



Khufu's 30-Year Jubilee

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In the center, a fragment of painted, carved relief discovered this year in the Great Pyramid Temple. The person depicted is a "Controller of the Palace," indicated by the sash and emblem of the goddess Bat, a female face with cow's ears and inward-curving horns. On the left the Bat emblem is worn by a son of Khufu on a reused relief fragment from the Amenemhet I Pyramid at Lisht, which may have originally been in one of Khufu's or Sneferu's temples. On the right an Old Kingdom relief fragment from Lisht shows three Palace Controllers wearing the sash and emblem of Bat. (Photo courtesy of the Metropolitan Museum of Art.)

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Menkaure Valley Temple Season 2020

We returned to Giza in January 2020, planning to spend five weeks excavating the Menkaure Valley Temple (MVT), focusing primarily on the back area where we had made important discoveries during our 2019 field season.¹ Since our first field season at MVT in 2005, we have been building upon the work of the original excavator, George Reisner,² examining the temple remains through the lens of contemporary archaeological methods.

Our field season began on January 27 and ran through March 31. But the COVID-19 crisis abruptly halted excavations in mid-March, two weeks before we had planned to stop digging. Despite the premature shutdown, Season 2020 yielded important insights into the long, complex history of the MVT with its many building and rebuilding phases, including a major intermediate phase that Reisner missed, as well as the likely function of two large pits, one dug into the southwest corner of the temple and a second at its northeast corner.

The Temple

Menkaure, the last of the Giza pyramid-builders, had planned a grand valley temple in stone, like that of his predecessor,

Khafre, which stands to the north-northwest. But upon his death, only the massive limestone block foundation had been laid. His successor, Shepseskaf, hastily completed the temple in mudbrick. This First Temple, as Reisner called it, functioned into the 5th Dynasty until a flash flood tore through the back wall, leaving much of the temple in ruins and abandoned. Sometime during the mid- to late 6th Dynasty, under Pepi II, a new temple rose upon the ruins of the first one. The structure, designated the Second Temple by Reisner, was a modest affair compared with the first, but it resumed services for Menkaure (map, facing page).

In Search of the MVT Foundation

One of our goals during the 2020 season was to explore what lies under Shepseskaf's mudbrick temple, to get to the bottom of the stone foundation that Menkaure laid. For this, we probed the two great holes: Thieves' Hole and the Northeast Hole (NEH).

We re-cleared Thieves' Hole during our 2019 season (photo, facing page). Reisner first found the top of this large pit, lined with a rubble retaining wall in 1908—he believed treasure

AERA excavations in progress in the Menkaure Valley Temple, west end, during the 2020 field season. The Khafre (left) and Khufu (right) pyramids stand in the background, with the Khentkawes Monument between them. View to the northwest. Photo by Mark Lehner.





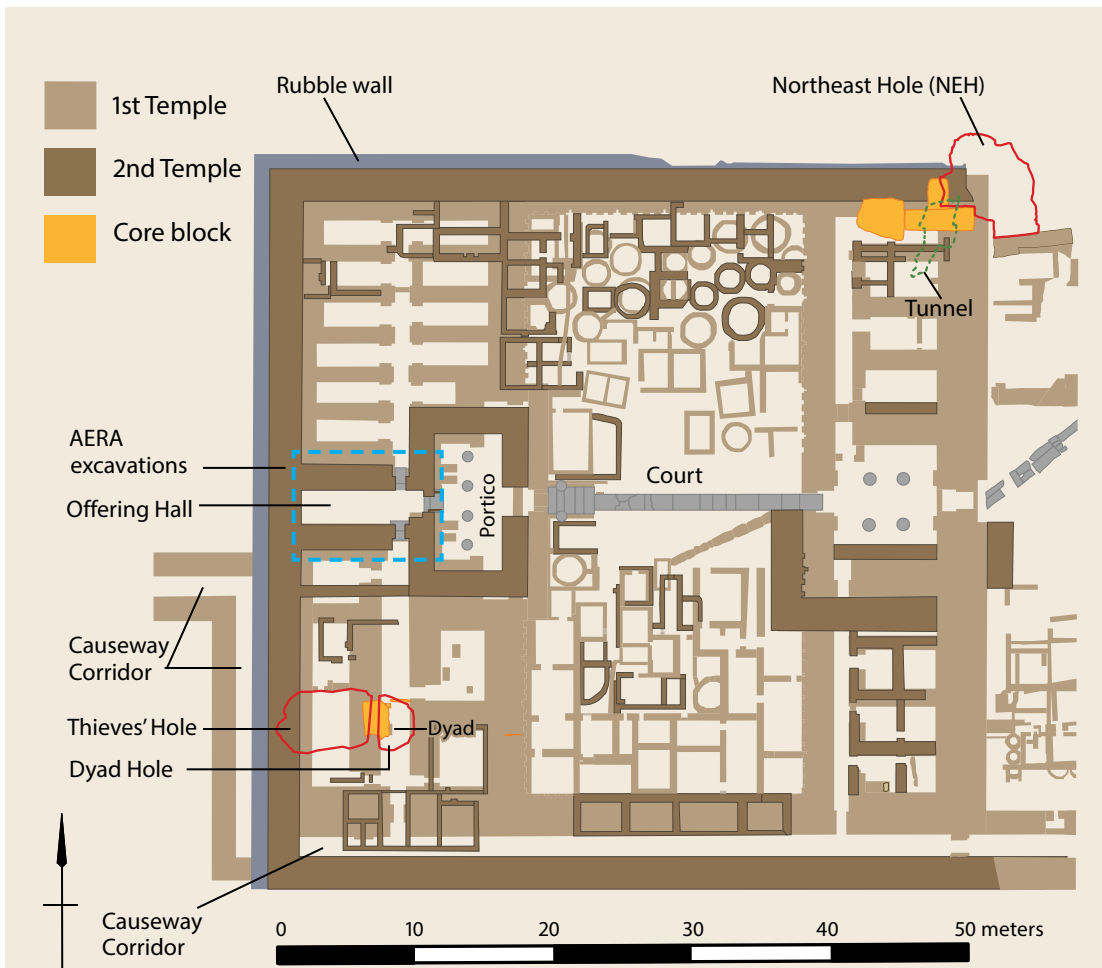
Excavations in the southwest corner of the Menkaure Valley Temple in 2019. Dan Jones photographs the Dyad Hole. View to the east-southeast. Photo by Sayed Salah Abd el-Hakim.

hunters dug it sometime during the Islamic period. He wrote in his 1931 publication that Thieves' Hole was where in 1910 he discovered the famous dyad of Menkaure and his mother (or queen), now on display in the Museum of Fine Arts, Boston. But in fact, Reisner found the dyad in a deeper pit, under the rubble retaining wall, just to the east of Thieves' Hole.

We determined the exact spot where the dyad stood in what we called the Dyad Hole by comparing Reisner's field photos of the discovery with features we could see on the adjacent limestone foundation blocks. When Reisner published the site, he conflated the two holes, and so he wrote that the dyad came from Thieves' Hole. In addition to the dyad, Reisner found statue fragments below it, but was not able to dig very far because of the water table.

During 2020 in our efforts to study Menkaure's foundation, we planned to examine the core block that was just barely exposed below the dyad findspot. But, like Reisner, we were thwarted by groundwater. We set up a pump to lower the water level, which slowly fell, for a time. But the pump was no match for the water; it soon rushed in (photo, page 4). We were able to pull a few small fragments of granite and diorite out of the muck, but failed to expose the core blocks below.

In the Northeast Hole (NEH) we had a better look in and under the



Map of the Menkaure Valley Temple showing the First and Second Temple walls, Thieves' Hole, the NEH, and AERA's 2020 excavations in the Offering Hall. Map prepared by Rebekah Miracle, AERA GIS.

temple foundation, because someone had tunneled into the northeast corner of the temple. Selim Hassan was the first to excavate NEH, during his 1932–1933 field season, when he worked in the east end of the MVT and in the Khentkawes Town, just to the north.³ He believed it was “the temple well” built by Menkaure and used by Queen Khentkawes. In 2008 we attempted to clear the sand that had filled the hole since Hassan’s excavation, but groundwater stopped us before we reached the bottom. AERA teams cleared our own backfilled sand and went deeper in 2009 and 2011–2012. Each season, and again this year, we encountered the water table.

But this was the first time we cleared deep enough to find and clear out the tunnel.

Someone burrowed through or between four of the temple’s limestone core blocks and tunneled south for nearly 6 meters (20 feet). Perhaps they cleared out limestone debris that Shepseskaf’s builders used to fill a gap that Menkaure’s builders left between the large core blocks when he prepared the unfinished foundation for the First Temple of mudbrick. This was suggested by crushed limestone and tafla (calcareous desert clay) lying along the margins. Inside the tunnel we could see six core blocks, three on either side. The blocks are gargantuan; two of them formed a sort of platform that measured 2.9 × 2.6 meters (9.5 × 8.5 feet). The floor of the tunnel, like the base of the NEH, was saturated with water.

A Very Deep Foundation

Two of the three courses we exposed lie below the level of the temple floor at this end of the structure. And we have not yet reached the bottom of the lowest block, 3 meters (9.8 feet) still farther down. So the foundation extends at least 3 and possibly 4 meters below the floor level. But still more blocks may lie below the lowest one we exposed. How many we don’t know. Confronted with the water table—never mind how much we would need to dig—we have not been able to probe to the bottom of the foundation. But suffice to say, Menkaure made a very deep foundation.

Because he so carefully placed his pyramid at the far, southwestern end of a great Giza diagonal line that touches the southeast corners of all three main pyramids, and then sighted the line of his causeway straight east toward the floodplain, Menkaure had to place his valley temple where quarry workers had already removed stone for pyramids and temples, leaving a deep crater,⁴ in which Menkaure’s builders had to raise the foundation and walls of colossal limestone blocks.



Sayed Salah (on ladder), Ramadan Hussein (left), and Emad Shabaan (center) work with the pump at the bottom of the Dyad Hole. View to the east. Photo by Mark Lehner.

Wells and a Search for Water

The NEH did not date from the time of Menkaure, as Hassan proposed. It cuts through the mudbrick casing of the limestone core blocks at the northeast corner of the MVT, indicating that it was later than the early temple. It was probably dug at the same time as Thieves’ Hole; the two pits share many features. The NEH, at ca. 5.6 to 5.8 meters (18 to 19 feet) wide, is about the same size as Thieves’ Hole. And like Thieves’ Hole, it descends down to the water table, along the massive limestone core blocks of the temple foundation like Thieves’ Hole. The NEH also features a curved revetment of irregular stones placed against the sloping eastern side. These and other common features suggest that the two pits were dug at the same time and probably for the same purpose. What was that purpose?

Hassan believed that the NEH was a well, and he was probably right. The depth of the hole and the retaining wall suggest a well, as is also the case for Thieves’ Hole/Dyad Hole. In Thieves’ Hole, a “hitching post” that we noted in 2019,⁵ carved on a block at the west edge of the pit, may have been to secure a rope on which a bucket was lowered down into the well to draw water. In the NEH, the core blocks provided steps for going up and down into the well to fetch water.

But how could people dare to dig a deep pit right inside the temple and also tear away part of the facing in the northeast corner? We know people dug these holes late in the occupation of the temple, a time when the climate was becoming increasingly arid, and the nearby harbors and waterways were filled with sand. They were probably desperate for a secure water supply close at hand.

At Giza we have seen evidence of increased aridity. The MVT was engulfed in windblown sand, which would be expected during very dry conditions. A stepped rectangular basin just north of the MVT also filled with sand.

With poor crops, pharaoh's resources were probably much diminished, and he may have reduced or curtailed what he bestowed upon the people maintaining Menkaure's cult. The residents, reduced to managing with little or no support from the crown, may have had no qualms about digging deep for groundwater right through the old temple walls to create village wells.

