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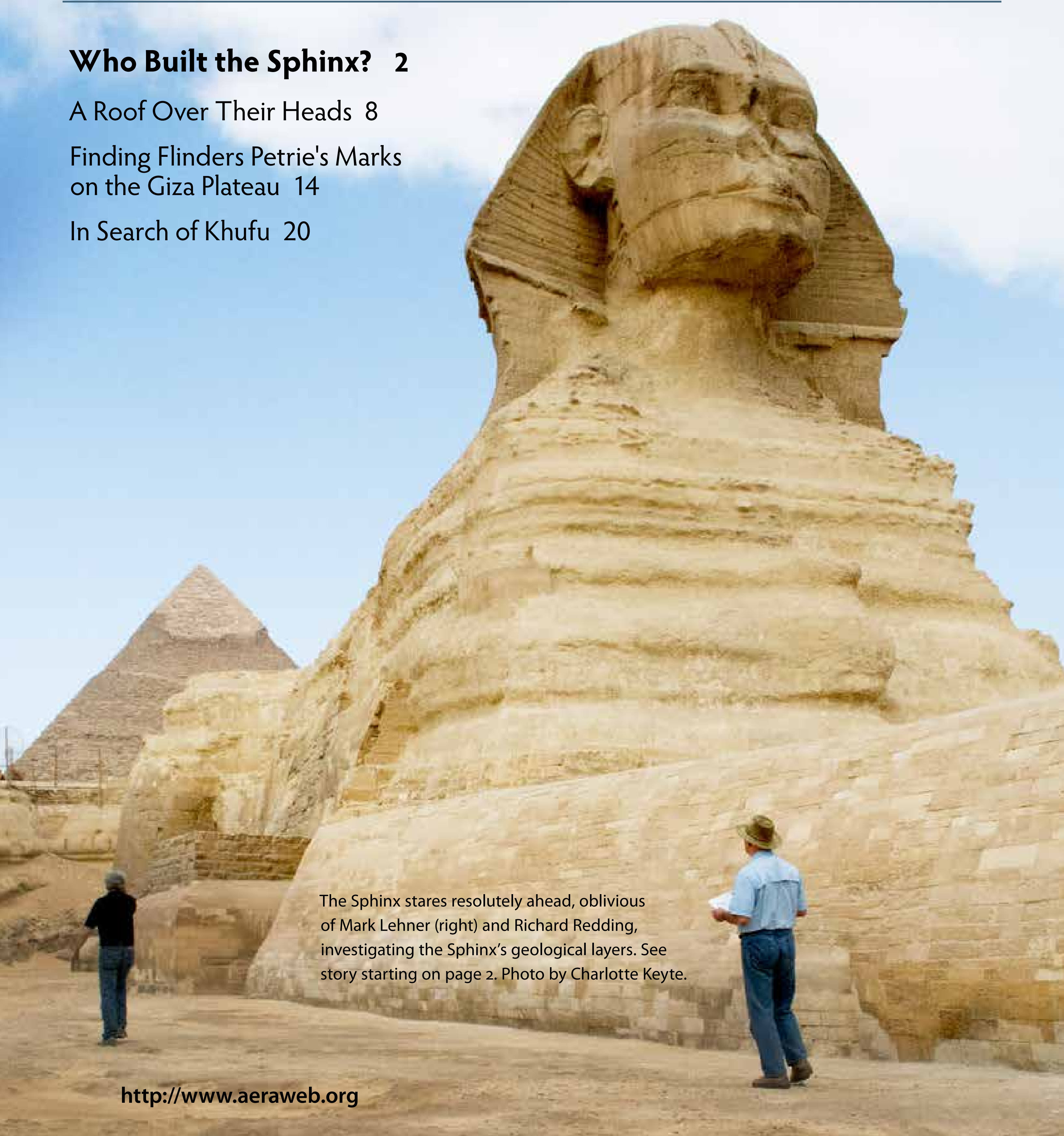

The Sphinx stares resolutely ahead, oblivious of Mark Lehner (right) and Richard Redding, investigating the Sphinx's geological layers. See story starting on page 2. Photo by Charlotte Keyte.

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Who Built the Sphinx? The Sphinx Temple Has the Answer

by Mark Lehner

Who built the Sphinx? One Egyptologist claims it was Khufu, builder of the Great Pyramid.[1] Others say it was Khafre, builder of the second pyramid.[2] Some geologists believe the Sphinx could be older.[3] About half a dozen scholars are debating the question.

Many alternative thinkers claim the Sphinx is much, much older, that it existed thousands of years before Khufu. But our study of the Sphinx and the temple lying just below it—the Sphinx Temple—says no. As certain as we can be about such matters, Khafre created most of the Sphinx. However, Khufu might have started it.

Stone by Stone

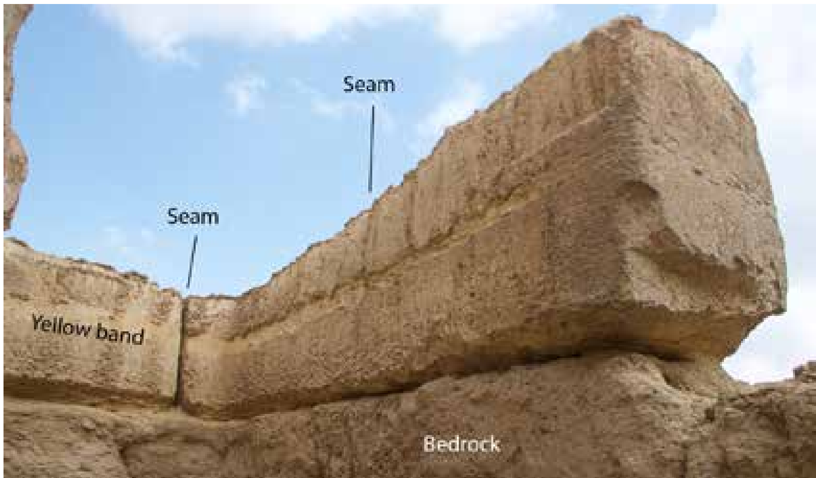
Between 1979 and 1983, I mapped, stone by stone, the Sphinx, the Sphinx Temple, and the adjacent Khafre Valley Temple. Starting in 1980, geologist Tom Aigner joined me.

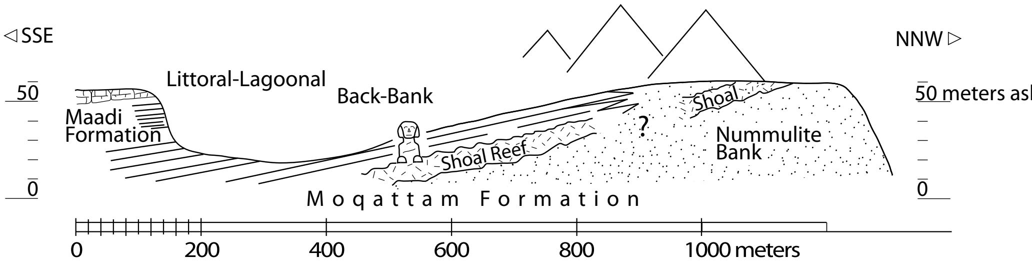
The stone-by-stone map of the Sphinx Temple allowed us to investigate a telltale clue about who built the Sphinx. Quarrymen cut the core blocks (the ones forming the core of the temple walls) so thick—some weigh up to a hundred tons—that many of them include three geological layers. And it was clear that the layers in many blocks were the same as those that run through the bedrock of the Sphinx itself. The blocks had to have come from the U-shaped ditch around the Sphinx. When workers quarried the ditch they left a large block of limestone from which the Sphinx was carved.

As I moved about the Sphinx Temple during my first year of the mapping project, I was struck by how the geological layers run continuously in many places, from one block to another, as the layers must have run in the bedrock. The gangs of young men who moved these mighty stones did not have much chance of mixing them up from quarry to temple wall. The Sphinx and its temple must have been part of the same quarry-construction sequence. But could I prove this?

Above: Sphinx and Sphinx Temple ruins. View to the northwest.

Below: Core blocks (Type A) on the western side of the Sphinx Temple, cut from three geological layers, with a thin marl layer—the "yellow band"—running continuously through the middle of three blocks. Photos by Mark Lehner.





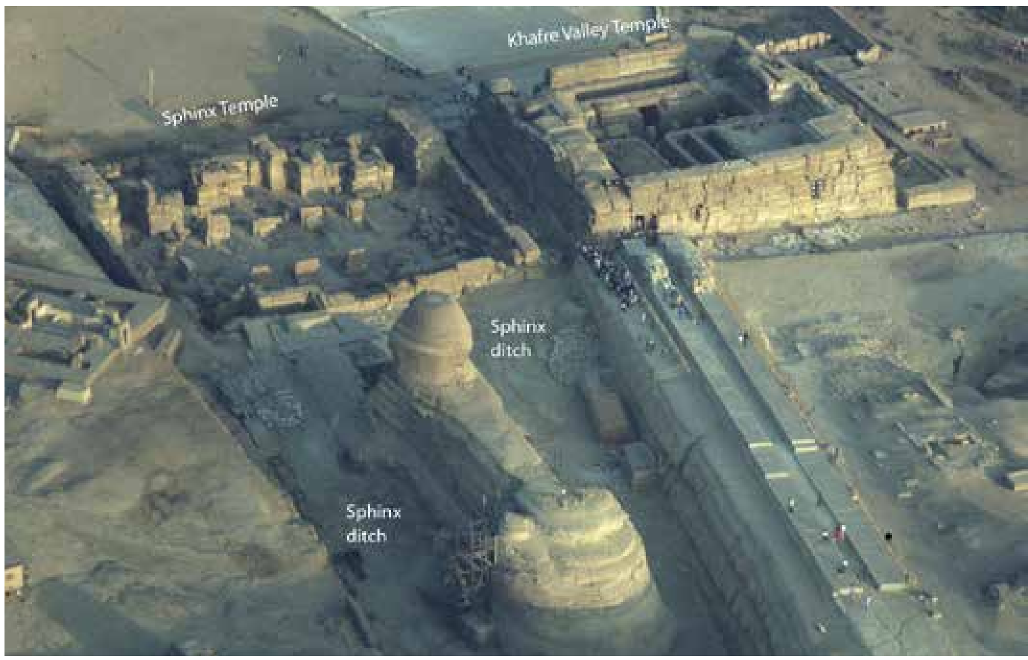
Schematic profile by Tom Aigner shows the principal geological layers of the Moqattam (Middle Eocene) and Maadi (Upper Eocene) Formations that make up the Giza Plateau. After T. Aigner, "Zur Geologie und Geoarchaologie des Pyramidenplateaus von Giza," *Natur und Museum* 112, pages 377–388, figure 4, 1982.

