easy to identify as they are large and very characteristic. Other bones from the meagre might have been recovered from the trash dump and remain in Richard's cache of unidentified materials. But until he acquires a meagre skeleton for comparison—which may happen next field season—he will not be able to identify any meagre remains aside from the highly distinctive ear bones.

The Giza meagre find is nearly unique. The Delta site Tell el-Daba (Middle Kingdom to Second Intermediate Period), located nowadays about 25 miles inland, is the only other site where the meagre has been identified in Egypt.

~Richard Redding and Wilma Wetterstrom

1. Van Neer, W., O. Lerna, R. Friedman, G. Mumford, J. Poblóme, and M. Waelkens, “Fish remains from archaeological sites as indicators of former trade connections in the Eastern Mediterranean,” *Paléorient*, Vol. 30:1, pages 101–147, 2004.

2. Redding, R., “‘Treasures’ from a High-Class Dump,” *AERAGRAM* 8-2, pages 6–7, Fall 2007. All back issues of our newsletter can be downloaded for free from our website: aeraweb.org.

3. Nolan, J., and A. Pavlick, “Impressions of the Past: Seals and Sealings from Pottery Mound,” *AERAGRAM* 9-1, pages 2–4, Spring 2008.

4. *The Cook's Book of Ingredients*. London: DK Publishers, page 38, 2010.

5. Redding, “‘Treasures’ from a High-Class Dump,” pages 6–7.

Left: In a scene from Horemheb's 18th Dynasty tomb in the Valley of the Kings, fish dry on lines strung between the rigging of a sailboat. After C. Winter, *Die Reliefs und Malereien des neuen Reiches (XVIII.-XX. Dynastie, ca. 1580-1100 v. Chr.)*, Luise Sigwart Klebs, Heidelberg, 1934, page 88.

Background: The Mediterranean coast of Egypt, view from the air looking east. Photo by Wilma Wetterstrom.