A Second Flood, Another Phase Discovered in the Offering Hall

This season, we hoped to excavate the Offering Hall (see map, page 3) and the adjacent room, the portico, at the west end of the temple. We especially wanted to look at the western wall of the Offering Hall. Here Reisner found the clearest evidence of the flash flood that destroyed the First Temple and left it abandoned for 100 years or more. Our goal was to record how that storm washed out the back of the temple.

Reisner began work in the Offering Hall in 1908, clearing the room down to the Second Temple floor. He found the walls standing tall and well preserved.⁶ Following his standard field practice, he documented the room with photos. They are the only record of much of that space as he found it. He dug out the floor of the Second Temple to reach the floor of the First Temple. He removed most of the northern wall and trenched the floor along the base of the walls in search of the foundation core blocks in order to trace the lines of the First Temple (photo, page 6). He also scraped off the face of the western wall and hacked two vertical trenches into it.

We took the opportunity to clear the Offering Hall even as we backfilled what we had cleared of the rest of the temple, three weeks sooner than planned. It was full of clean sand that Reisner's crew dumped in 1910. We found the hall looking much as it did in Reisner's final photos.

In the complex architectural remains of the Offering Hall, Reisner saw two phases—the First and the Second Temple, separated by a period of abandonment. But, from careful scrutiny of features in the hall and Reisner's diaries, photographs, and publications, Dan Jones found evidence of a more complicated rebuilding.

The models on pages 7 and 8 depict the four episodes of wall building and the flood damage.

The major flood event that Reisner saw breached the west wall of the temple and ended the second phase of the Offering Hall (page 8, model 5), a rebuild following a flood Reisner missed (model 3). We see evidence of yet another event that interrupted the temple in its earliest phase, the true First Temple (Phase 1). The walls of this oldest Offering Hall survive to only a few centimeters high at the bottom of the sequence.



Top: The Northeast Hole (NEH). Survey Assistant Abass Eid Shabaan stands in the bottom of the hole as far as we could excavate. The water table prevented us from going any farther down. Workman Sayed Hani Abd el-Hakim brushes the retaining wall in preparation for photography and mapping. Note the limestone rubble retaining wall on the east and south side of NEH, similar to the one in Thieves' Hole. View to the east.

Above: Abass Eid Shabaan points to (ancient?) debris at the far end of the "tunnel" into the foundation of monolithic limestone blocks at the northeast corner of the MVT. The tunnel departs from the bottom of the NEH Hole. View to the south. Photos by Mark Lehner.



Above: The Offering Hall. Mark Lehner and Dan Jones (center) ponder the gutted hall that Reisner left. Dan straddles one of the trenches Reisner dug in order to look for the temple foundation. Note the great volume of clean sand Reisner deposited as backfill in the portico, in the background. The Offering Hall was also filled with clean sand, which preserved it in a state that looked much like the photos that Reisner took upon completion of his excavation. View to the east. Photo by Sayed Salah Abd el-Hakim.

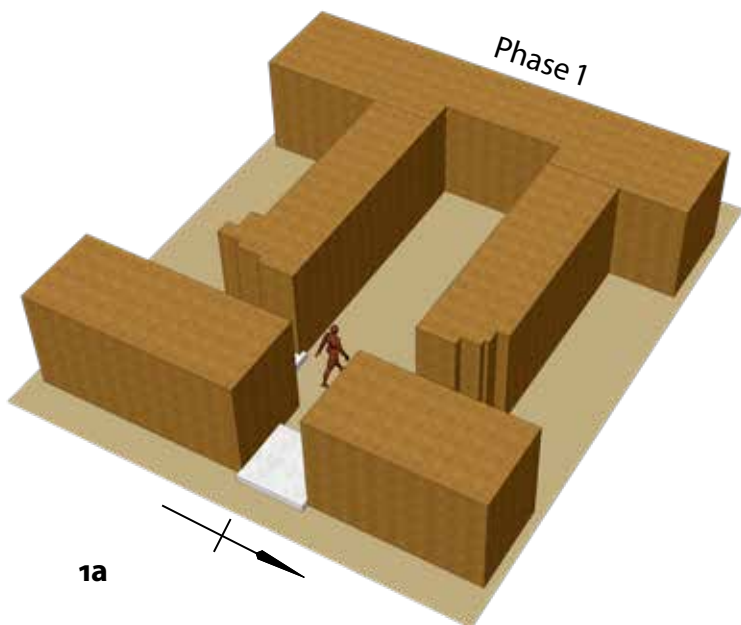
Right: Close-up of the Phase 2 north wall (35,839). Fine sand in the seams of the bricks deposited by streaming water indicates that the temple was left open and abandoned for some time. Photo by Mark Lehner.



Why did the temple personnel invest so heavily into building and restoring an inner sanctum at this particular spot, so amenable to desert flash floods? It's as if they saw the natural destructive force as divine displeasure, perhaps of the deceased god, Menkaure himself, and hoped to propitiate that force with a rebuild and continued service, offering to his spirit in the Offering Hall.

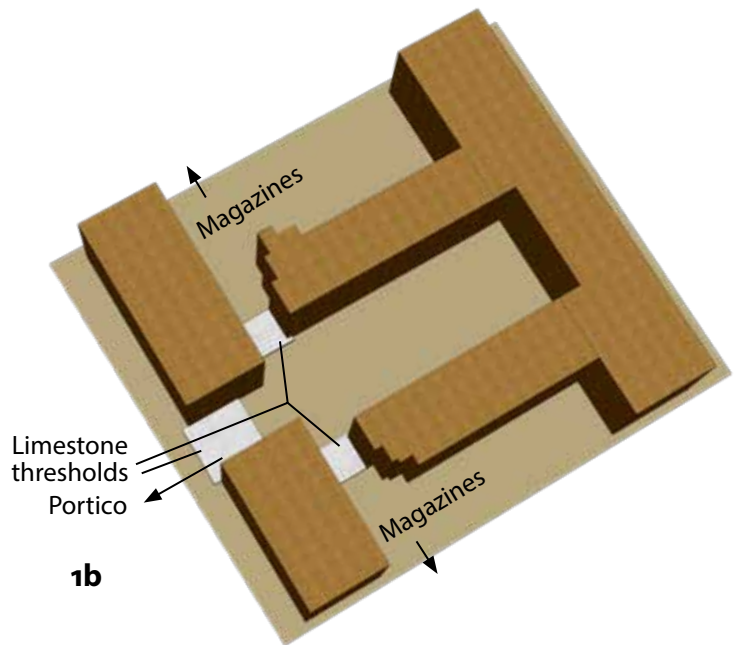
But it was Menkaure himself who set his valley temple in this place so exposed to flash flooding. Three generations of quarrying stone for pyramids forced him to build this temple at the bottom of the plateau slope, and deep down in a quarry basin, as we learned in Thieves' Hole and NEH.

1. "Return to the Menkaure Temple," *AERAGRAM* 20-1, pages 1-8, Spring 2019. *AERAGRAMs* are available for free download at our website: aeraweb.org. Lehner, M., "Giza Plateau Mapping Project," *Oriental Institute Annual Report 2019-2020*, pages 63-82, 2020. Oriental Institute Annual Reports are available for free download at the Oriental Institute's website: oi.uchicago.edu.
2. Reisner, G. A., *Mycerinus, The Temples of the Third Pyramid at Giza*, Cambridge, MA: Harvard University, 1931.
3. Hassan, S., *Excavations at Giza Vol. IV, 1932-1933*. Cairo: Government Press, 1943.
4. Lehner, M., "Giza Overview and Ground Truths," *AERAGRAM* 9-2, pages 12-15, Fall 2008.
5. "Return to the Menkaure Temple," *AERAGRAM* 20-1, page 7, Spring 2019.
6. Reisner's photo of the Offering Hall showing the walls "standing tall" is figure 7 (page 71) in "Giza Plateau Mapping Project," by M. Lehner, *Oriental Institute Annual Report 2019-2020*.



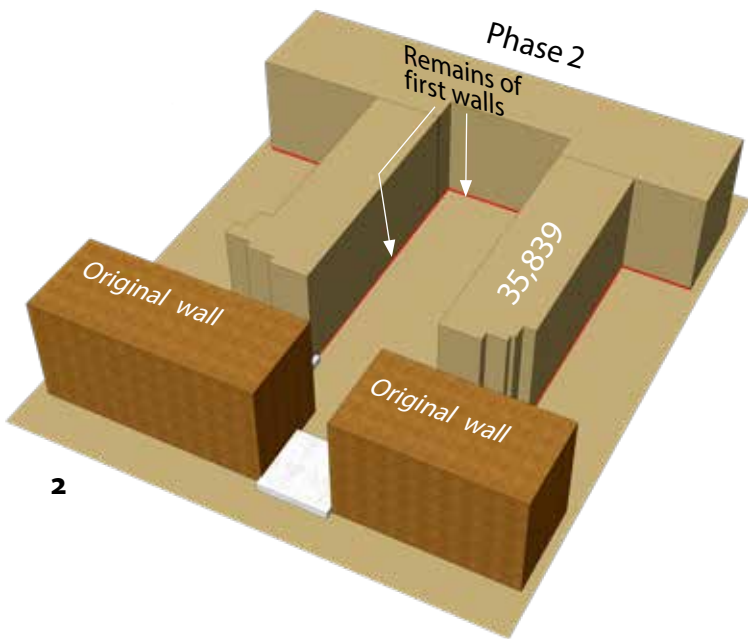
1a

1a) The mudbrick Offering Hall that Shepseskaf built following Menkaure's untimely death (shown with a human figure for scale). We found traces of these walls surviving to only a few centimeters high at the bottom of the stratigraphic sequence of wall rebuilds (shown below in 2).



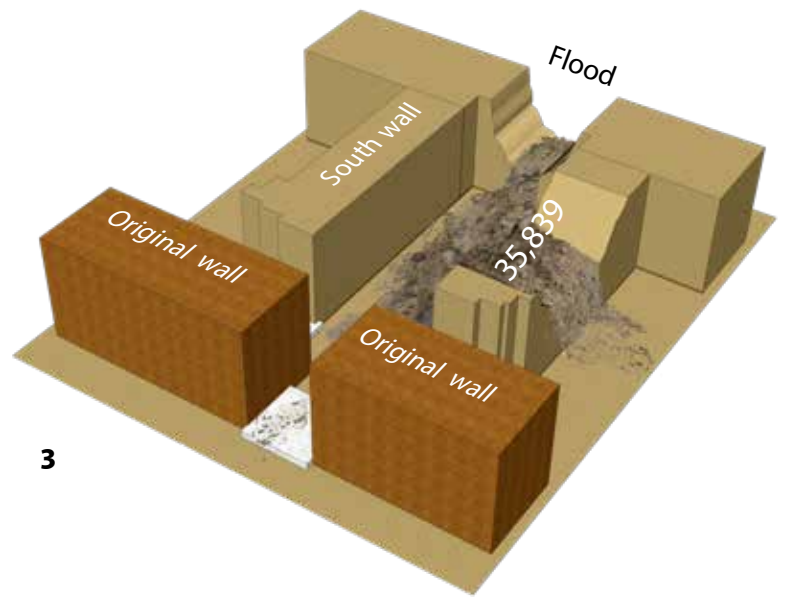
1b

1b) This first hall had three entrances, each with a limestone threshold. The northern and southern entrances had single-leaf doors, Reisner believed, based on the single pivot sockets in the thresholds. The doors opened into corridors that gave access to magazines to the north and south along the western wall. The eastern entrance, with two pivot sockets, and hence a double-leaf door, opened onto the portico, which overlooked the court.