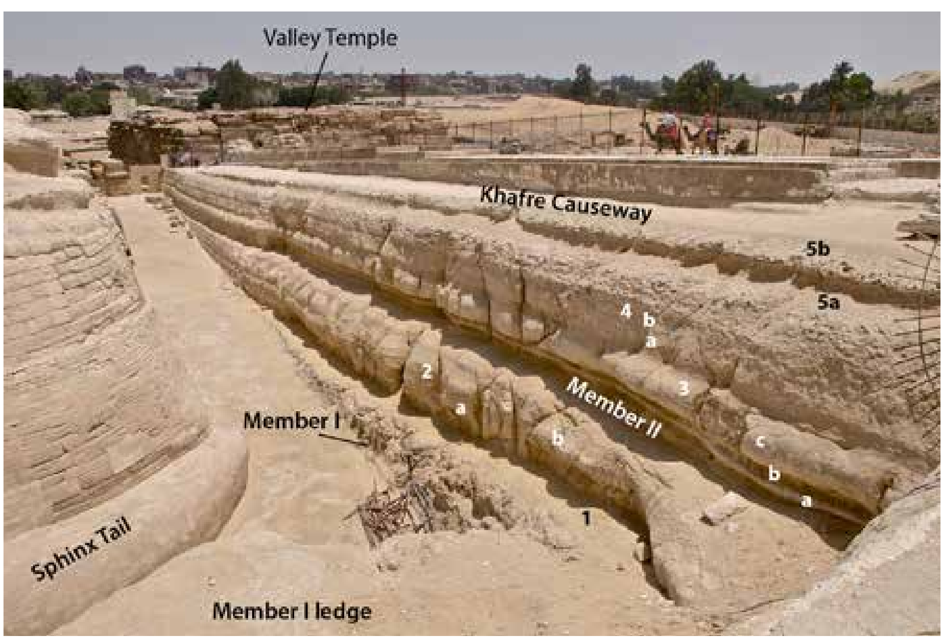
Fingerprinting the Core Blocks

The following year I met Tom, who had the expertise needed to geologically "fingerprint" the blocks and trace them back to the quarry. Tom looked at the Giza Plateau less as an archaeological site and more as frozen sea floors, petrified, pancaked, and stacked into the bedrock layers from which the pyramid builders quarried blocks, created tombs, and carved the Sphinx.

These layers formed during the Eocene epoch—some 34 to 56 million years ago, as a great primordial sea retreated northward. Under its ebbing waters, a colossal bank of nummulites, unicellular plankton-like organisms, built up. A sandbar developed on the embankment, and in the more protected waters behind it, a shoal and coral reef grew. As the sea retreated to the north, the area behind the sand bank became a muddy lagoon, inhabited by burrowing bivalves and sea urchins. A regular sequence accumulated, which petrified as soft, yellow, marly layers interspersed with harder beds.

In carving the Sphinx directly from the natural rock, the ancient Egyptian quarrymen cut a cross-section through the principal geological layers of the southeastern slope of the Moqattam Formation (see schematic above). The hard layers of the shoal and reef, for example, make up the lowest layer (Member I) in the Sphinx and its ditch. The shallow waters of the lagoon laid down sediments that make up the layers running through the body of the Sphinx (Member II). Turbulent waters churned up mud and silts, which petrified into softer layers. Calmer waters laid down more compact sedimentation, the harder layers. The Sphinx head is of harder bedrock (Member III) than the body, representing, again, calmer waters.





Above: The Sphinx in its ditch, fronted by the Sphinx Temple (left) and the Khafre Valley Temple (right).

Left: Lagoon layers, of Member II, in the south side of the Sphinx ditch (which forms the northern side of Khafre's causeway, connecting his valley temple and upper pyramid temple), with numbered beds of Members I and II. According to Aigner's model (see above schematic), these layers derive from a back-bay lagoon along what became the southeastern flank of the plateau, behind the nummulite embankment and coral reef, as the Eocene sea water retreated northward about 50 million years ago. View to the southeast. Photos by Mark Lehner.

Sphinx and Sphinx Temple core blocks (foreground). Type A blocks (labeled) derive from Beds 4 and 5; see diagram, below and bottom of facing page. Photo by Mark Lehner.

Mapping

Tom and I began our Sphinx Temple core block study by examining each layer, or bed, of the Sphinx. (At that time, more of the Sphinx's bedrock core was visible than today.) We gave each bed a number and marked them on photographs and on profiles of the Sphinx. The beds were easy to distinguish as they weathered differentially: harder beds protruded, softer beds receded. Also, the relative abundance of different fossils varied. Members I and II showed the greatest differences: I is a very hard gray reef formation, while the first bed of Member II, 2b, is one of the softest of the yellow marl-clay layers. Members II and III are distinct, but the boundary is not so clear as between I and II. Aigner, following an earlier geologist, set the boundary between Beds 7 and 8.

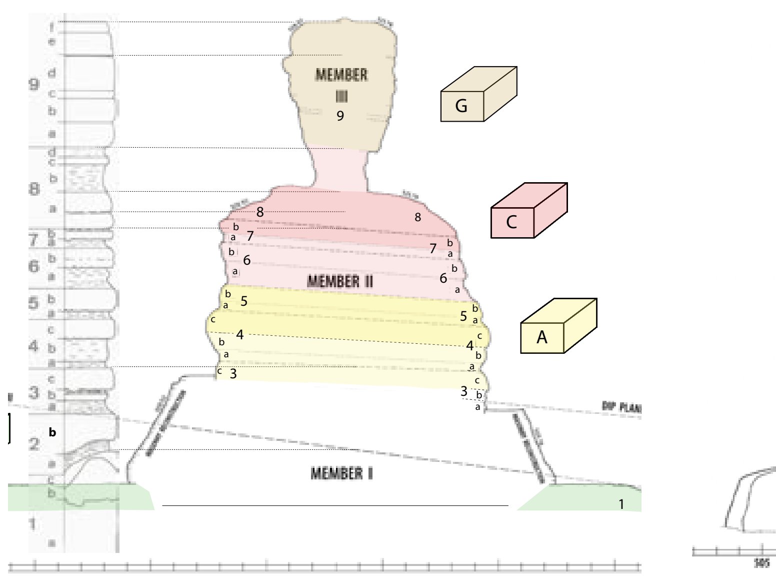
The massive fine-grained bedrock of Beds 8–9 (Member III) made for good sculpting, with far more endurance than the soft-hard-soft sequence of Member II. This is why the 4th Dynasty builders reserved Member III for the more exposed head. Details like the eyebrows have survived wind, rain, and sand for 4,500 years. But the Member II sequence was perfect for quarrying giant core blocks, because quarrymen could cut the bottoms and tops of the blocks along the clay-like yellow beds, and take out as many intervening beds as required (generally three) for the thickness of the block.

But from which beds exactly did they cut the core blocks? Would this tell us where they were in fashioning the Sphinx at the time they built the Sphinx Temple? To answer these questions we logged each block. We recorded their lithic qualities and fossil content, and assigned each block to one of seven types, A through G.

What the Core Block Types Tell Us

Most of the Sphinx Temple core blocks are Type A (yellow on the drawings) and consist of three layers: upper and lower hard massive layers separated by the soft, yellow marl layer in the middle, which runs continuously through separate blocks over long stretches of temple wall (as seen in photo, bottom page 2). These blocks come from beds that correspond to the lower chest of the Sphinx.

Type C blocks (red) come from beds that correspond to the Sphinx's upper chest, top of the chest, and base of the neck. In the Sphinx Temple these blocks cluster near the front. The quarry workers hewed the blocks from layers that would become the lion's upper chest and top of the back and then dragged them to the eastern front of the Sphinx Temple. As quarry workers cut deeper, to the middle and lower Sphinx chest level, haulers and builders composed most of the core walls of the temple.



Profile across the front of the Sphinx and across the Sphinx ditch, with limestone beds numbered. Color codes indicate source layers of large limestone core blocks in the Sphinx Temple.

Left: Sphinx Temple core blocks color-coded for block type. Most core blocks are Type A, yellow, which matches Beds 4b–c to 5b in the Sphinx's lower chest. Type C blocks, red, match Beds 7b–8a in the upper chest and top of the back of the Sphinx and cluster to the front of the temple.

Below left: Distribution of Type B and D core blocks (orange and purple) within the Sphinx Temple. These did not come from the Sphinx ditch.

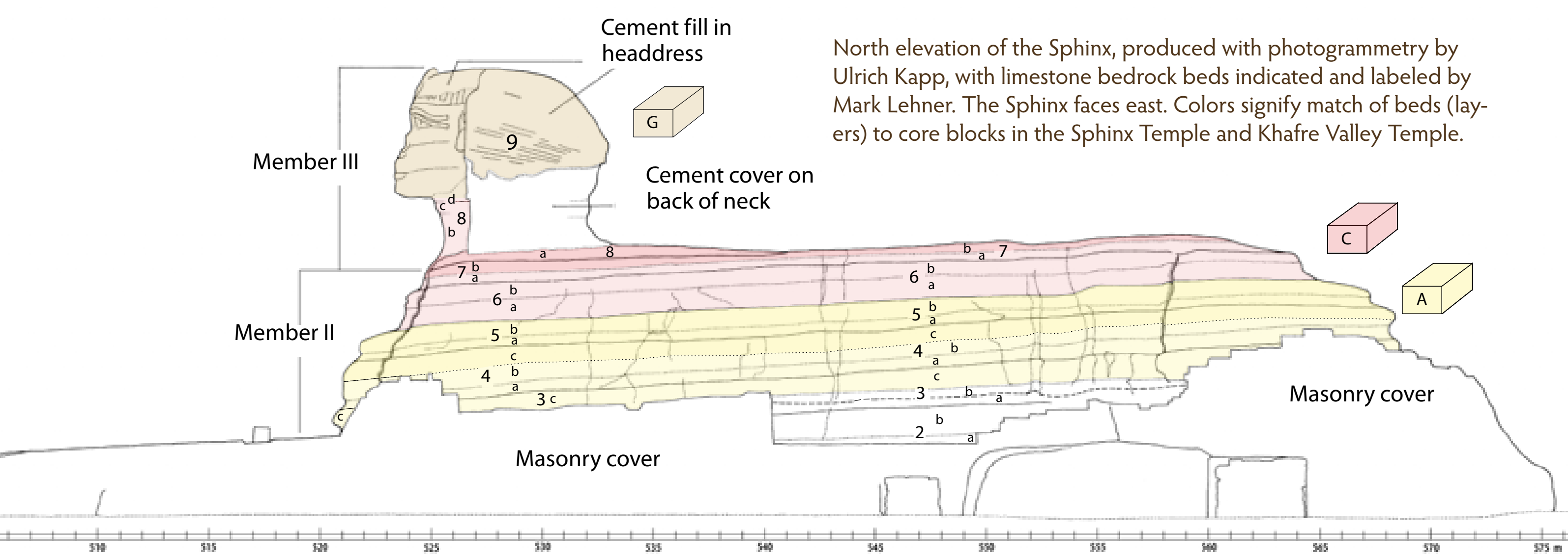
Block types B and D did not come from the Sphinx ditch. They most closely match strata to the southwest, exposed in the quarry cut for the Khentkawes Monument (see photo upper left page 7). They are less frequent and more intermittent in the temple walls than the A and C blocks. This could indicate that the builders stockpiled these blocks and brought them into the walls whenever there was a hiatus in the quarrying, dragging, and placing of the A blocks from the Sphinx ditch. The scanty distribution of B and D blocks might also reflect the fact that because they had to be hauled so far, it took much longer to deliver them to the temple than it took to drag A blocks from the Sphinx ditch.