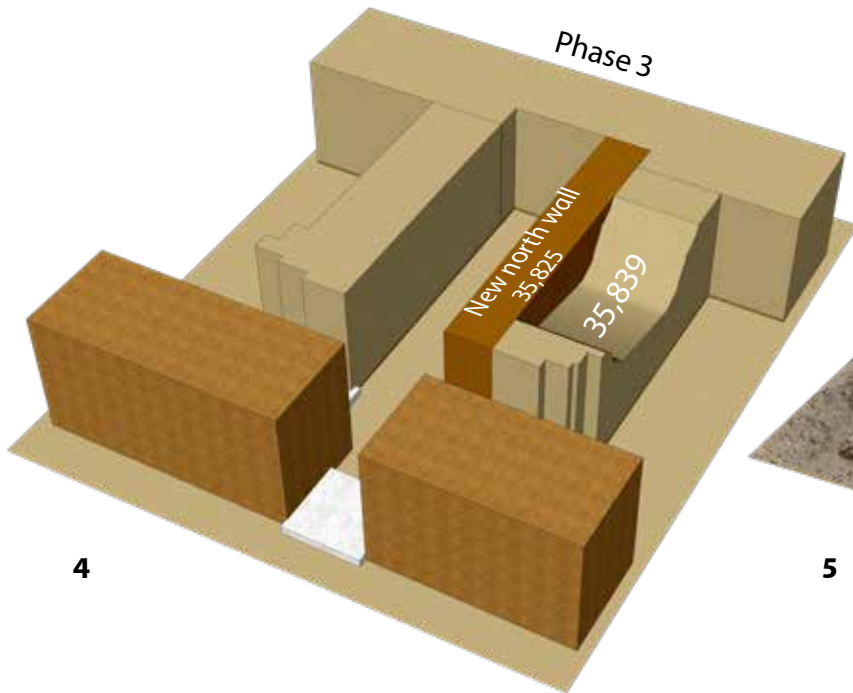
2

2) At some point, a flood, or other catastrophe, so badly damaged the First Temple sanctuary that the temple caretakers rebuilt the walls, setting them directly on the footprint of the first walls. The builders probably leveled what remained of the oldest walls to form a foundation for the new set of walls. In the model of Phase 2 the remains of the first walls are shown as thin bands at the bottom of the new north, south, and west walls. The original east walls apparently remained standing, as we found no evidence of rebuilding.



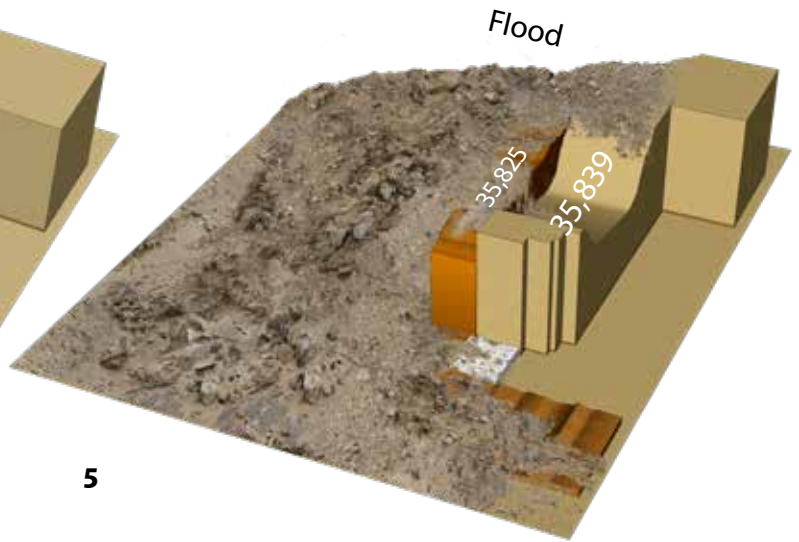
3

3) Sometime after the new walls were erected, another (?) flash flood tore through the back wall of the Offering Hall (the MVT western wall) and apparently rendered the temple uninhabitable. The hall stood open—the roof presumably having collapsed—and abandoned long enough for the bricks of the northern wall (35,839) to develop a crackled crust, and for streaming water to leave fine sand in the seams (see photo, facing page). We don't see the same weathering in the southern wall, because plaster still covers much of what survived of it. Elsewhere in the MVT there were signs of extensive plundering, as reported by Reisner, another indication that the temple must have been abandoned and open.



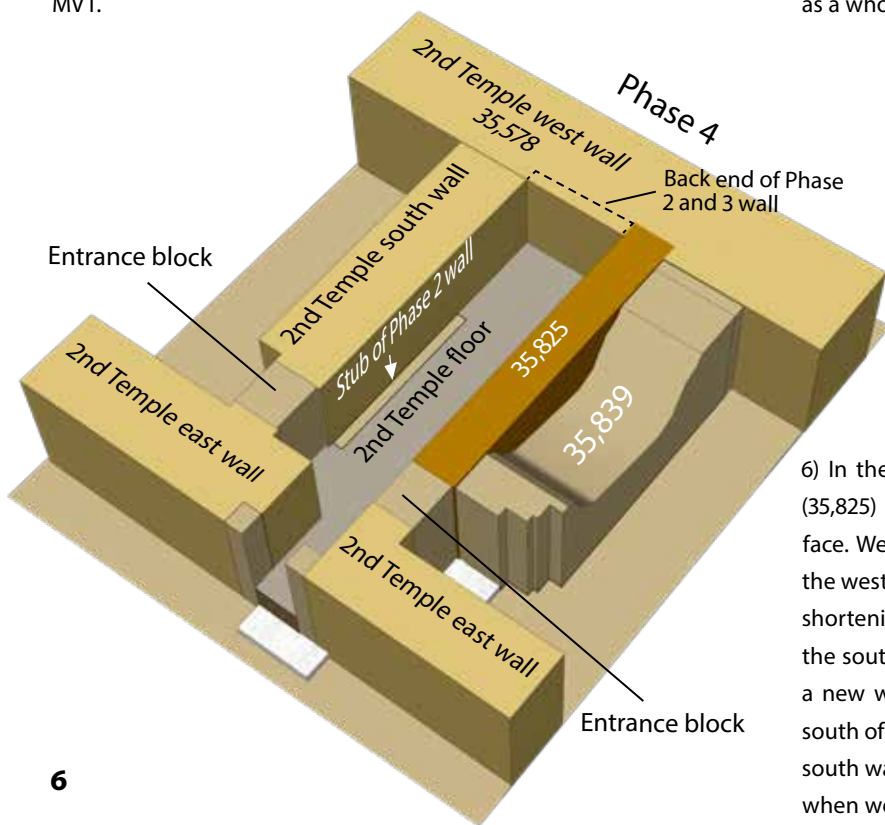
4

4) The damage to the north wall was apparently extensive enough to call for a new wall. The people restoring the temple built a new northern wall next to the old damaged one. This new wall reduced the width of the Offering Hall from 3 to 2.15 meters (9.8 to 7 feet). Reisner believed that the new north wall was built as part of the Second Temple, and he missed a phase in the complex history of the MVT.



5

5) The First Temple period came to an end when yet another devastating flash flood ripped through the back wall, tore through the Offering Hall, and pooled in the court. The torrent of floodwater left coarse limestone debris, fragmented mudbricks, and sand in its path. When the temple was resurrected during Pepi II's reign, builders constructed new walls on the south, west, and east sides of the temple as a whole (shown in 6).



6

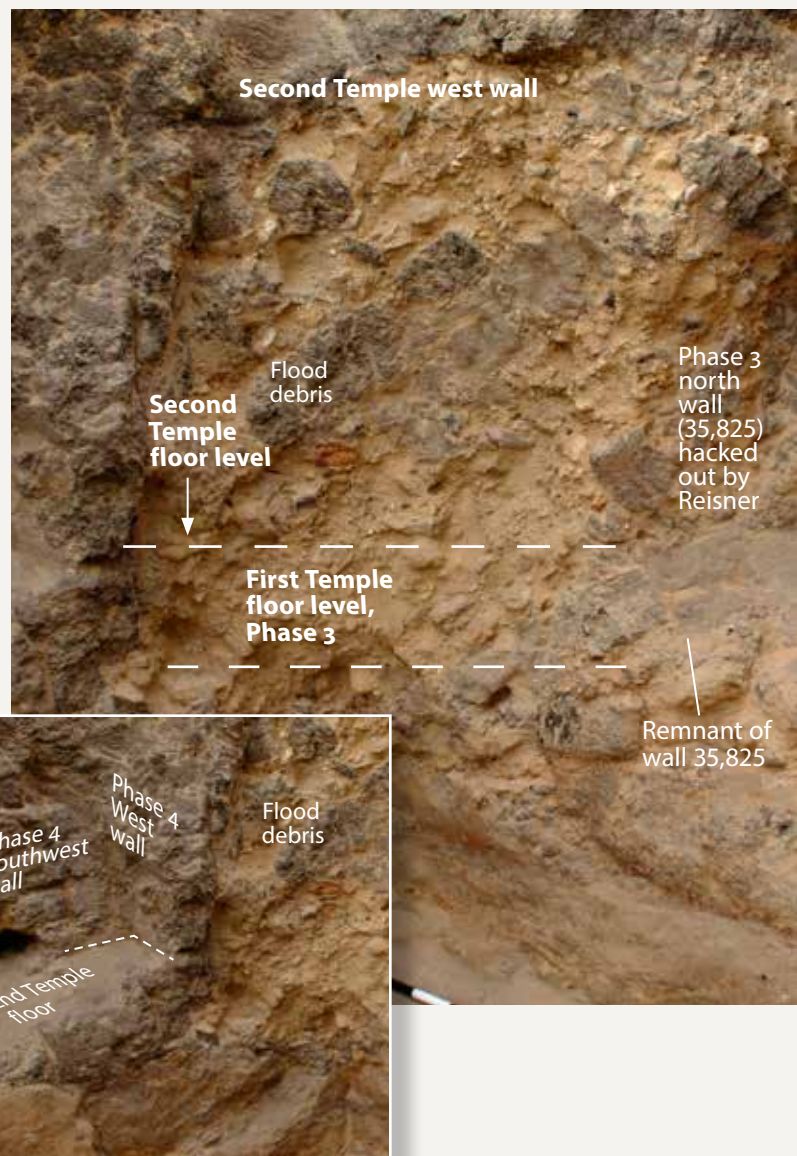
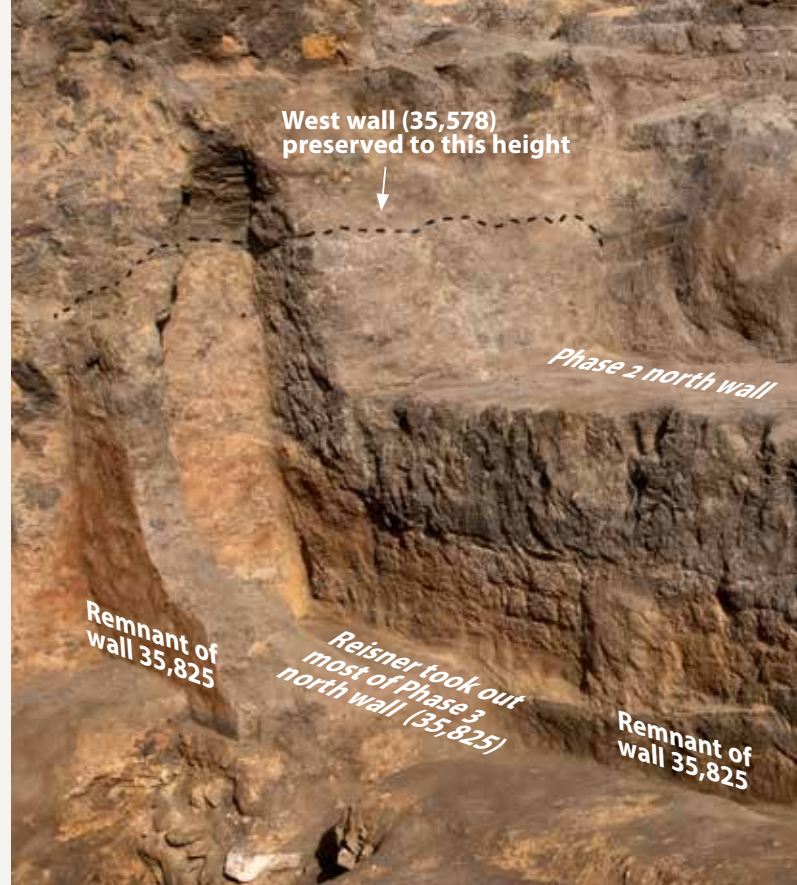
6) In the Offering Hall the flash flood left standing the north wall (35,825) built during Phase 3, but Reisner says it washed away the face. We cannot verify this as Reisner dug out much of that wall. At the west end, builders erected a new wall in front of the flood debris, shortening the hall's length from 8 to 7.5 meters (26 to 24.6 feet). On the south side, which was hardest hit by the floodwaters, they built a new wall, with the face shifted nearly 25 centimeters (10 inches) south of the footprint of the Phase 2 wall. A stub of the second phase south wall appears in Reisner's photos of the hall and was still visible when we excavated the room. The Second Temple floor was built at the level of the stub, which was about 0.82 meters (2.7 feet) above the location of the earliest First Temple floor. The force of the water was apparently great enough to knock out the east walls. The builders constructed new walls at the east end of the hall. They also blocked the entrances on the north and south, leaving only the one to the east. The new, higher entrance apparently had a dirt threshold.