Type G Blocks and the Temple Sequence

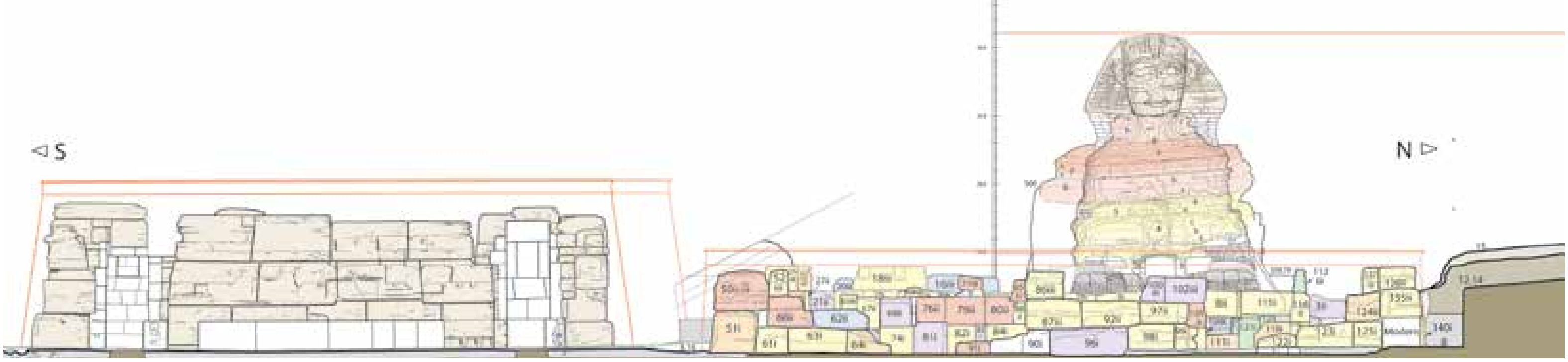
Type G blocks were not used in the Sphinx Temple, except for three instances, but they form the bulk of the Khafre Valley Temple. Aigner observed that this type of limestone cannot be found in the immediate Sphinx area, but seems to derive from strata which are equivalent to the Sphinx's head. I would suggest that they were not only equivalent to the Sphinx head, but actually came from it.

I hypothesize that as quarrymen worked down through the Member III strata (Sphinx head), they took the blocks to the southeast to make the core walls of the Khafre Valley Temple on the southern half of a terrace they had already leveled. They removed the Member III layers from all around the Sphinx head, leaving an island of Member III beds.

They continued quarrying down through the bedrock strata, removing Member II layers, carving out the Sphinx ditch, while



North elevation of the Sphinx, produced with photogrammetry by Ulrich Kapp, with limestone bedrock beds indicated and labeled by Mark Lehner. The Sphinx faces east. Colors signify match of beds (layers) to core blocks in the Sphinx Temple and Khafre Valley Temple.



East elevation of the Khafre Valley Temple (after U. Hölscher, *Das Grabdenkmal des Königs Chephren*, Leipzig: J. C. Hinrichs'sche, 1912), Sphinx Temple (after H. Ricke, "Der Harmachistempel des Chefren in Giseh," *Beiträge zur ägyptischen Bauforschung und Altertumskunde* 10, plate 2, 1970), and the Sphinx (from Ulrich Kapp's photogrammetry), with core blocks and bedrock strata. Khafre Valley Temple core blocks are hypothesized to be Type G and to derive from Sphinx head layers.

reserving the block for the Sphinx body. They cut the C blocks from the upper beds of Member II and hauled them to the east side of the Sphinx Temple site. Then they worked their way down into the lower layers of Member II, cutting the A blocks, which they dragged to the temple site and used to create the Sphinx Temple walls.

This hypothetical construction sequence fits the general pattern of G blocks (beige, head) in the Khafre Valley Temple, C blocks (red, upper chest and neck) mostly in the eastern walls of the Sphinx Temple, and A blocks (yellow, lower chest) comprising most of the Sphinx Temple.

Unfinished Projects

Khafre's workers started shaping the Sphinx as they built his valley temple. And they were probably still shaping the lower lion body, cutting it out of its surrounding ditch, as they made the Sphinx Temple, Khafre's last major addition to his pyramid complex. But they did not finish. They left the Sphinx Temple incomplete, without its exterior granite casing. Quarrymen never finished completely cutting and straightening the Sphinx ditch, leaving a huge massif of Member I bedrock projecting to within a meter of the tail.

Did the Sphinx Originate with Khufu?

The connections between Khufu and the Sphinx are intriguing, but tenuous. Just to the north of the Sphinx, a quarry cut lies at the end of Giza's central canal basin[4] and could have created a hauling track from the delivery basin to Khufu's pyramid. That cut forms the North Cliff of the Sphinx ditch. Perhaps Khufu, or his courtiers, first conceived the Sphinx and started quarrying to create it.

Certain associations have come to light in recent years between Khufu and the lion. A reference to "lion" is prominent in one of the names of work gangs that Pierre Tallet and team found in Khufu's port at Wadi el-Jarf[5] (see page 20 here). They found the names inscribed in ink on water jars, anchors, large stone blocks that plugged the rock-cut galleries, and in account papyri. Tallet writes that the name refers to a metaphorical mixing of king and lion. Should Khufu have used the same metaphorical mixing to conceive the Sphinx, then Khufu would not only have built the Great Giza Pyramid, he would also be the one who formulated the Great Giza Lion, the Sphinx, which certainly manifests king as lion.

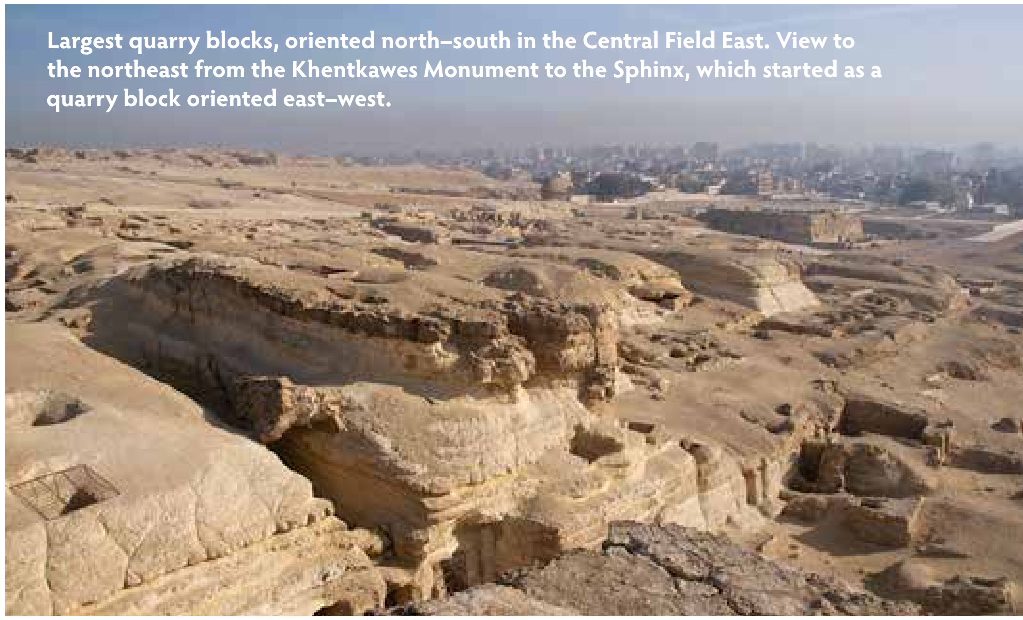
At Saqqara a Japanese mission found four terracotta statues of a lion goddess and two terracotta recumbent lion statues in subterranean chambers under so-called "Lion Hill," a monument of many periods.[6] One of the recumbent lions bears the inscription "King of Upper and Lower Egypt, Khufu" (*nsw-bity 2wfw*) between the paws. Khufu's Horus name *(1r MDdw)* is added to the side of the back pillar of one of the standing statues, which features at the feet of the goddess small figures of kings Khufu and Pepi I. It is possible this entire set of lion statues was made originally for Khufu.

None of this is entirely convincing that Khufu started the Sphinx, but it is worth considering. The evidence linking Khafre and the Sphinx is stronger, although not absolute "proof." However, the stratified building sequence of the Khafre Valley Temple and Sphinx Temple makes it highly probable that Khafre built both temples, while leaving the Sphinx Temple unfinished.[7]

1. Stadelmann, R., "The Great Sphinx of Giza," in *Egyptology at the Dawn of the Twenty-first Century: Proceedings of the Eighth International Congress of Egyptologists, Cairo, 2000*, edited by Z. Hawass and L. P. Brock, Cairo: The American University in Cairo Press, pages 464–469, 2000.
2. Reisner, G. A., *A History of the Giza Necropolis*, Cambridge: Harvard University Press, 1942.
3. Schoch, R., "Re–dating the Sphinx," *KMT* 3 (2), pages 53–67, 1992. Reader, C. D., "A Geomorphological Study of the Giza Necropolis, with Implications for the Development of the Site," *Archaeometry* 43 (1), pages 149–159, 2001.
4. I reconstructed that waterway based on evidence; see M. Lehner, "On the Waterfront: Canals and Harbors in the Time of Giza Pyramid-building," *AERAGRAM* 15 (1&2), pages 14–23, 2014.
5. Tallet, P., "Des serpents et des lions et des lions: La flotte stupéfiante de Chéops en Mer Rouge," in *Du Sinaï au Soudan, Itinéraires d'une égyptologue (Mélanges offerts à Dominique Valbelle),* edited by N. Favry, C. Ragazzoli, C. Somaglino, and P. Tallet, Paris: Editions de Boccard, pages 247 and 249–251, 2017.
6. Yoshimura, S., N. Kawai, and H. Kashiwagi, "A Sacred Hillside at Northwest Saqqara. A Preliminary Report on the Excavations 2001–2003," *Mitteilungen des Deutschen Archäologischen Instituts, Abteilung Kairo* 61, pages 390–394, figures 21–22, 2005.
7. For more information see M. Lehner, "Unfinished Business: The Great Sphinx. Why it is most probable that Khafre created the Sphinx," *AERAGRAM* 5-2, pages 10–15, Spring 2002.

The quarry face north of the Khentkawes Monument. Surveyors stand at the top of the outcrop. View to the east. All photos on this page by Mark Lehner.

Largest quarry blocks, oriented north–south in the Central Field East. View to the northeast from the Khentkawes Monument to the Sphinx, which started as a quarry block oriented east–west.



HOW EGYPTIANS QUARRIED THEIR BUILDING BLOCKS

The Egyptians left no texts describing quarrying, but we can look at cuts and other traces they left behind. We see huge quarry cuts in the Central Field West—probably the main quarry for the Khufu Pyramid—just below the southeast corner of the Khafre Pyramid, and another deep, vertical cut in the bedrock outcrop north of the Khentkawes Monument (above left). These cuts suggest that the quarrymen worked through the geological layers top-down, not in steps.

They cut channels to define blocks of various sizes in the Central Field. We can see their largest-scale channeling between the Sphinx and the Khentkawes Monument (above right), where the quarrymen divided quarry blocks oriented north–south, the size of small houses with channels as wide as hotel corridors.

Next, quarrymen subdivided the largest quarry blocks. Unless they wanted to extract megaliths—like the core blocks in the Sphinx Temple and Khafre Valley Temple—they would take out smaller blocks the thickness of a single geological bed.

Whether they took small blocks, like those in the pyramid core work, or the large megaliths of the temples, quarry workers would "strip the bed." That is, they would cut and lever the bottoms of blocks along the bedding plane, along its natural, geological incline (below).

To pry out block bottoms, quarry workers used a series of three wooden levers, each the size of a railroad tie. Parallel lines of sockets for such levers were exposed when the Giza Inspectorate cleared debris on the bottom of the Central Field West quarry, west and north of the Khentkawes Monument. The spacing between lines of sockets corresponds to the lengths of large blocks (below right).

Below: The bottom of the Central Field West quarry. Here, from a single bed, quarry workers removed blocks in the size range of many blocks in the Khufu Pyramid core. View to the west.

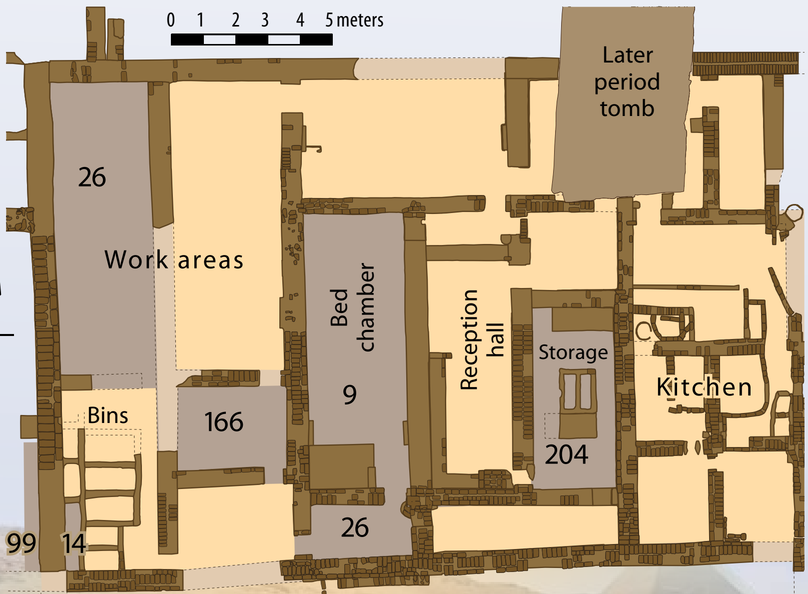
Rows of sockets cut to receive the ends of wooden levers used to pry up blocks along the bedding plane of a geological layer at the bottom of the Central Field West quarry. View to the west-northwest.

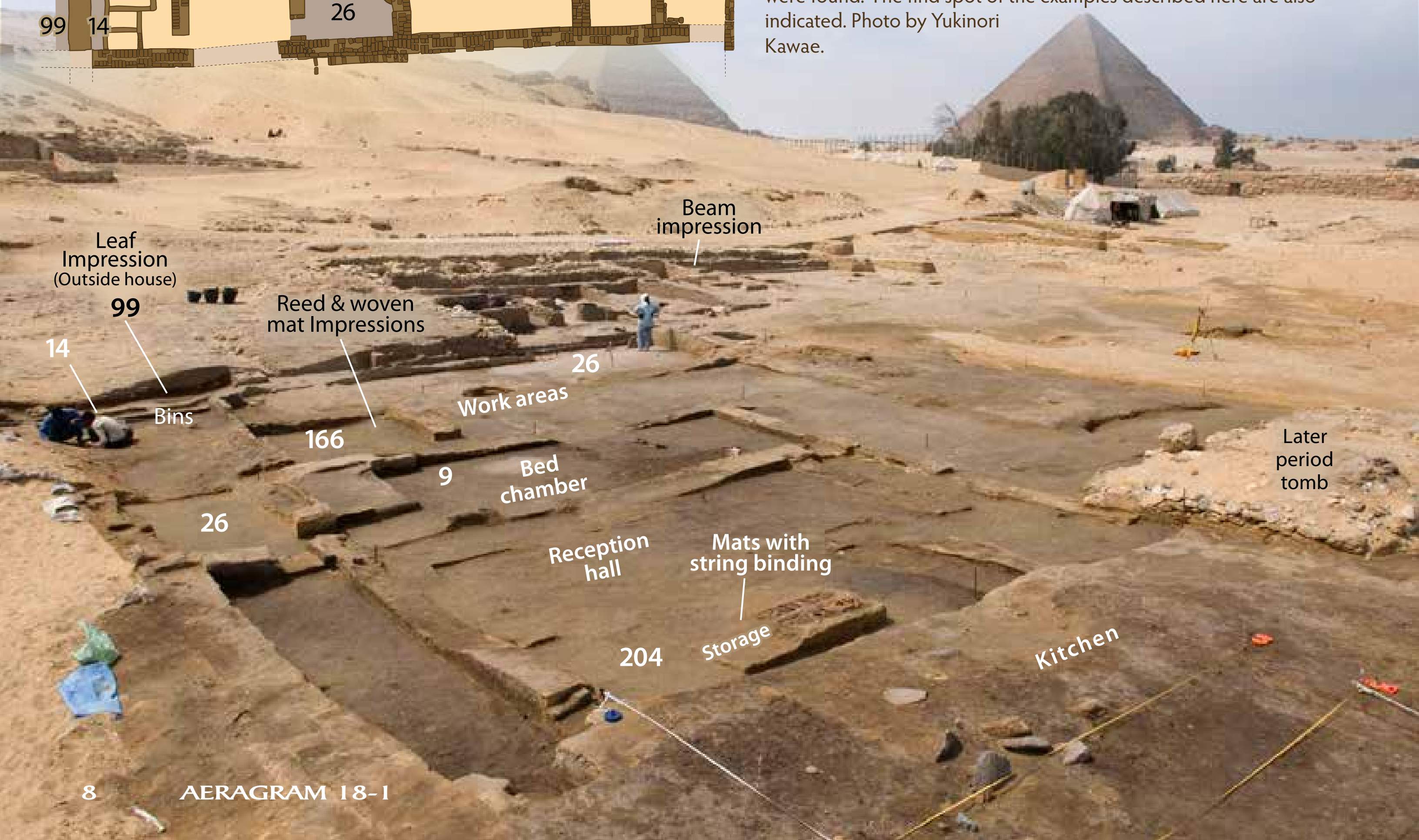
A Roof Over Their Heads

by Manami Yahata

During AERA's 2017 study season, Manami Yahata worked in our field lab at Giza on mud roofing fragments. Here she describes some of these remains and what they tell us about how the residents of the Heit el-Ghurab site roofed their houses.

Roofing material fragments are direct raw data of a house's structural evidence. But it is rare for roofing materials to be preserved in their original state on account of the fragile nature of the material. They are usually found among debris from collapse layers, and are most often mud fragments bearing impressions of beams, mats, sticks, etc. These fragments are sometimes hard to recognize as pieces of roofing and, as Barry Kemp points out, they have often been ignored or overlooked in earlier excavations. But as important structural evidence, they "should be looked for and recorded during excavation."[1]





Top left: Manami Yahata working on fragments of roofing material in the Giza field lab. Photo by Claire Malleson.

Left: Map of House Unit 1 showing the number of roofing fragments found and the rooms where they were recovered. The spaces filled with light brown produced roofing fragments; the others had no remains of roofing material. Map by Rebekah Miracle, AERA GIS.

Below: Photo of House Unit 1 after the 2007 excavations. The numbers of roofing fragments are listed in the areas where they were found. The find spot of the examples described here are also indicated. Photo by Yukinori Kawae.

Flat roofs and ceilings in ancient Egypt were constructed with wooden beams, plant stems, mats, and mud plaster coating. Archaeological evidence shows that logs were laid across the short axis of the room—ends resting on top of the sidewalls—and covered with palm leaf ribs, reeds, or grass bundles perpendicular to the cross beams. Reed matting might also be used over the beams or placed on top of the palm/reed layer. A thick layer of mud covered the top and might be plastered. The underside, the ceiling, could also be plastered.[1]

Kemp notes, "When ceilings and roofs of this kind collapse, the mud coverings break into pieces which will continue to retain the impressions of beams and other supporting material (which will normally eventually decay)."[1] The photo below illustrates this. Part of the ceiling of the Giza Taftish storeroom next to our field lab collapsed and sits on the floor. Impressions of the wooden poles are preserved in the gypsum fragments.

Ancient roofing remains have been found at the Old Kingdom settlements of Ayn Asil[2] and Ain el-Gazzareen[3] in Dakhla Oasis. Sites from other periods have yielded roofing materials that have been reported with brief descriptions. However, details have not been published, except for evidence from Tell el-Amarna[4] and two other sites. At Akoris, in Middle Egypt, a Japanese mission found well-preserved roofing from the Third Intermediate Period, including both impressions and desiccated beams and reeds (shown on page 11).[5] Also, at the Ramesside Period town of Amara West in northern Sudan thousands of mud fragments with impressions were uncovered and are discussed below.[6]

Heit el-Ghurab Roofing

Although the Heit el-Ghurab site was apparently cut down to knee-level or lower after abandonment, stripped of most useful materials, and subjected to occasional flooding, many fragments of mud roofing materials nonetheless survived. After the roofs collapsed onto the floor—probably after timbers were scavenged—they could have been protected by mud layers. The organic materials would have gradually decomposed, but the hard mud fragments, some with impressions, would have survived. When they are unearthed, these mud scraps of different sizes and shapes tell a fragmentary story.

Most of our information on roofing material comes from House Unit 1, the largest house at the site, which we excavated during seasons 2004–2007, 2009, and 2011. Of a total of 544 pieces so far recovered, 445 come from inside House Unit 1. An additional 99 were found in a trench we excavated along the west side of the outer west wall. This area lies within the adjacent structure, AA-S, which we excavated in 2015. An additional roofing fragment was found in an "industrial" structure northwest of House Unit 1, possibly a brewery.

House Unit 1 includes a kitchen area on the east end and in the central and west portions, work areas, a reception hall, bed chamber, storage areas, and in the southwest corner a series of bins.[7] The roofing fragments found inside the house all come from the areas to the west of the kitchen. The distribution of the pieces is shown on the map and photo on the facing page.

Impressions

During study season 2017 I documented 149 pieces with impressions of roof construction material. I placed the roofing fragments in the following categories:

A. impression of a woven mat
B. impression of mat with a knotted string/rope binding
C. impression of a leaf
D. impression of reeds
E. impression of a wooden beam.

A. Impression of a woven mat

Two different patterns of mat can be identified. Type A is a woven, wickerwork-like pattern, as seen in specimen RM80 (see next page), which is remarkably well preserved. Its surface on one side shows clear undulations from the beams on which the

Right: Yukinori Kawae holds one of the many fragments of roofing material with impressions he uncovered during the 2004 excavation in House Unit 1. Photo by Mark Lehner.