Archaeological Forensics: Sorting Out the Confusing Offering Hall

The models of the Offering Hall phases on the previous pages show the architecture clearly delineated, even tidy. But in reality it was far from clear. Over the course of several hundred years, two floods, possibly three, tore through the walls and ravaged the room. Temple stewards in turn repaired, rebuilt, tore out, built anew, and built over, leaving a perplexing, complicated record. In 1910, Reisner muddled the picture further when he tried to unravel the Offering Hall's history by tearing out the Second Temple floor, trenching along the walls, and digging out the north wall (35,825) and part of the west wall.

In 2020 Dan Jones sorted out the confounding remains, following standard AERA practices. He worked out the hall's component parts and their timelines by scrutinizing subtle differences in layers and deposits of mudbrick and dirt, recognizing them as distinct features with their own histories, and assigning each its own feature number. The sleuthing also entailed much concentrated study of Reisner's diary, photos, and publications. Dan's meticulous work led to the discovery of a third building phase (model 4, facing page)—one that Reisner missed—which dated to the First Temple period. The discovery hinged on a wall (35,825, model 4) that was built on the north side of the room in front of an older north wall. Dan realized that the wall was constructed during the First Temple occupation, after another flood that left the temple open and deserted, and not as part of the Second Temple build, as Reisner believed. Dan's evidence:

1. The flood that tore out much of the back wall (model 5, facing page) and brought down the First Temple did not inflict much damage on the north side of the room. The west wall (models 2–5, photo above right) was preserved to some height, not torn out, along the northern side of the flood breach. The floodwaters flowed in an east-southeast direction, attacking mainly the south side of the room. The flood debris probably scraped wall 35,825, but did not destroy it.
2. The location of the west end of wall 35,825 establishes that it was not torn out by the flood and rebuilt as part of the Second Temple. The wall extends all the way back to the Offering Hall's First Temple west wall (Phase 2). When builders erected the Second Temple they constructed a new back wall in front of debris that the flood deposited, positioning it almost 50 centimeters (20 inches) farther into the hall than the original. If wall 35,825 had been built with the Second Temple, the west end would have been at that hall's new west wall and would have been a seamless build with the western wall, like the south wall (inset photo, right).
3. Also, the base of wall 35,825 stands at a lower level than the Second Temple floor surface. Plaster and paint on the wall can be seen at this lower level in the photo right.
4. Finally, the interface for the Second Temple west wall (35,578) along the west side of the room shows that it was built over 35,825.





View to the northwest of the completed Great Pyramid Temple walkway. Photo by Mark Lehner.

The Great Pyramid Temple Project by Zahi Hawass, Mark Lehner, and Daniel Jones

The Great Pyramid, the last surviving of the Seven Wonders of the Ancient World, is probably the most famous and largest icon of antiquity; yet few visitors who walk, mount a camel, or ride a horse on its upper temple ruins know they are helping erase the central focus of the whole Great Pyramid complex, which also included its valley temple (now buried below the modern city and floodplain), causeway, pyramid court and enclosure wall. For much of the half century after the last excavations, cars and buses drove over the temple ruins on an asphalt road.

In 1995, when I (Zahi) was Director of the Giza Pyramids, I directed members of the Giza Inspectorate to remove the asphalt road that ran across the temple. In subsequent years, visitors, souvenir sellers, camels, horses, and buggies still trafficked over the temple every day. The temple zone developed into a parking lot for camels and horses. Something had to be done to save what remained of the temple. So, we launched the Great Pyramid Temple Project (GPTP) to conserve the temple and present it to visitors. Supported by the Antiquities Endowment Fund (AEF) of the American Research Center in Egypt (ARCE), we completed the first phase of the project in Fall 2020. We documented the temple remains, installed a

wooden walkway, and reinforced fencing. We are in the process of installing signage.*

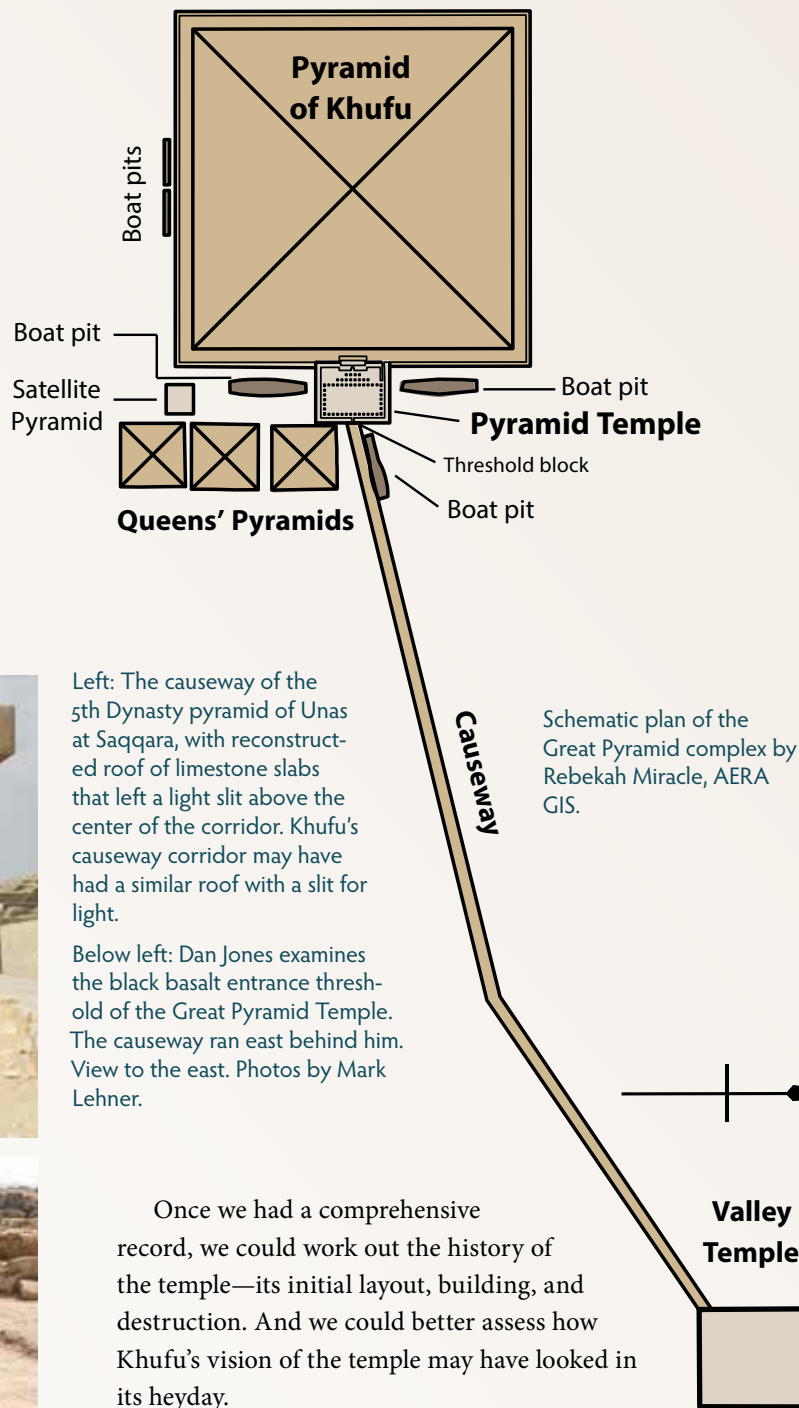
Mapping Stone by Stone

Shortly after the Giza Inspectorate removed the asphalt road and cleaned the temple in 1995, Mark, John Nolan, Carl Andrews, and surveyor David Goodman of the AERA team mapped the temple at scale 1:100. This was the most detailed map of the temple ruins since Jean Phillip Lauer published his plan in 1947.¹ Except for the basalt pavement with its intricate jigsaw joinery, so typical of Old Kingdom pavements, Lauer's map did not show a myriad of details. His emphasis was to reconstruct the temple and make it understandable in terms of what the ancient builders had finished, or what they intended to finish. But important information can be lost in not producing a facsimile map, especially information about ancient builders' methods. In 1995 we completed most of a facsimile line-drawn map of all features, but had not quite finished

* We worked in collaboration with Egypt's Ministry of Tourism and Antiquities (MoTA) Giza Inspectorate and its director, Ashraf Mohamedin. In the field, we worked with surveyor Mohamed Helmi, Overseer of Workers (*Reis*) Sayed Salah, and a team of workers.



Project director Mark Lehner hand-drawing features. Photo by Sayed Salah Abd el-Hakim.



Schematic plan of the Great Pyramid complex by Rebekah Miracle, AERA GIS.



Left: The causeway of the 5th Dynasty pyramid of Unas at Saqqara, with reconstructed roof of limestone slabs that left a light slit above the center of the corridor. Khufu's causeway corridor may have had a similar roof with a slit for light.



Below left: Dan Jones examines the black basalt entrance threshold of the Great Pyramid Temple. The causeway ran east behind him. View to the east. Photos by Mark Lehner.

Once we had a comprehensive record, we could work out the history of the temple—its initial layout, building, and destruction. And we could better assess how Khufu's vision of the temple may have looked in its heyday.

On the Axis of the Sun God: The Temple Layout

A long causeway once linked the temple to a lower temple, 825 meters (2,707 feet) to the east-northeast, at the level of the Nile Valley floor. The valley temple was the gate house to Khufu's pyramid ensemble.

The basalt block of the eastern entrance threshold remains in place where the causeway connected to the temple. On it we can see pivot sockets for a wooden double-leaf door that swung open like an American Old West saloon door to give access into the temple. If the causeway had been roofed and poorly lit, the effect on entering the open court would have been startling, blinding. Sunlight blazed down on the burnished black basalt floor and reflected off the polished white casing of the Pyramid towering above—a gigantic special-effect wrought in stone.

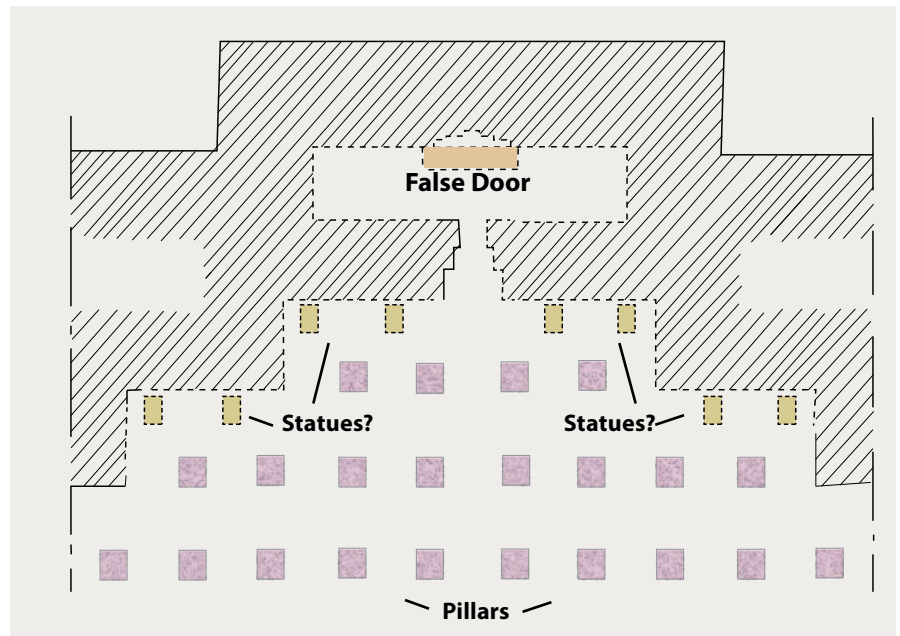
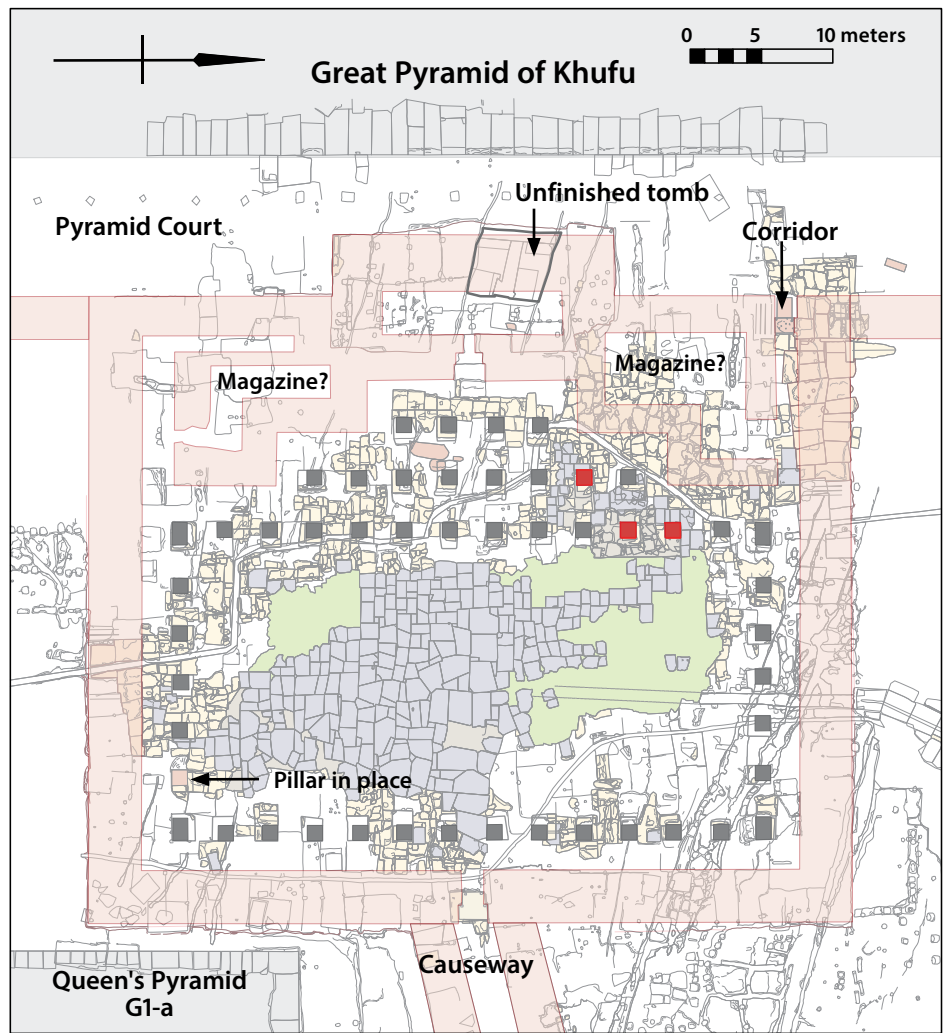
mapping details in the western part of the colonnade. So, our first task in 2020 was to finish the map, and also to document with notes and photographs each and every feature of the temple according to AERA standards.

Fifty red granite pillars surrounded the court. Each was around 3.5 feet square (2 cubits in ancient Egyptian units) except for the four slightly larger pillars at the corners. Painted, relief-carved scenes depicting Khufu's 30-year jubilee celebration probably ran across the walls; the GPTP team found limestone fragments with snatches of such scenes buried in temple debris (see page 16).

In the northwest and southwest corners of the temple, where the walls are completely gone, the builders probably framed long, narrow magazines. In the southwest corner, they may have installed a stairway to the roof that covered the west part of the temple. In the northwest corner, we can still see basalt and granite thresholds of doorways at the eastern and western ends of a corridor that led to the pyramid court.

On the center west, behind the court, the walls stepped back into a bay. Two rows of pillars, one of eight and the other four, flanked a narrow passageway down into the inner sanctuary. Statues of the king might have stood against the western walls facing east, out through the spaces between the pillars. We can only wonder what the builders created in the inner sanctuary. All that remains is a broad, irregular cut, about 0.6 meters (2 feet) deep into bedrock, extending ca. 19.50 × 9.25 meters (64 × 30 feet). It steps back to the west, beyond the line of the pyramid enclosure wall, bringing the sanctuary closer to the pyramid. Lauer saw this down-cutting as the foundation of a long, north-south hall. But we do not know what Khufu installed in the inner sanctuary of his temple—a set of statues “coming forth” in small chambers or niches; a “false door” such as we see in temples of later pyramids for the dead king to emerge from his pyramid tomb to receive offerings and commune with the living; a pair of false doors, like we see in the chapels of Khufu's queens' pyramids; or a pair of tall, round-topped stelae flanking an offering slab, like those in front of Sneferu's pyramids at Dahshur South and Meidum.

It doesn't help that long after Khufu's time, probably 2,000 years later in the Saite Dynasty (26th), or 2,500 years later, in the Roman Period, someone dug a huge, deep shaft, either



Top: The Great Pyramid Temple site showing all the features recorded and our proposed reconstruction (pink) of the temple walls. By Rebekah Miracle, AERA GIS.

Above: Statues of Khufu might have been installed in the west bay of his upper pyramid temple (after Lauer 1949, fig. 1). Lauer also shows the possibility of a false floor in the center back wall of the temple sanctuary, where people could place offerings on a slab, and through which Khufu could magically come and go from his Great Pyramid.



Above: Dr. Louise Bertini, Mariam Foum, and Dan Jones examine a granite pillar. Right: Here they look at the socket in which this pillar might have stood. Below right: In Roman or Saite (26th Dynasty) times someone cut this shaft into the Great Pyramid temple sanctuary down along two prominent natural fissures. After clearing the temple and shaft between 1938 and the early 1940s, the antiquities authority installed a metal door across a passage leading to the shaft and a metal railing around its perimeter. Photos by Mark Lehner.

as a well or an unfinished tomb, into the center of this sunken foundation. This season we hired a crew with a motorized winch to take out many years of accumulated trash and clear the shaft to its bottom, more than 16 meters (52 feet) deep.

Building Sequence

Our close examination of every feature gave insight into how Khufu's builders created this, the second-oldest pyramid temple, and the first to include basalt pavement and granite pillars. First, they pounded a level foundation in the limestone bedrock for the outer wall. Next, they cut sockets into the bedrock for the 50 pillars and the thresholds of the northwest corridor. They cut sockets to different depths to accommodate granite pillars of varying lengths, so that they would stand at the same height to support the roof. It was easier to cut the limestone bedrock deeper than to shorten the lengths of the granite pillars as they were delivered from quarries at Aswan, 600 kilometers (373 miles) south of Giza.

For the basalt court pavement, workers prepared a bedding of limestone pieces and gypsum mortar, cut to conform to the angular bottoms of the basalt floor slabs. Basalt is a magmatic, volcanic rock² with a hardness of 6 on the Mohs hardness scale (resistance to being scratched); granite being 6 to 7, diamond 10, while limestone is only 1 to 3. When the magma flow cooled and hardened into black rock, it fractured in conchoidal or angular surfaces. Quarrymen took pieces from natural cleavages with angular facets.³ At Giza, Khufu's masons left those angular facets on the undersides of the pieces as they carefully





Above: View to the north of the limestone bedding below the basalt pavement. Photo by Mark Lehner.



Inset: The west side of a pillar socket showing the hole cut into the bedrock for the pillar, the stones packed around the hole, and the limestone bedding laid to accommodate the basalt pavement placed on top of it. Photo by Mark Lehner.



Hani Hussein Abd el-Hakim and Harbi Abu Shenaf take hammer and chisel to the gray cement and basalt fragments that cover pillar sockets. They were placed over the sockets during a restoration. View to the southwest. Photo by Mark Lehner.

trimmed the upper edges to make the complex, intricate fits, rather like a jigsaw puzzle. Again, they chose to work the soft, underlying limestone rather than the irregular, hard basalt slabs.

Once they installed the pillars and pavement, the builders moved on to the outer walls and roof of the temple.

Walkway

We completed our 2020 work by engaging Nour El-Rahman contractors, Kamal Hassan and Mohamed Hassan, to install a wooden walkway around the outer wall line of the temple. To compliment the walkway and improve visitor experience we will install three large information panels around the temple, to show the layout of Khufu's pyramid complex, the original footprint of the temple, and to inform about the sanctuary and unfinished tomb shaft. We are in the process of preparing the panels.

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3. Bloxum, E., and P. Storemyr, "Old Kingdom Basalt Quarrying Activities at Widan el-Faras, Northern Fayum Desert," *The Journal of Egyptian Archaeology* 88, pages 24–26, 27, 35, table 2, 2002. These authors calculate that Khufu took out an estimated 1040 cubic meters for upper temple, valley temple, and harbor walls.



Above: The Great Pyramid Temple walkway completed. In the foreground, the walkway runs along the west side of unfinished tomb shaft. Queens' pyramids stand in the background. View to the southeast. Photo by Sayed Salah.

Right: The walkway around the Great Pyramid Temple under construction. Workers pour sand into the walkway frame to provide support. The wooden frame, 2.06 meters (6.75 feet) wide and 0.15 meters (6 inches) high, sits directly on the limestone bedrock and archaeological remains. To support the frame and the planks that would go over it, crossbeams were fixed with metal brackets, treated to prevent rust, to the inside of the frame. Swedish pine was used for the frame and crossbeams. View to the northwest. Photo by Dan Jones.



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Khufu's 30-Year Jubilee: Newly Discovered Pieces of a Puzzle

Sometime after Lauer mapped the temple, but certainly before the modern asphalt road was laid down, the basalt pavement of the open court underwent “restoration” (highlighted green on our map on page 12) with displaced stones from the pavement and gray cement. This restoration comprises some 40% of the “island” of pavement that remains. It covered three of the pillar sockets (highlighted in bright red, on map page 12) on the northwest of the court.

Ashraf Mohedein, General Director of Giza, gave us permission to remove the restoration over the three sockets, so we could complete our documentation. Underneath, we found sandy debris. As we removed it, we were surprised to find limestone pieces with remains of relief-carved decoration in each socket. These pieces must come from the inner walls around the court. It appears that ancient material filling these pillar sockets was never removed before being covered. It makes us wonder whether more unexcavated material lies below the rest of the restoration.

There can be no mistaking the delicate, low relief as that of Khufu's time, known from several other fragments¹ found nearby or in the core of the Middle Kingdom, 12th Dynasty pyramid that Amenemhet I built at Lisht some 600 years later.

The face of one piece (facing page), a fragment 80 centimeters (2.6 feet) long, retains exquisite low relief of shrines and a row of typical Egyptian five-pointed stars with traces of paint, and a row of booths patterned after Predynastic reed “tent shrines,” lined up for a special festival called *Sed*—a celebration of a king's 30-year jubilee that renewed his physical and magical power.² As part of the ceremony, people erected temporary booths with shapes iconic of Upper and Lower Egypt. They housed images of local town gods.