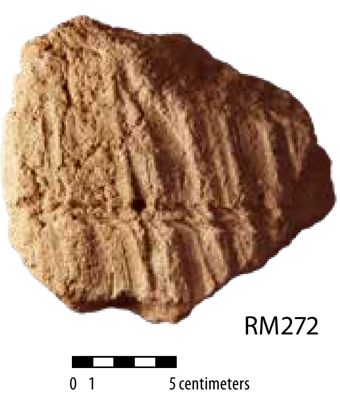
Below: Roofing fragments from a partially collapsed modern ceiling lie on the floor of the Giza Taftish storeroom adjacent to the AERA field lab. Note the impressions preserved in the gypsum. The stems/beams would eventually decompose in exposed environments. Photo by Manami Yahata.

Impression of a woven mat

RM80

Impressions of a woven mat with string/rope binding

RM352



RM272

mat rested. It is obvious that the mud became rippled under its own weight while still wet. Inclusions of cultural material—potsherds, charcoal and stones—are visible on its outer surface. The photo on page 12 of a deteriorating roof top in Old Gurna village shows a similar looking mud surface.

Most of the examples of this pattern in House 1 (43) were found in the small room on the west side where 166 roofing fragments were recovered. AERA team members found a very similar mat impression in one of the galleries west of the Khafre pyramid (the so-called "Workers Barracks") during their 1988–1989 excavations.[8]

B. Impression of mat with knotted string/rope binding

There are two different types of mat pattern B, which is made of plant stems tied in bundles. RM352 shows the impression of parallel plant stems, their fibers distinctly visible, bound with a single rope. Posed next to the impression is a dried reed taken from the Nile riverside. See the photo on page 12 of a modern roof with matting made of reeds bound with rope.

RM272, the second type, shows impressions of plant stems/leaves (straw?) of varying width bound with double ropes.

C. Impression of leaf

RM156 shows the details of a monocot leaf's midrib impression. I have not identified the species of the plant, but when I attempted to set the tip of a reed leaf into the shallow groove, it fit.

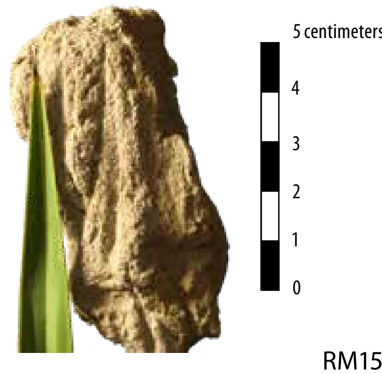
D. Impression of reeds

RM29 shows an impression of stems, probably reeds, with an additional impression of matting (inset). Matting was apparently placed over the stem layer. A number of the mud fragments bear complex impressions like this one.

E. Impression of wooden beam/pole

RM542 is a good example of a well-

Impression of a leaf



RM156

Impression of reeds

RM29

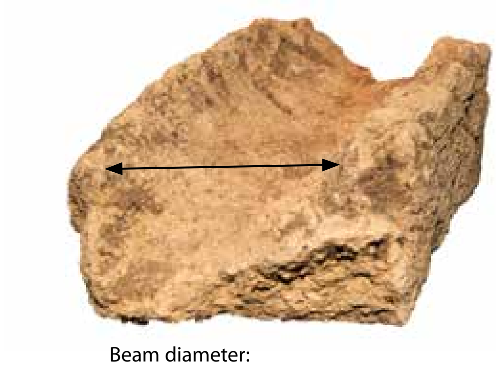
Reeds placed in impressions

preserved impression of a beam, found in an area immediately northwest of House Unit 1. The mud fragment is made of whitish-yellow marl clay. One side has a flat surface that might have been part of the ceiling. The other side bears the impression of the beam, which has irregular horizontal ridges, a feature of palm tree trunks (see photo above). The diameter of the beam/pole impression is 2.6 inches (6.5 centimeters).

Roof Construction

The width of the rooms where roofing

Impression of a wooden beam



Beam diameter:
2.6 inches (6. 5 centimeters)

RM542

Palm tree trunk

fragments were found range from 5.5 to 10.10 feet (1.67 to 3.08 meters) across (without intermediate support from columns). The one with the largest short axis is the bed chamber, which measures 27.8 × 10.10 feet (8.48 × 3.08 meters). The beams that spanned the room to support a roof had to be 10.1 feet (3.08 meters) long plus extra length to place on top of the walls, which were 2.2 feet (0.68 meters) thick. So the timbers must have been at least 14.6 feet (4.44 meters) long. There is no evidence of columns or column bases that could have helped support a beam. The nine roofing fragments from the bed chamber include two with impressions of a beam. There were also five examples of Type C and one of D (and one roofing piece with no clear impression).

The variety of roofing materials reflected in these mud fragments indicates that more than one method was used to build flat roofs over House Unit 1, even within one room. This is not surprising. At Amara West, Maria Vandenbeusch identified three types of roofing used on one house.[6] Kemp and Stevens discovered two methods of construction represented in the impressions in mud fragments found in the House of Ranefer at Amarna.[4]

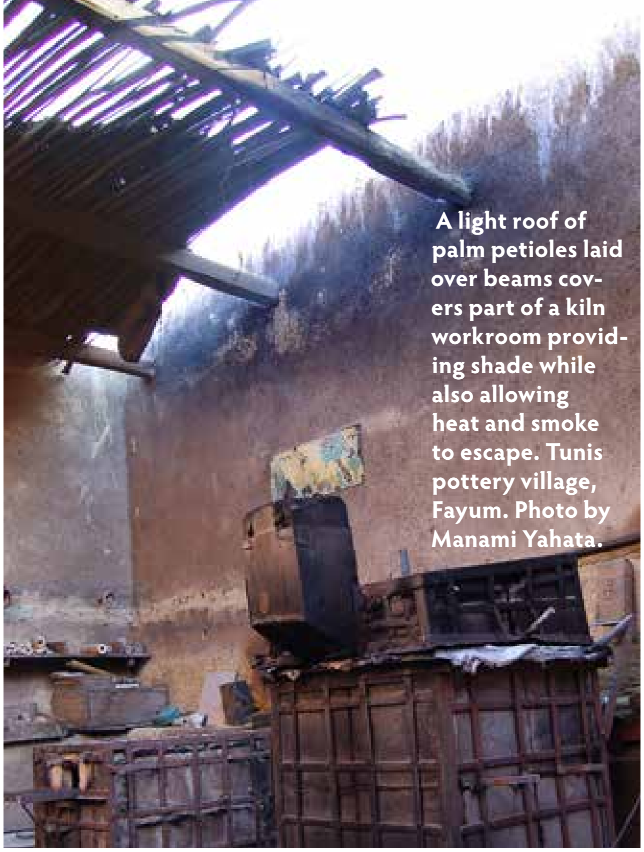
Not all rooms in House Unit 1 had solid roofs, as indicated by the absence of roofing fragments (see map on page 8). These spaces might have been covered with a light canopy of reed mats or date palm fronds. Three of the photos on page 12 show contemporary examples of light covers or awnings used to shade work areas. In the oven courtyard (center left) and the kiln workroom (top left), they cover only a portion of the space, allowing heat and smoke to escape. The kitchen area in House Unit 1 was probably partially covered in a similar fashion.

Roofing fragments are seemingly just lumps of mud; so they are rarely studied. However, when we observe them carefully, they prompt us to think about how a space had been roofed and used by the inhabitants. By combining the indirect data from roofing fragments with direct architectural data, such as wall width, and looking at good examples of roofing found at other sites in Egypt, particularly el-Amarna, Amara West, and Akoris, we can reconstruct the roofs at HeG. Granted there is a big gap between our Old Kingdom site and these later period sites. However, from the many houses I have observed over the 15 years I have lived in Egypt, it seems that this type of roof construction has not changed fundamentally since ancient times.

The House Unit 1 roofing fragments, along with other information, also offer insights into the functions of the spaces. The rooms that were roofed, as indicated by the presence of roofing fragments, were protected from the elements. These spaces would have provided shelter and could have been secured. But they would have been dark, save for lamp light. Activities requiring good light would have been carried out in the unroofed spaces. Roof tops, if strong enough, also offered a place for such activities. Evidence of the thickness of a roof and the materials used to build it could shed light on whether it was stout enough to bear the weight of people.

As I continue my study of the House Unit 1 roofing pieces, I hope to reconstruct the building methods and determine how the spaces might have been used.

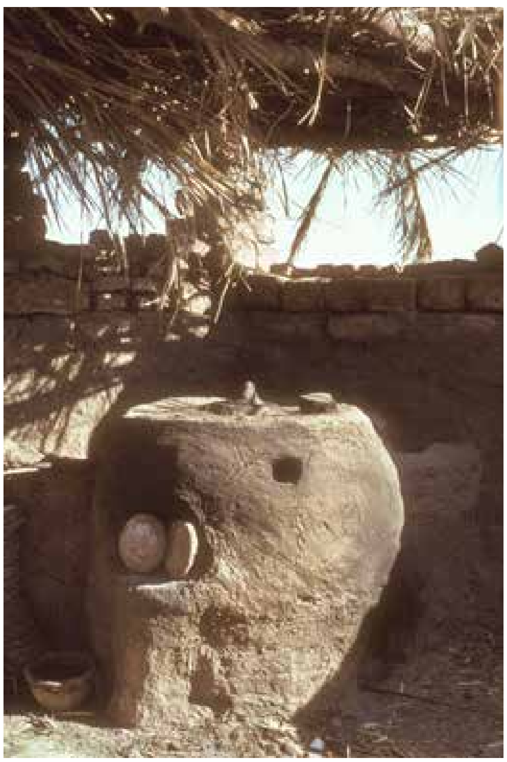
At Akoris, in Middle Egypt, a Japanese mission found well-preserved roofing from the Third Intermediate Period, including both impressions and desiccated material. Detail of roofing, viewed from the north, in *Preliminary Report, Akoris, 2012*, page 6, figures 5-8.[5] Photo courtesy of Akoris Archaeological Project, Akoris General Director, Hiroyuki Kawanishi.



A light roof of palm petioles laid over beams covers part of a kiln workroom providing shade while also allowing heat and smoke to escape. Tunis pottery village, Fayum. Photo by Manami Yahata.

A light cover of plant stems and corn stalks shade an outdoor work area in Dahshur. Photo by Manami Yahata.

Above: Looking down at a deteriorating roof top in Old Gurna village in Luxor. Mud lies over plant stems. A modern material, plastic, was also incorporated in the roof. Photo by Manami Yahata.



Right: An awning of palm fronds laid across beams partially covers and shades a courtyard where women prepare and bake bread dough in the cylindrical oven. Gurna, Luxor. Photo by Wilma Wetterstrom.

Below: Looking up at the ceiling in St. Paul Monastery in Egypt's Eastern Desert. The matting resting across the beams consists of plant stems tied together with rope. Photo by Manami Yahata.

1. Kemp, B., "Soil (Including mud-brick architecture)," in *Ancient Egyptian Materials and Technology*, edited by P. T. Nicholson and I. Shaw, Cambridge: Cambridge University Press, page 93, 2000.
2. Minault-Gout, A., and P. Deleuze, *Balat II. Le mastaba d'Ima-Pépi. Mastaba II. Fin de l'Ancien Empire*, Cairo: l'Institut français d'archéologie orientale, page 8, 1992.
Soukiassian, G., "A Governors' Palace at 'Ayn Asil, Dakhla Oasis," *Egyptian Archaeology No. 11, The Bulletin of the Egypt Exploration Society*, pages 15–17, 1997.
Bernard, M., "Balat, 'Ayn Asil (oasis de Dakhla)," *Bulletin de l'Institut français d'archéologie orientale* 100, pages 486–487, 2000.
3. Mills, A. J., and O. E. Kaper, "Ain el-Gazzareen: Developments in the Old Kingdom Settlement," in *The Oasis Papers 3, Proceedings of the Third International Conference of the Dakhleh Oasis Project*, edited by G. E. Bowen and C. A. Hope, Oxford: Oxbow Books, pages 123–129, 2004.
4. Kemp, B. J., and A. Stevens, *Busy Lives at Amarna: Excavations in the Main City*, Vol. 1, London: Egypt Exploration Society, pages 149–169, 2010.
Peet, T. E., and L. Woolley, *The City of Akhenaten*, Memoir of the Egypt Exploration Society 38, pages 57–8, 1923.
Weatherhead, F., and B. J. Kemp, *The Main Chapel at the Amarna Workmen's Village and its Wall Paintings*, London: Egypt Exploration Society, pages 90–112, 2007.
5. Kawanishi, H., S. Tsujimura, and T. Hanasaka, *Preliminary Report, Akoris, 2012*, Tsukuba: University of Tsukuba, Institute of History and Anthropology, pages 5–9, 2013.
6. Vandenbeusch, M., "Roofing houses at Amara West: A case study," in *Nubia in the New Kingdom: Lived experience, pharaonic control and indigenous traditions*, edited by N. Spencer, A. Stevens, and M. Binder, Leuven: Peeters, pages 389–405, 2017.
7. Sadarangani, F., and Y. Kawae, "Soccer Field West, House Unit 1, 2009," in *Giza Occasional Papers 5, Giza Plateau Mapping Project Season 2009 Preliminary Report*, edited by M. Lehner, Boston: AERA, pages 135–145, 2011.
8. The area is located in Khafre's western magazines (the so-called "Worker's Barracks"). AERA re-excavated it in 1988–1989 after Flinders Petrie's excavation in 1881.
Conard, N. J., and M. Lehner, "The 1988/1989 Excavation of Petrie's 'Workmen's Barracks' at Giza," *Journal of the American Research Center in Egypt*, Vol. 38, pages 21–60, 2001.

16 Candles for 16 Terabytes
Celebrating the New Giza Server

Early this past May at our AERA-Egypt Center, we celebrated the "launch" of a new Giza server. In the photo on the right AERA IT specialist Mohamed Saied (Midou) beams as he cuts the ribbon around our new machine. On the cake, four candles—each standing for four—flicker, representing the Dell's 16 terabyte storage capacity.

The new server, selected by Midou after careful study of all options, replaces a much smaller, older device that had been chugging along for eight years, storing vast quantities of our data and making it available to team members in Giza and around the world. Initially it did the job, but over the years as AERA grew, the old server could not keep pace with our needs. The storage capacity, upgraded to the maximum of the device, eventually fell far short of what we needed for the gargantuan volume of data generated each field season. In fact, at the start of this past season, Midou had to remove files to make room for the new ones that would be forthcoming.

The old server had another serious shortcoming as well: it could support no more than ten users at a time. Thus during the field season, with far more than ten people trying to log on, some would-be users were left hanging.

There were other problems too. Team members complained about the server's sluggish performance when uploading photos or searching for files. Midou worried about reliability. The old machine only had a single USB hard drive for backup and in the event of a power outage it could run for no more than an hour.

The new server addresses all these shortcomings and offers much more. With storage upgradable to 72 terabytes, the Dell should keep pace with our needs for the next ten years. It supports up to 50 users concurrently with very rapid transfer rates. The daily download of field photos, for example, will take one third the time it used to, and 20 cameras will be able to download simultaneously, even while other team members work online with drawings, text files, and spreadsheets.

AERA IT specialist Mohamed Saied beams as he cuts the ribbon around the new Dell server at the AERA Egypt Center in Giza. Photo by Mark Lehner.

The Dell server can also be counted on for reliability and security. Its backup power source can provide 1500 watts to keep the machine running for up to two hours during power outages. A backup server assures that all files are protected from loss. And as the Dell supports the latest security technology, cyber threats are kept at bay. In addition, the server alerts the administrator to hardware failures, and with its fail-safe support, it will continue working even with damaged hardware.

It's "not only a new server, it's an entire system upgrade!" Midou proclaims. We heartily thank Glen Dash,* AERA board member, for funding this dream IT system. It will assure smooth, efficient running of our research operation and keep our data safely preserved. Thank you, Glen!

*Glen also heads the Glen Dash Foundation Survey. See his article about the Great Pyramid on page 14.

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Ancient Egypt Research Associates
26 Lincoln St. Ste. 5, Boston, MA 02135 USA
E-mail: info@aeraweb.org

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Finding Those Indelible Marks Flinders Petrie Left on the Giza Plateau by Glen Dash

Flinders Petrie has been called "the Father of Egyptian Archaeology."[1] His 1880–'81 survey of the Giza Plateau and its pyramids was a watershed. Without doubt, he left his mark on archaeology. As it turns out, at Giza he left his marks literally as well. These were his "stations," the markers in his survey network. They can still be found, if you know where to look, and they are still important. Most of them have not been seen in more than 130 years. In this paper I identify where they are, and what they should look like.

William Matthew Flinders Petrie (1853–1942) was the son of William Petrie, a surveyor and inventor. His mother, Anne Flinders, was the daughter of a famous sea captain, Matthew Flinders, who mapped the Queensland coast of Australia. Young Flinders began surveying archaeological sites in England with his father while a teenager. By the age of 22, he had surveyed and planned 40 of them, including Stonehenge.[2] In 1866, at the age of 13, Flinders Petrie purchased Charles Piazzi Smyth's *Our Inheritance in the Great Pyramid*.[3] Smyth, following John Taylor, claimed that the Great Pyramid was divinely inspired and, among other things, prophesied the future and recorded the measures of the Earth.

Petrie and his father resolved to travel to Egypt to see for themselves. Precise measurements of the Great Pyramid's internal and external elements, it was thought, could be used to confirm Taylor and Smyth's theories. Petrie's father's interest may have waned, but young Flinders's did not, and in 1880 he set off on his mission.[4]

Petrie arrived at the foot of the Great Pyramid on December 21, 1880, the winter's solstice. "We reached the pyramid about 10; a lovely morning with a delicate mare's tail sky, and the pyramids, one side warm with sunshine, the other grey blue with slight haze."[5] He settled into an empty tomb and commenced his survey work. On February 11, 1881, he wrote:

> I have planned out and made a good beginning, in a large survey of geodetic accuracy, to extend round all the Gizeh pyramids and to shew us their real errors of construction. Few people will sympathise with such a work, but I feel it is shameful not even to know the accuracy of the finest work of ancient times; to attain it is something beyond the zeal of modern architects, but at least we ought to be able to measure more accurately than they worked.[6]

To conduct a "geodetic" survey of the kind Petrie describes, a surveyor begins by picking reference points around the target area from which to survey.[7] These were Petrie's "stations." At each station the surveyor places a signal, so the location of the station can be seen from adjacent stations.

The surveyor's first task is to carefully measure the angles between stations, known as azi-

"The Great Pyramid has lent its name as a sort of by-word for paradoxes; and, as moths to a candle, so are theorizers attracted to it. The very fact that the subject was so generally familiar, and yet so little was accurately known about it, made it the more enticing …"

~ W. M. Flinders Petrie[8]

Glen Dash and Mohamed Abd el-Bassett ponder over Petrie Station B on the north side of the Khafre Pyramid Temple. Photo by Mark Lehner. On the far left the ghost of Petrie "haunts" the Giza Plateau.

muths, and calculate the distances between them, a process known as reduction. The calculations allow the surveyor to place the stations on a map. The surveyor then proceeds to measure the angle to a particular feature, such as the corner of a pyramid temple, from multiple stations. Using triangulation, the surveyor can calculate the location of this feature relative to the stations, which allows the surveyor to place that feature on the map. Moving feature to feature, a picture, or plan, of the whole area can be built up.

For Petrie, the endeavor proved daunting owing to the conditions at Giza. On February 7, 1881, he wrote:

> A typical day. Off by 7.45 with Ali [Gabri] to station on hill top W. of pyramids, placing signals on the way there. Then began observing, but the wind was so high that three times I had to leave off and take a run of ¼ to ½ mile and back to replace signals blown over … to add to which a gust constantly came driving sand into one's eyes and making one screw them up for a minute before anything could be seen again. … I had to go to and fro moving things; the theodolite of 36lbs was a lug to carry 1/3 mile and then up a slope of rubbish. Hence I took azimuths to 5 stations, the wind gone down then and then just finished by sunset, packed up and then west round and collected signals, getting in by 6½. After supper reduced all observations and then wrote this and to bed about 11.00.[9]

The nights could be as bad as the days. In a passage generations of field archaeologists can empathize with, Petrie wrote:

> Did not get any sleep till 11 or 12 and then [sleep] broken by 1st trap down, big rat, killed and reset.
> 2nd Mouse about trap for long, though bait must be eaten, got up to see.
> 3rd Fleas.
> 4th Mouse let trap down without going in, got up, reset it.
> 5th Mouse in, got up, killed him, re-set trap.
> 6th Fleas.
> 7th Dog …[10]

Prior to Petrie's arrival, British astronomer David Gill had surveyed incompletely the base of the Great Pyramid in 1875. He had left a series of permanent stations, or monuments, around the Great Pyramid consisting of bronze stakes set in lead and mounted into holes in the bedrock or into stone slabs. Petrie had hoped to use Gill's monuments, but, upon his arrival, found half of Gill's markers had been stolen. He did find three at the corners of the Great Pyramid, at the northwest, northeast and southeast. The fourth, at the southwest corner was gone, leaving an empty 1.6 inch (4 centimeters) square hole. Petrie would set his own stations, and resolved not to have them disappear. He wrote:

> For station marks on rocks and stones, I entirely discarded the bronze lead forms [used by Gill]. They may be very good in a law-abiding country, but I found that half of those put down by Mr. Gill, in 1874, were stolen or damaged … I therefore uniformly used holes drilled in the rock, and filled up with blue tinted plaster; they are easily seen when looked for, but are not attractive. To further protect them, I made the real station mark a small hole .15 [inches in] diam.; and, to find it easier, and yet draw attention from it if seen, I put two ½ inch holes, one on each side of it; usually 5 inches from it, N.E. and S.W. Thus, if an Arab picked out the plaster (which would be not be easy, as the holes are 1 to 1 ½ inch deep) he would be sure to attack a large hole, which is unimportant. Where special definition was wanted, as in the main points round the Great Pyramid, a pencil lead was set in the middle of the plaster. This cannot be pulled out, like a bit of wire, but crumbles away if broken; yet it is imperishable by weathering. To clean the surface of the marks, if they became indistinct, a thin shaving can be taken off the rock, plaster, and central graphite altogether.[11]

One hundred and thirty-four years later, on February 7, 2015, Egyptologist Mark Lehner, surveyor Joel Paulson, and I stood at the southwest corner of the Great Pyramid. We were there to conduct a survey of the base of the Great Pyramid using the latest equipment and survey techniques. We started the way Petrie did, looking for monuments from previous surveys. Standing at the Pyramid's southwest corner we saw exactly just what Petrie had seen so many years before, an empty hole in the rock (shown in the photo below left). There should have been a modern control monument there. Mark Lehner and Surveyor David Goodman had replaced the lost Gill stake in 1984 by filling the 4-centimeter hole with epoxy and setting a survey nail in it. However, sometime between 2014 and 2015, that was stolen as well.