So that he could celebrate jubilees forever in the Afterlife, King Djoser built a set of *Sed* Festival tent shrines in his Step Pyramid complex.³ They are dummy buildings, like a sacred Universal Studios stage set, built here for magical effect. From a dais at the southern end, the king came and went to the shrines of local deities, or else they came to him, so that he could interlace his renewed vital force throughout the Two Lands.

Two of the four fragments found during the excavation and clearing of the temple that began in 1939 also belong to Khufu's *Sed* jubilee. One shows the king, minus his head, enthroned in a kiosk, wearing a ceremonial *Sed* Festival cloak. Another shows Khufu striding, wearing the crown of the North with a particular scarf draped over his shoulder.⁴

We found yet another fragment of Khufu's jubilee (see cover photo). It shows the torso and arm of a man wearing a sash hung with an emblem of the goddess Bat—a female face with cow ears and horns that curve inward toward one another. In later times, craftsman made sistrum in Bat's image. This “harness-like arrangement of crossed straps ... with sistrum pendant”⁵ (the Bat



Left: Relief-carved fragment showing the back of a pleated kilt and hand holding a “key of life”—or *ankh*. Right: A relief fragment showing the head of a Horus falcon. Photos by Mark Lehner.

emblem) featured a counterpoise, which we see in our fragment as a braided rope ending in a tassel, hanging between the arm and the small of the man's back. The front-forward, cow-eared face of Bat is similar to common depictions of the cow-goddess Hathor, the mother of Horus (although Hathor's horns curve in and then outward). Eventually, in the minds of the Egyptians, Bat and Hathor merged. The edge of a thick staff, held vertically, shows along the right edge of the piece.

In temple and tomb scenes, Egyptian artists labeled men wearing this assemblage as *Kheryp Ah*, “Controllers of the Palace.” They are among the attendants to the king's *Sed* jubilee. We see three of them on one of the many fragments of Old Kingdom temple scenes placed, for some reason, into the Middle Kingdom Pyramid of Amenemhet I at Lisht (see cover photo, right). In this fragment, each Controller wears the double crossed sash of Bat. They carry a *kheryp* scepter in one hand and hold a tall, vertical staff in the other. They approach one of the rituals of the *Sed* Festival, in which a goddess named Meret cheers the king as he performs a ritual run to demonstrate his vitality.

Hans Goedicke, who published the Old Kingdom reliefs from the Amenemhet I Pyramid (now in the Metropolitan Museum—MMA—in New York), ascribed the scene fragment showing the Controllers, along with a dozen other scene fragments, to the *Sed* tableau of none other than Khufu.⁶ He believed they came from the walls of the Great Pyramid upper temple or valley temple. He also assigned 14 other fragments to Khufu's pyramid temple or valley temple. Six of these fragments actually bear parts of Khufu's name in a cartouche.

We might then expect a match between the Bat emblems and Palace Controllers on the MMA piece and our newly discovered piece. But details don't quite match. The counterpoise and tassel on ours and the MMA piece are different; the MMA Controllers wear their Bat emblems higher and hold their staffs vertical, while our staff seems at an angle. Dorothea Arnold wrote that, on the basis of the height and style of the MMA pieces, they must come from a temple of Khufu's father, Sneferu, perhaps the hurriedly finished



Overseer Sayed Salah having just found a piece of decorative relief from the wall of the Great Pyramid Temple cloister in sandy debris that filled a pillar socket.

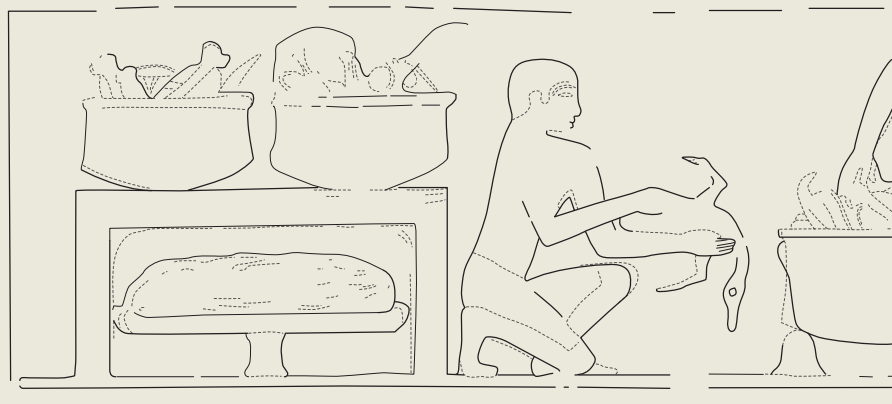
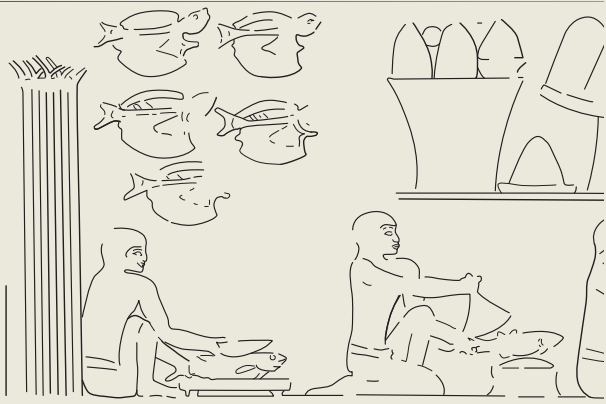


Left above: Block with painted and relief-carved decoration showing booths lined up for the Sed Festival, traditionally a king's jubilee of 30 years of rule, above a black band studded with stars. Inset far left: From the Great Pyramid Temple relief, one of a series of shrines of Lower Egypt, sometimes known as *Per Nu*. Inset center right: Top of a loop of rope may have been part of the hieroglyph for *za*, "protection." Inset right: One of two booths preserved at the right end of the piece with a cavetto cornice, symbolizing shrines of Upper (southern) Egypt, sometimes called *Per Wer*. Photos by Mark Lehner.

temple of his North Pyramid at Dahshur,⁷ which once featured two fine limestone shrines with Sed Festival scenes.

Any king, we suppose, could have his artists carve Sed jubilee scenes in his pyramid temple (or, later, in the 5th Dynasty, in his sun temple), whether or not he approached thirty years on the throne. The scenes magically ensured perpetual jubilees in the Afterlife. Dates in Khufu's final years on the throne, discovered only in the last several years, suggest Khufu was, in fact, approaching his 30-year jubilee, but that he may have just missed it, at least in this world. The highest known dates for Khufu include the year after his 13th "cattle count," discovered in 2013 in the Wadi el-Jarf Papyri.⁸ Egyptologists believe this Old Kingdom accounting for taxation took place every two years, so this would be Khufu's regnal year 26–27. In 2016, the Japanese team from Waseda University published another unequivocal date, the 14th census (or "Occasion") Month 1 of the season Shemu ("Harvest," our spring-early summer). They found four examples of this graffito from the western of two rock-cut pits along the south side of the Great Pyramid, which they are excavating in order to salvage Khufu's second wooden funeral ship. A regular, biennial "cattle count" would make this Khufu's regnal year 28–29. The boats, which probably served as royal hearses, were placed in these pits at the time of Khufu's funeral—the name of his successor, Djedefre, was also found in the graffiti from the pits. So, this date must be Khufu's last "Occasion."

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Slaughter to Table:

New Questions by Richard Redding



Science is a process: we define problems, test ideas, and answer questions. Science, at its best, generates new questions every time it answers one. At AERA we start each season with a series of questions as part of our research design.

I started my first season with AERA (1989) looking at the animal bones from Giza with a very simple, albeit important, question: were the workers provisioned with meat from producing sites? The answer is yes. This led to another question: was everyone provisioned with the same cuts and quality of meat, or did the status of a person affect the cut and quality? The answer is diet varied based on rank.¹

I have been looking at a new series of questions on meat preparation over the last three seasons, and answers have been difficult to obtain:

1. Where was meat prepared? In a central kitchen and distributed? Or were live animals distributed to each house or barracks and prepared by residential units?
2. How was meat prepared? Grilled, roasted, or stewed?

Meat Distribution

I have a more definitive answer to the first question than the second. In 2012 we identified a large enclosure that we believe held livestock; it has features found even in contemporary stockyards, such as rounded corners. We dubbed it the OK Corral (see map, page 23).² We thought that two adjacent enclosures were the abattoir. When we excavated one, it turned out to enclose an elite house, perhaps for the overseer of the corral. The adjacent enclosure could still be an abattoir.³

The distribution of body parts represented in the bone fragments recovered from the various residential buildings at the Heit el-Ghurab indicates slaughter took place where the meat was consumed. Livestock were driven from the corral to areas where they were dispatched, butchered, cooked, and eaten—at houses, in individual galleries in the kitchens at the rear (map, page 23), and in locations where the meat was presented as an

offering. Some animal parts may have been re-distributed from the slaughter area, such as cattle feet.

Cut marks on animal bones also indicate that there was no centralized slaughter of livestock. During the 2019 field season, Luther Sousa studied cut marks on animal bones from the Kromer Dump (see page 21), with the main objective to examine the butchering marks for evidence of copper tools.⁴ He found that the cattle bones were butchered using bifacial tools, the big knives that were common at Heit el-Ghurab (photo above), and the sheep-goats were butchered with unifacial tools, simple blade tools. This suggests two separate processing systems and areas for slaughter of cattle and sheep-goats.

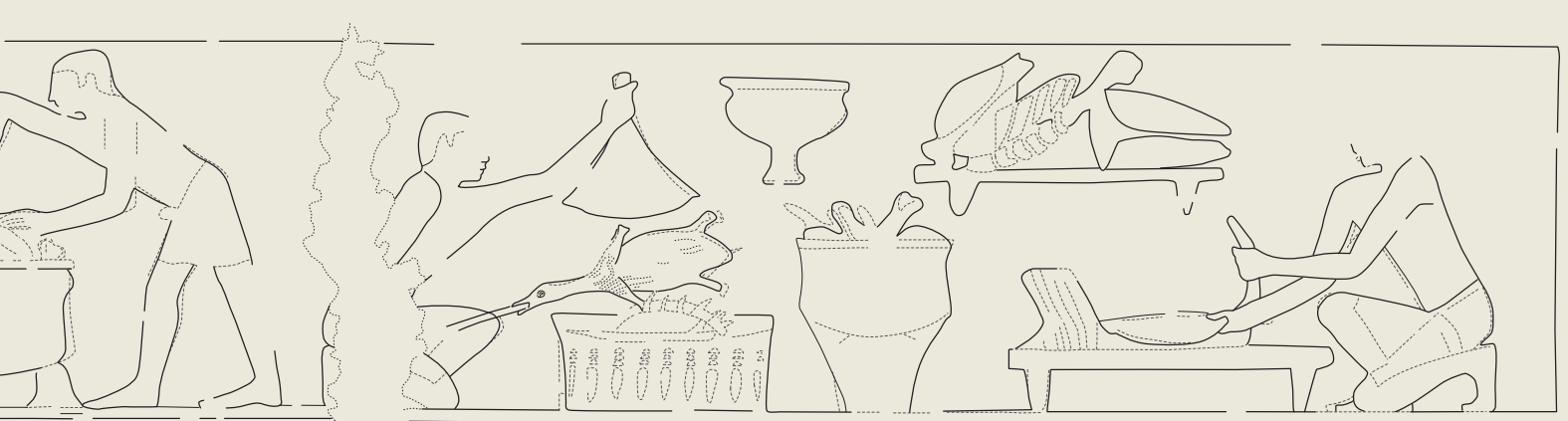
Cooking Meat

The second question, on cooking techniques, is much more complex. We have no precise definition of terms, which is a problem. So, let me define some terms.

- Boiling involves putting the cuts of meat directly in boiling water. This is actually a quick way of cooking.
- Stewing meat is a slow process with the meat put into water and simmered over several hours.
- Roasting is cooking by diffuse heat and is a slow process.
- Grilling does not really require a “grill.” To grill meat is to place it over direct heat; it is a quick process. Unfortunately, in the literature roasting/grilling and boiling/stewing have been used interchangeably.