For us, the missing monument was a problem. We had only a few days to complete our survey, and resetting the marker would take time. Still, it had to be done. So we began to scrape away a

The southwest corner of the Great Pyramid, looking north. The empty hole that once held David Gill's bronze survey monument can be seen in the foreground next to the north arrow. Photo by Glen Dash.

Petrie rediscovered. Glen Dash points at Petrie's blue-plaster-filled hole, just north of where Gill's bronze monument was once set. We used it as a station in our 2015 survey of the base of the Great Pyramid. Photo on the left by Mark Lehner. Inset photo by Rebecca Dash.

layer of encrustation over the limestone slab to prepare the area when we saw a baby-blue-plaster-filled hole (shown above). It was Flinders Petrie's calling card. We were most happy to find it. We would use it as our southwest station for our pyramid survey.[12]

The blue-plaster-filled hole was one of three Petrie had left here. It was not until the 2016 season that we cleaned enough of the surrounding surface to find the other two. All three were much as Petrie had described them, except that the half-inch holes that flanked the center hole were to the northwest and southeast rather than to the northeast and southwest (below right). The center hole was complete with its pencil lead. The flanking holes, which surveyors refer to as "reference points" or RP, were exactly 5 inches from the center hole.

In *The Pyramids and Temples at Gizeh*, Petrie recorded the location of all his stations on a survey grid of his own devising.[13] In tables available at http://dashfoundation.org/downloads/archaeology/working-papers/Coordinates-for-Petrie-Stations.docx, I have converted the coordinates of the stations as reported by Petrie to points on the modern survey grid we now use at Giza, the Giza Plateau Mapping Project (GPMP) grid established by Mark Lehner and David Goodman in 1984–1985. I also list each point's longitude and latitude.

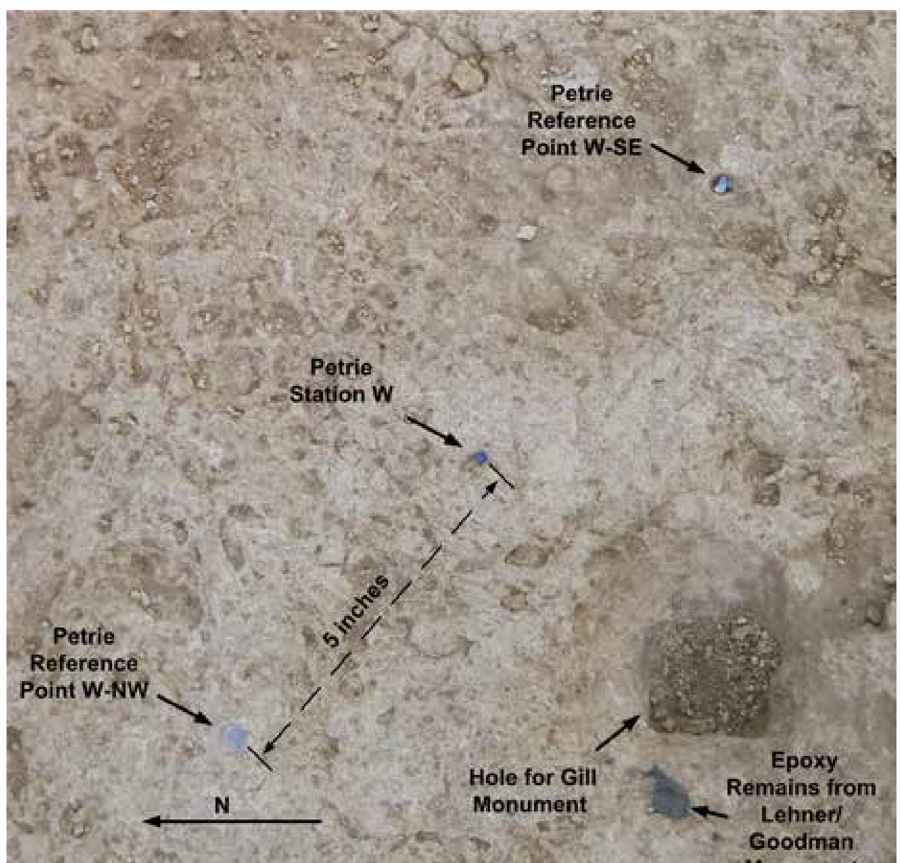
The figure on the facing page shows their locations on the Giza Plateau. During our 2015 and 2016 seasons, we found Petrie's stations B and G on the north side of the Khafre Pyramid Temple and on Lepsius Tomb 17, respectively. We used stations O, W, U, and Q in our survey of the base. We also found and recorded station L, a surviving Gill monument north of the Great Pyramid's entrance. All the others remain to be recovered, recorded, and photographed.

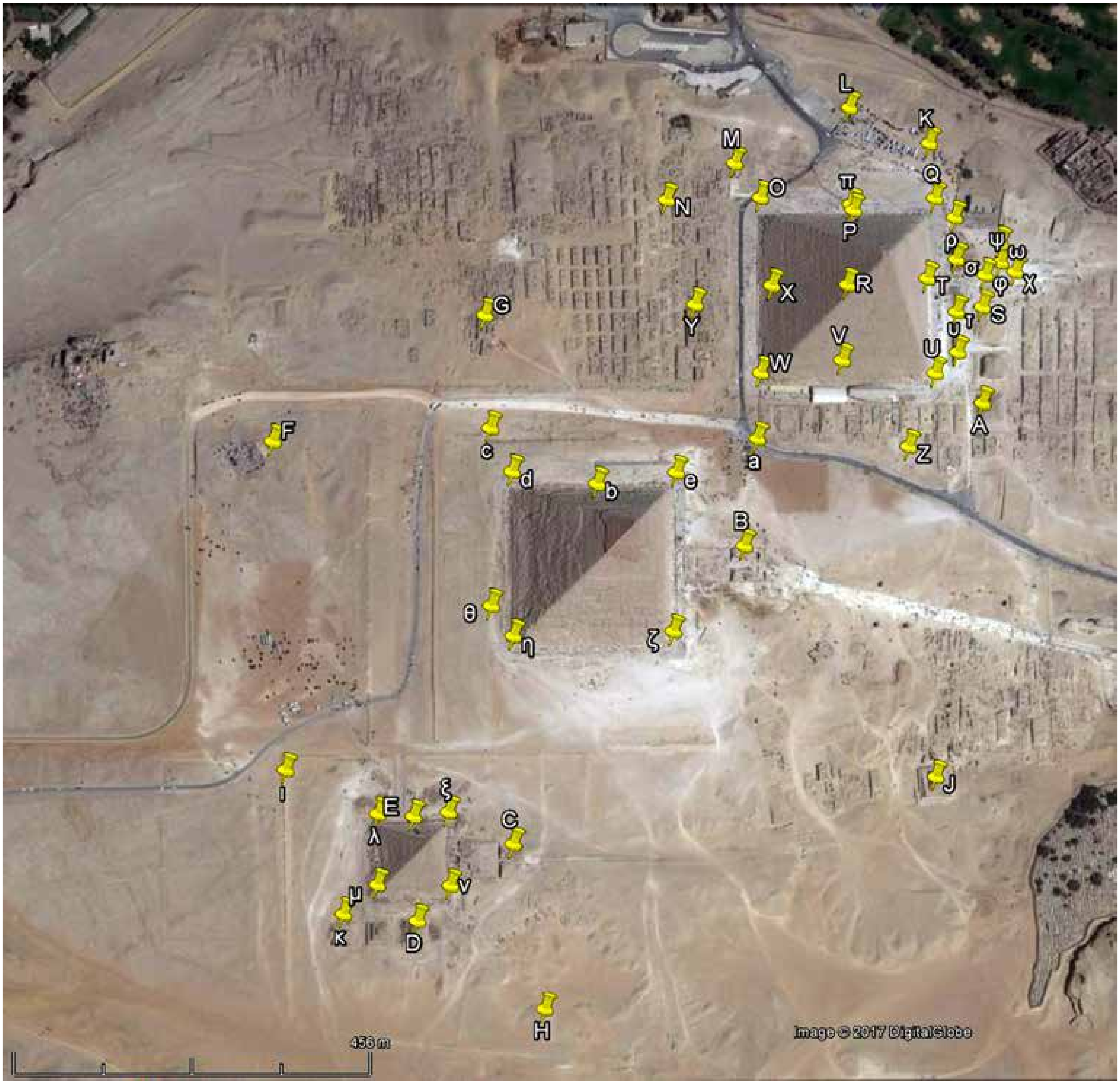
Fortunately for us, Flinders Petrie left some indelible marks on the Giza Plateau. They are so subtle and well set that they may survive a thousand years, well after the rest of our markers are gone. When encountered, their bright blue appearance contrasts so much with their drab surroundings that they shock the eye. Spread around Giza, they are tiny monuments of Flinders Petrie's work here, still useful today.

At the conclusion of his work, Petrie reflected on the theories of Smyth and Taylor which had brought him here:

> As to the results of the whole investigation, perhaps many theorists will agree with an American, who was a warm believer in Pyramid theories when he came to Gizeh. I had the pleasure of his company there for a couple of days, and at our last meal together he said to me in a saddened tone, -- "Well, sir! I feel as if I had been to a funeral." By all means let the old theories have a decent burial; though we should take care that in our haste none of the wounded ones are buried alive.[13]

One hundred and thirty-four years on, we are still trying to answer many of those same questions. Fortunately, owing to Flinders Petrie's genius, we still have his assistance.

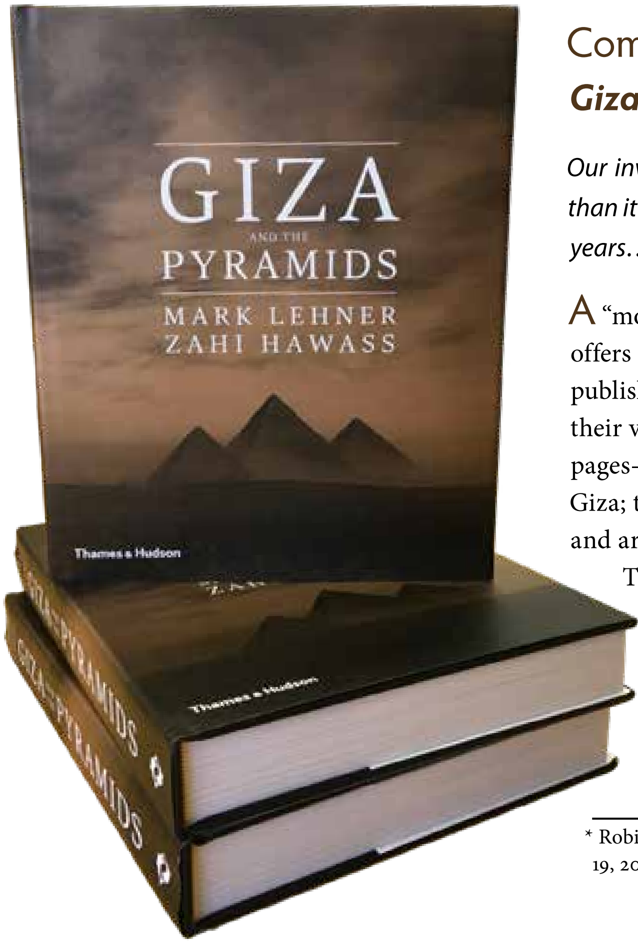




Above: Location of Petrie's stations. The Latin or Greek letters denoting each station are from Petrie 1883, pages 35–36, and are listed in Tables 1 and 2 (http://dashfoundation.org/downloads/archaeology/working-papers/Coordinates-for-Petrie-Stations.docx). Photo courtesy Google Earth and Glen Dash.