Cooking meat is shown in tomb scenes, and while relying on depictions in tombs must be done with caution, boiling or stewing and grilling are represented. But despite numerous scenes of ovens for baking bread, I know of no scenes of roasting meat.

Fish, birds, and mammals may have been cooked using different techniques. Based on tomb scenes, fish were probably



Top left: Scene from the 6th Dynasty Tomb of Urama. Fishermen in the marshes prepare lunch. One man cuts open and cleans a fresh-caught fish, while another grills it. Filleted fish are laid out above on the left. After N. Davies, *The Rock Tombs of Sheikh Said*, London: Egypt Exploration Fund, text page 24, plate xii, 1901.

Left: Large chert knife from Heit el-Ghurab. Photo by Y. Kawae.

Above: Scene of workers preparing meat in the 5th Dynasty mastaba tomb of Iymery at Giza. On the left side of the scene, a worker cleans a

duck, while another man adds cuts of meat to a large cauldron. On the far left, two pots filled with meat sit on a table. A large piece of meat rests on a pedestal table below. Above on the left, a man holds a fowl mounted on a stick over a brazier, while fanning the coals. A kettle full of meat and bones stands next to him. On the far right a man cuts up a rib section from a large animal (steer?). Large chunks of meat, a vertebral column, and a rib cage sit on a table above. After K. R. Weeks, *Mastabas of Cemetery G 6000, Giza Mastabas*, Vol. 5, Museum of Fine Arts, Boston, figure 35, text, page 43, 1994. Drawings by A. Witsell.

grilled or dried and salted, or cooked in a stew.⁵ Tomb scenes of cooking fish are almost non-existent. One scene of grilling a fish is in the 11th Dynasty tomb of Antef. In the 6th Dynasty tomb of Urama at Sheikh Said, a scene (top left) depicts fishermen filleting and grilling a fish for lunch while out working in the marshes. A scene in the 5th Dynasty tomb of Nianchnum and Chnumhotep at Saqqara (below) depicts two workers filleting fish, while a third tends to fish cooking in a kettle. It is likely salted fish were also cooked in a stew. Very small fish, less than 10 centimeters (4 inches), may have been dried, salted, and consumed like potato chips.

Numerous scenes show grilling of birds. A fine example of grilling a bird is found in the 5th Dynasty mastaba tomb of Iymery at Giza (above). A similar scene is depicted in the tomb of Ukhhotep, a 12th Dynasty tomb at Meir (next page).

Only a small number of tomb scenes represent the cooking of large mammals, most likely cattle. Most of the scenes show

the stewing of cuts of meat. The scene in Iymery's tomb, above top, also shows a worker cutting up a rib section of a large animal, probably a steer or an ox. In the center of the scene a worker adds cuts of meat to a large cauldron. I know of only one scene that shows the grilling of a bull or steer, in the tomb of Ukhhotep, mentioned above, which shows an entire carcass being cooked on a spit over a fire (next page).

Based on tomb scenes, I would suggest that fresh fish were probably grilled, while salted fish, unless eaten dried, were stewed. Birds could have either been consumed stewed or grilled, with a strong preference for grilling.

The meat from cattle, sheep, and goats shows a lot of variation in the amount of embedded collagen. Why is this important? Cuts of meat with a higher proportion of collagen and lower fat content are best when stewed, in order to break down the collagen and reduce its "toughness." Conversely, cuts of meat that are lower in collagen and higher in fat are

Below: Scene from the 5th Dynasty tomb of Nianchnum and Chnumhotep, showing gutting and cooking fish. Workers cut the fish with a large knife similar to the one in the photo, facing page. They remove and set aside the valuable roe and discard the entrails. Another worker stuffs a fish into the kettle, already crammed with fish, as he pokes the fire. In another scene, not shown here, the cooked fish are dried. After A. M. Moussa and H. Altenmüller, *Das Grab des Nianchnum und Chnumhotep*, Mainz am Rhein: Von Zabern, text page 100, figure 35, 1977. Drawing by A. Witsell.





Scene in the tomb of Nomarch Ukhhotep, 12th Dynasty, at Meir. On the left a cook roasts a duck over a pan or brazier of glowing charcoal. The inscription reads: "I have been over the blaze since the world began ... ! I have never seen such a duck as this!" On the right, two workers (one mostly cut off and badly damaged) roast a small ox (?) on a spit over a brazier. From A. M. Blackman, *The Rock Tombs of Meir, III, The Tomb-Chapel of Ukh-Hotp Son Of Ukh-Hotp and Mersi (B, No. 4)*, London: Egypt Exploration Fund, plate XXIII, text pages 80–81, 1915.

better grilled or roasted. If these cuts are stewed, they lose fat and become "tough." The forelimb and the lower hind limb, including the feet, are cuts that are best stewed. I discussed the importance of stewed cattle feet in the previous *AERAGRAM* in an article on *shorbet kawara*.⁶ If you go to the butcher and ask for stew meat, it is always the meat on the scapula and humerus. The meat on the ribs, back, and hips is best grilled.

This brings us back to fish and birds. Since they lack collagen in the muscles and intra-muscular fat, they can be grilled without the complex considerations of red meat from mammals.

The characteristics of cattle, sheep, and goat meat requires that they be grilled and stewed. Stews are an efficient method to prepare meat for distribution to large numbers of people. Vegetables could be added to a stew, and the nutritious broth consumed by drinking or sopping up with bread. At Giza the vegetable additions would probably have included onions and garlic, which are pictured in tomb scenes. Other vegetables that might have been added are a matter of speculation because these do not preserve well in the archaeological record.

I would expect bones from grilled meat to show some evidence of burning, but what would stewing do to bone and can it be detected? This has become an important new question in archaeology. Several recent articles have attempted to identify characteristics of stewed bones. Part of my "Bone Smashing" project is determining the effects of stewing on sheep bones' fragmentation.⁷ Do stewed bones look different at a macro- or microscopic level?

A stew, along with bread and beer, would compose the primary diet of the workers, overseers, and, perhaps, even administrators at Giza. Each season at Giza, AERA has an end-of-season feast for the workers, mentioned in the last issue of *AERAGRAM*.⁸ In 2020 a large stew of meat, potatoes, and tomatoes (photo, above right) was served in aluminum bowls to 80 men. The most common bowl found in the excavations at Heit el-Ghurab is the carinated bowl (photo, center right). Is the AERA end-of-season feast for our workers a trip back in time to an Old Kingdom dinner for corvee laborers who came to build the pyramids?



Above: 2020 end-of-season workers' feast. Photo by Sayed Salah Abd el-Hakim.

Right: A carinated bowl from Heit el-Ghurab. Some of these bowls were probably used as individual serving dishes like the aluminum bowls in 2020. Photo by Mark Lehner.



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Looking Below the Surface: More Than Meets the Eye on Ancient Plastered Mudbrick Walls

by Manami Yahata

At Giza, houses and other secular structures—and sometimes even temples—were built of simple, sun-dried mudbricks. But the rough brick surfaces were rarely left exposed. In the Ministry of Tourism and Antiquities Magazine Lab this past season, Manami Yahata began studying how ancient Egyptians finished their mudbrick walls by analyzing ancient fragments on which plaster still survived. She discovered that there is more here than meets the eye. Mudbrick may be a peasant building material, a primitive technology, but the workers who finished the walls were highly skilled craftsmen, probably as skilled as their modern day counterparts. Moreover, they had a number of methods for finishing the walls.

Manami focused her study on mudbrick wall fragments recovered during AERA's 2018 excavation at the Kromer Dump (KRO),¹ a large trash midden on the Giza Plateau west of the Heit el-Ghurab settlement. Great piles of construction debris and everyday trash were deposited here during the time of Khufu and Khafre.

Here Manami describes Old Kingdom methods for finishing walls based on the samples from the Kromer Dump, augmented with data from AERA's excavations at Giza: Heit el-Ghurab, the Menkaure Valley Temple, and Khentkawes Town.

The Kromer Dump site (KRO) (which AERA named after Karl Kromer, who first excavated the site in the 1970s) sits high on the Giza Plateau at 44 to 53 meters above sea level (asl), compared with the Heit el-Ghurab (HeG) settlement at 15 to 16 meters asl. Far from the floodplain and the water table, KRO is a dry site, allowing for good preservation of organic material. Most exciting to me, KRO's dry deposits helped preserve the wall finishes on mudbricks from ancient collapsed walls.

Thus far in my study, I have examined a total sample of 161 KRO mudbrick fragments with wall finishes intact. These came from six deposits at the site, five from a later phase and one from an earlier phase.

How Were Mudbrick Walls Finished?

Ancient Egyptians first covered wall surfaces with mud plaster,

which sometimes was the only finish; more often it served as an undercoat. Two types were used: a yellow marl clay (*tafla*) and, less often, an alluvial grayish-brown mud; sometimes they were mixed together. Ancient Egyptian mud plaster usually contains large quantities of chopped straw of various lengths, used as a binder to adhere to the mudbrick, for the plaster to adhere to it, and also to reduce cracking.² Impressions of straw often can be seen where plaster is exposed. When a coat of plaster was applied over the mud plaster, the outer surface was painted as needed. I recorded eight paint colors (using Munsell soil color charts): white, yellow, brown, gray, black, red, orange, and pink.

Flinders Petrie noted that initially Egyptians spread plaster with their hands. But they needed finely stuccoed walls for tomb paintings and house walls, which led to the use of the plasterer's float.³

Two wooden floats from the 12th Dynasty pyramid town at el-Lahun. They were made of a single piece of wood, and both surfaces are perfectly flat. The larger one, 52A, was for the rough coat. The beveled end that projected far out from the handle was evidently used to get into corners without disturbing the coat on the adjoining wall. The smaller float (52B) is lighter and smoother and was used for applying the final coat. Both floats were found covered with mud plaster and even pieces of chopped straw. Courtesy of the Manchester Museum.



Manami Yahata, prepares a fragment of plastered mudbrick wall for a photograph. Photo by Amel Aweida.



No plasterers' floats dating from the Old Kingdom have been found so far. Petrie discovered two floats at the Middle Kingdom pyramid town of Senusret II at el-Lahun,⁴ but I believe floats were used as early as the Predynastic period. The el-Lahun floats—very similar to those of the present day—are now at the Manchester Museum (photos, page 21).

Floats were also used by ancient plasterers at Giza. Some plaster surfaces on the KRO mudbrick fragments bear impressions of uniform parallel horizontal lines (PL4, below).

At AERA's excavations in the Menkaure Valley Temple (MVT) (see page 2), I found evidence of the use of plasterers' floats on white plaster on the walls in the western and southern causeway corridors (photo below). The white plaster was applied over pale yellow marl clay plaster. The surface treatment shows how the float was used. The plasterers applied the wet plaster to the wall horizontally, so the float motion must have been a systematic movement from left to right, or vice versa, during the final stages of plastering. It looks easy; however, only highly skilled plasterers could produce a perfectly smooth surface. Plasterers sometimes used reed brushes, as indicated by traces of tiny white dots splashed on the surface of a plastered mudbrick from KRO (PL91 below). Plasterers probably also used their fingers.

What Was the Purpose of Plastering?

Plaster smoothed and sealed the rough surface of mudbrick walls. It could also make ancient structures more attractive and functional. Painted plaster brightened and decorated rooms. White was the dominant color, and it made the space inside a room brighter. Painted plaster also added ornamentation. But not every wall was finished in painted plaster. The function of the space determined how the walls were finished. Kitchens, pens, fortresses, and enclosure walls were often covered with just a rough mud plaster. The outside of buildings were probably plastered to create a finished appearance and obviously to protect the outer wall from weathering.

Looking Under the Surface

At first glance it looks like a common plastering process was used to finish the plastered walls seen in AERA's excavations

at HeG, Khentkawes Town (KKT), MVT, and Area C (galleries just west of the Khafre Pyramid), as well as in other Old Kingdom sites. However, while the finishes appear similar, under the surface they are not.