Facing page: Petrie's Station "W." During our 2016 season we carefully brushed clean the area to the north and east of the hole that once held the Gill monument. We found all three blue-plaster-filled holes Petrie had left here, their appearance being much as he had described them in his 1883 book. Photo by Glen Dash.

1. Lehner, M., *The Complete Pyramids*, London: Thames and Hudson, page 56, 1997.
2. Smith, H. S., "Preface," in *Letters from the Desert* by M. Drower, Oxford: Oxbow Books, page viii, 2004.
3. Piazzi Smyth, C., *Our Inheritance in the Great Pyramid*, London: A. Strahan and Company, 1864.
4. Smith, H. S., in Drower 2004 (see footnote 2), pages viii–ix.
5. Drower 2004, page 14.
6. Drower 2004, page 24
7. Surveys of this type, generally known as traverse surveys, can be geodetic or planar. A geodetic survey factors in the curvature of the Earth, whereas a planar survey does not. There is no evidence that Petrie figured in the Earth's curvature. As such his survey may be better described as a planar survey.
8. Petrie, W. M. F., *The Pyramids and Temples of Gizeh*, London: Field and Tuer, page 1, 1883.
9. Drower 2004, page 21.
10. Drower 2004, page 26.
11. Petrie's reference to 1874 is in error. Gill set his monuments in 1875, after returning from the transit of Venus expedition to Mauritius in 1874. Petrie 1883, pages 20–21.
12. The method we used to measure the base of the Great Pyramid can be found in G. Dash and J. Paulson, "The 2015 Survey of the Base of the Great Pyramid," *Journal of Egyptian Archaeology* 102, pages 186–195, 2016.
13. Petrie 1883, pages 34–36.
14. Petrie 1883, page xvi.



Coming Out on October 29:
Giza and the Pyramids, The Definitive History

Our involvement with Giza and the Pyramids spans 42 years, longer, probably, than it took to build the Great Pyramid. We worked on the book …for 30 of those years… ~ Mark Lehner and Zahi Hawass

A "monumental book," one reviewer called it.* Indeed, *Giza and the Pyramids* offers what is probably the most comprehensive study of the Giza Plateau yet published. Its Egyptologist-archaeologist coauthors infuse the volume with their vast knowledge, experience, and unique insights. In twenty chapters—560 pages—they discuss in-depth the pyramids, tombs, and other monuments at Giza; the pyramid builders and their town; ancient Egyptian economy, religion, and art; the history of the Giza Plateau; history of research at Giza; and more.

The volume is beautifully illustrated with hundreds of color photos, maps, and diagrams.

The University of Chicago Press is distributing the book in the US and Canada, along with many independent booksellers and Amazon. In Egypt, the AUC Press is the distributor. A German version, *Die Pyramiden von Gizeh*, will be available from Philipp von Zabern.

* Robinson, A., "Archaeology: The wonder of the pyramids," *Nature* 550, pages 330–331, October 19, 2017. http://www.nature.com/nature/journal/v550/n7676/full/550330a.html.

Memphis Site and Community Development Project Update

Our next issue will feature a cover story on wrapping up the Memphis Site and Community Development (MSCD) project, our two-year cultural outreach and heritage management program at ancient Memphis. But we did not want this newsletter issue to go to press without a brief update.

In late September, Dr. Khaled el-Anani, Minister of Antiquities, hosted a "soft opening" of our new tourist walking circuit for Ministry, USAID, and US Ambassadorial dignitaries, including US Chargé d'Affaires Thomas Goldberger, Governor of Giza General Kamal al-Daly, Minister of Investment and Social Solidarity Dr. Sahar Nasr, several other ambassadors, and heads of foreign archaeological and cultural missions.

After intense work by our dedicated MSCD team, the eight sites in the walking circuit are ready for visitors. New, dual-language signage is up, pathways with newly-installed benches and rubbish bins are ready for tourists, and the museum is freshly painted. Attractive, informative brochures and guidebooks created by our MSCD students and graphic design staff are printed and ready for distribution. Shortly, the new Memphis website will launch with site information available for free download by visitors.

We now await word that the Ministry of Antiquities will officially open the site to the general public and tourists eager to learn more about this fascinating and important ancient capital city. Stay tuned for more information in our next AERAGRAM issue.

Stacks of guidebooks and brochures created by our MSCD students and graphic design staff arrive from the print shop, ready for distribution to tourists. Photo by Dan Jones.

AERA Awarded Two Grants

In May the American Research Center in Egypt awarded AERA team members two Antiquities Endowment Fund (AEF) grants. Financed by USAID, these grants support one-year professional projects "that serve the conservation, preservation and documentation needs of Egyptian antiquities."

Dr. Claire Malleson's Giza Botanical Database Project aims to conserve AERA's vast corpus of archaeobotanical records and make them freely available online through Open Context (https://opencontext.org), a website that publishes and archives archaeological research data and digital documentation.

Plant remains have been collected and analyzed by AERA archaeobotanists, including Claire, every field season since 1989 and now total more than 275,000 individual items, including cereal grains and chaff, sedges, grasses, and field weeds. Much of this material has not yet been published, residing only in AERA's archives. Open Context will make all of this data readily available and searchable, as well as safely archived, offering scholars an unprecedented record of the plant foods, weeds, fodder, and other botanical materials that were recovered at the Heit el-Ghurab and Khentkawes Town sites.

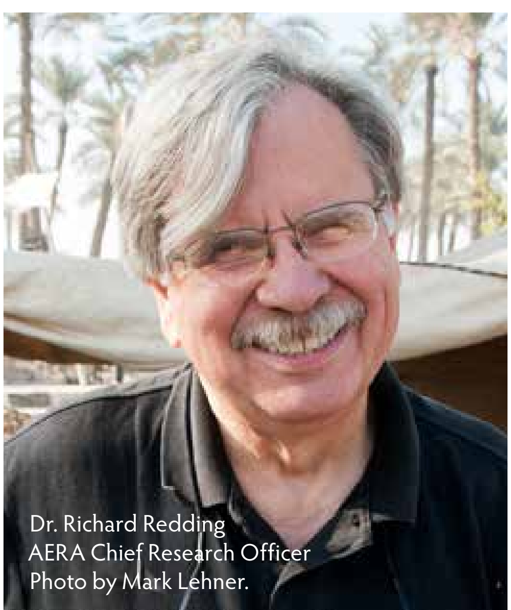
The second grant, submitted by Dr. Richard Redding, will fund the first year of what we hope to be a two-year program of training at the Khentkawes Town (KKT), along with conservation, reconstruction, and publication in conjunction with the Ministry of Antiquities' revitalization of the Giza Plateau. During the first year, 2018, we will run an eight-week field school for inspectors in the Ministry of Antiquities. They will train while excavating and recording one of the houses in the priestly quarter.

A planned community, KKT was first excavated in 1932 by Selim Hassan. Since we began working here in 2005, we have produced a wealth of new information about the settlement. We also reconstructed one of the homes of the priests who maintained the cult of Queen Khentkawes. The field school students will excavate and record the adjacent house and also participate in planning how to best present a future reconstruction to the public.

We will apply for a second year of funding for the reconstruction of the house and will offer training for students who are interested in reconstruction work and in presenting it to the public.

Dr. Claire Malleson, AERA Archaeobotanist

Right: Using a microscope, Claire Malleson sorts and counts some of the many thousands of charred seeds and other plant fragments recovered from our excavations. Supported by her AEF grant, she is conserving all the records of the plant remains that AERA archaeobotanists have analyzed since our first field season and making them freely available online. Photos by Mark Lehner.



Dr. Richard Redding
AERA Chief Research Officer
Photo by Mark Lehner.

Below: Excavation of a Khentkawes Town priest's quarters, House E, in 2009. During 2018, field school students will excavate and record House D. We hope to reconstruct it the following year, as we did House E in 2011. The bottom photo shows the work in progress in 2011. An exact replica was built over the original as a way to both display the structure and also protect the archaeological remains. View to the north. Photos by Mark Lehner.

Season 2018: In Search of Khufu and the Heit el-Ghurab Lower Level

This coming year marks AERA's 30-year jubilee—30 years of survey, excavation, and analysis at the Giza Plateau and the Old Kingdom site of Heit el-Ghurab (HeG). Over the years at HeG, our focus has often been on filling out the map of this unique ancient settlement, working horizontally to gain as much footprint as possible. Through these efforts we have uncovered the pyramid town of Khafre and Menkaure, builders of the second and third pyramids.

Below the Khafre-Menkaure layers we have seen hints of something big, an earlier phase that we think may date to Khufu, builder of the Great Pyramid. In the northeast area of the site at the bottom of a backhoe trench, for example, we uncovered massive walls over 4 feet (1.25 meter) thick. They appear to be part of an elite house, larger than those we excavated in the "posh" Western Town at the southwest end of the site. They hint at an earlier major settlement component, a northeast elite residential district.

We have never had the time to adequately explore these and other lower level areas or even analyze all the material we have recovered from them. But that is about to change. We are pleased to announce the beginning of a new research agenda for AERA: the search for Khufu. In preparation for this new project, we spent part of last season determining the work yet to be done on material we have recovered from these early phases and planning for new excavations in 2018 targeting the HeG lower level.

Evidence recently came to light that makes us even more certain we are on the right track in our search for Khufu. At Khufu's Red Sea port of Wadi el-Jarf, Pierre Tallet discovered 4th Dynasty administrative papyri and a logbook kept by Merer, an overseer.* The logbook includes the round trips of work gangs delivering fine limestone by boat from Tura to the Great Pyramid during Khufu's last regnal year. In his daily entries, Merer mentions place names, and it is very probable that the HeG site is among them—perhaps under the name *Ankh Khufu*, "Live Khufu." Merer notes that he and his men stayed overnight at Giza, most likely at HeG.

We aim to test our hypothesis that HeG was Khufu's pyramid town—before Khafre and Menkaure built their own over it. For his own pyramid town Khufu surely left no less monumental a footprint than they did.

It's an exciting time to support AERA's work at the HeG site. We hope you'll continue to follow us while we dig deeper.

* Tallet, P., *Les Papyrus de la Mer Rouge I, Le "Journal de Merer" (Papyrus Jarf A et B)*, Cairo: Institut française d'archéologie orientale, 2017.

Excavating a house in the early level at the bottom of a large backhoe trench in 2006. Note the very thick walls indicating that this was an elite house. Photo by Anies Hassan.

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