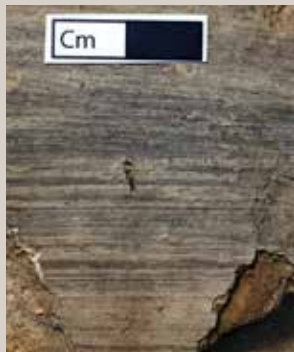
I found evidence of three plastering processes on plaster fragments from KRO and also on the in situ walls at HeG (House Unit 1, AA-South, and Standing Wall Island [SWI]).

1. A single coating of finish. Yellow marl clay plaster as the only finish on the wall (Number 1 in the sidebar on page 24). No paint added.
2. Painted plaster applied over tafla plaster, the type most frequently used at Giza. White was the dominant color, but red and black plaster were also used. Note the many variations shown in the examples in the sidebar on the page 24, number 2.

a) Plaster on MVT causeway corridor



b) PL4



c) PL91



a) and b) Plaster on mudbrick showing horizontal striations and ridges left by a plasterer's float. a) White plaster on east face of the wall in the causeway corridor of the Menkaure Valley Temple; b) Mudbrick fragment from the Kromer Dump; c) Plaster fragment with scattered white dots on the surface left by a reed brush. Photos by M. Yahata.

3. Painted plaster applied over grayish, muddy soil plaster. This type of plaster was made of alluvial mud, with much chopped straw added. Note the red, black, and white paint applied over this plaster in the examples on page 25.

Decorating the Walls

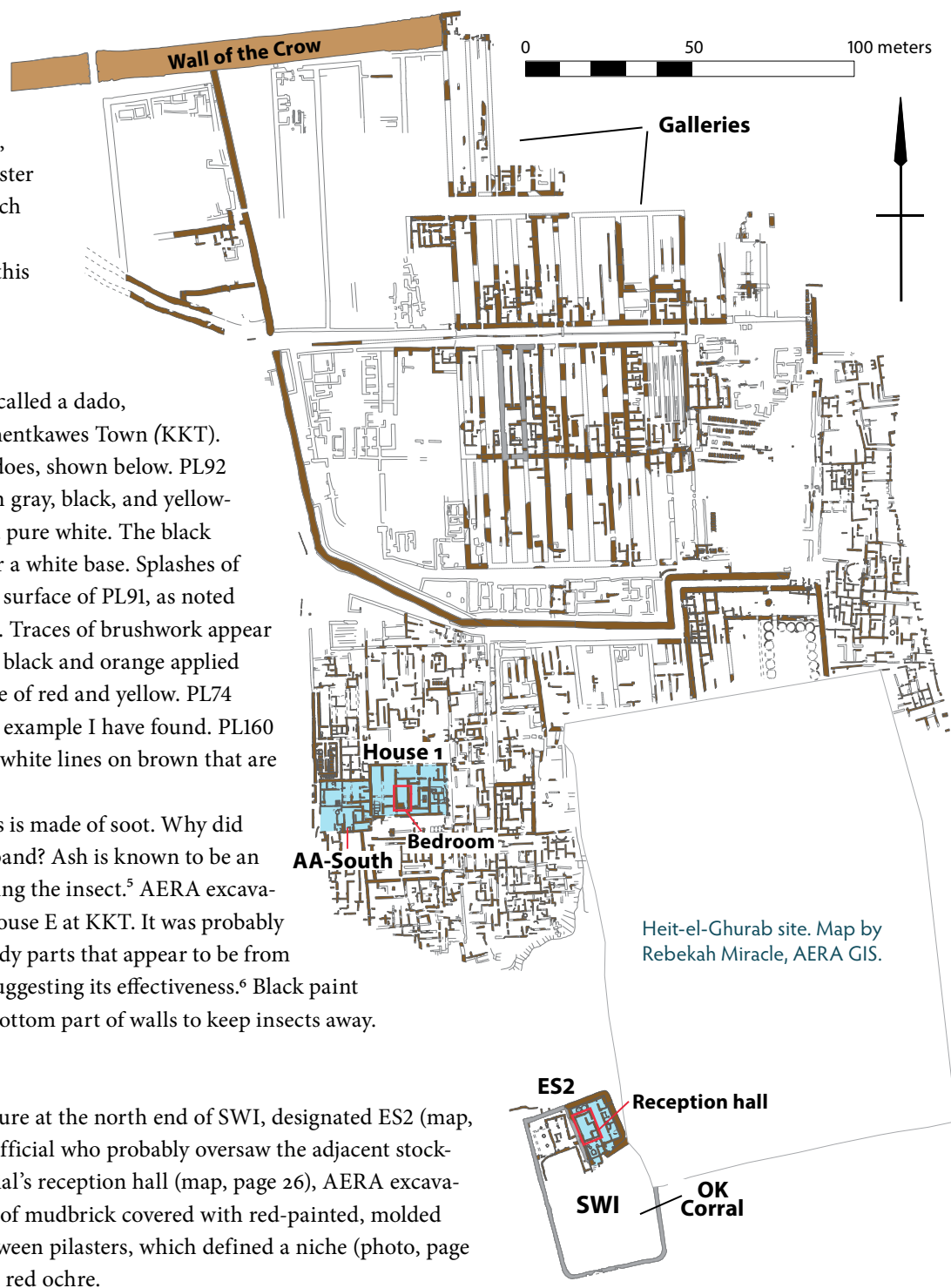
A black band along the base of the wall, called a dado, appeared in some houses at HeG and Khentkawes Town (KKT). Some KRO plaster samples also bore dadoes, shown below. PL92 is a section of plaster precisely painted in gray, black, and yellowish-white. Sample PL91 is pure black and pure white. The black paint on PL91 and PL92 was applied over a white base. Splashes of many tiny white dots can be seen on the surface of PL91, as noted earlier, indicating a reed brush was used. Traces of brushwork appear on other pieces as well. PL85 has striped black and orange applied over white. The orange color is a mixture of red and yellow. PL74 bears a black-white-black band, the only example I have found. PL160 bears striped brown and white, and two white lines on brown that are obviously traces of a reed brush.

The black pigment used on the dadoes is made of soot. Why did ancient Egyptians choose black for this band? Ash is known to be an effective insecticide; it works by desiccating the insect.⁵ AERA excavators found ash underneath the silos in House E at KKT. It was probably placed there to kill grain pests. Insect body parts that appear to be from granary weevils were found in the ash, suggesting its effectiveness.⁶ Black paint might have been chosen to apply to the bottom part of walls to keep insects away.

Decorating High Officials' Houses

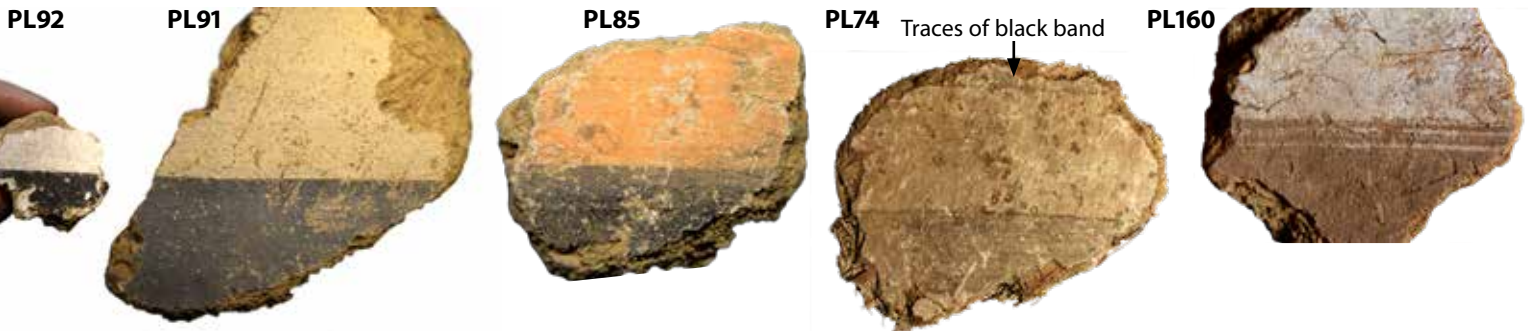
A High Official's Reception Hall. The structure at the north end of SWI, designated ES2 (map, at right), was the home/office of a high official who probably oversaw the adjacent stockyard and meat distribution.⁷ In the official's reception hall (map, page 26), AERA excavators found a large quantity of fragments of mudbrick covered with red-painted, molded marl plaster, on the floor in the area between pilasters, which defined a niche (photo, page 26). The paint was made of hematite and red ochre.

The fragments were typically rectangular in cross-section and would have formed part of an architrave that spanned the pilasters of the niche where the high official sat for meetings, framed by the architecture (drawing page 26, bottom left). *(continued on page 26)*



Heit-el-Ghurab site. Map by Rebekah Miracle, AERA GIS.

Below: Examples of dado on mud-brick wall fragments from the Kromer Dump site.



1. Single Coat of Yellow Marl Clay (Tafla) Plaster



Yellow marl clay (tafla) plaster applied to a wall in the MVT Annex without painted plaster.

2. Painted Plaster Applied over Tafla Plaster



2a. Left: **PL93.** From KRO, a wall fragment with red paint, with the plaster applied over a mix of marl clay and alluvial mud with much chopped straw. Right: **PL45.** From KRO, dark red paint applied over marl clay mixed with much chopped straw.

2b. MVT Causeway Corridor.

Red plaster applied over white plaster, which covers yellow marl clay plaster on a wall in the MVT Causeway. The rust red color is probably from hematite that was oxidized. This color is not seen in other AERA excavation sites or mudbrick fragments from KRO.



2c. MVT Causeway Corridor.

White paint applied over tafla plaster. It seems that the white paint had once continued all along the wall surfaces of the causeway, but only patches have survived. The white paint surfaces show many parallel horizontal lines that were probably created by the sweeping movement of a float.



2d. Dado. Black-painted plaster remains on a wall in AA-S at HeG up to 25 inches (64 centimeters) high. Black paint on the lower part of the walls is known as a dado and very often can be seen in tombs in the Old and New Kingdoms. Photo by Aly Ahmed Aly Abdel Latif.



Dado. Traces of a dado on the wall in situ in House Unit 1 at HeG. The grayish-black layer (3 millimeters thick) was applied over a thin layer of white painted plaster, which was applied over yellow marl clay.

3. Painted Plaster Applied over Grayish Mud



PL153. From KRO, thick pure white paint applied over grayish-brown plaster with cut straw and pebbles. The surface is rough flat alluvial mud, with tiny cavities in it. In contrast to other white paint used at Giza, this one is especially white, probably because it contains a high percentage of gypsum.



PL133. From KRO, very dark gray plaster applied on white plaster, over grayish-brown mud plaster. The very smooth flat surface shows that it was very carefully made. Many parallel horizontal lines on the surface suggest plastering using a float. The plaster contains many tiny black quartz pebbles, making the surface glitter.



Plaster repair. This is one of only two examples of wall plaster that had been repaired. A layer of black-painted plaster was applied over an older layer of black-painted plaster. Both examples had been applied over mud plaster.



North face of wall, MVT. The rust red paint, although faded (perhaps due to water damage), has survived well on a wall in the MVT. It was applied over white paint, over grayish-brown alluvial mud plaster.

House 1 Bin. In a series of eight low bins in the southeast corner of House 1 at HeG, the plastering method is the same as elsewhere, except yellow marl clay plaster was applied over red, like a sandwich. The color is bright hematite red. One bin shown in photo by Y. Kawae.



A High Official's Bedroom. In House 1 (map, page 23), the home of a high official and a scribal workshop, excavators also found a large quantity of red-painted molded plaster on mud-brick, distributed in the southern part of the bedroom (photos, facing page).⁸ These probably formed an architrave spanning the pilasters, as in the official's reception hall in ES2, but in this case for a bed niche, which may have been a reuse of the space. The pieces bear very vivid red paint on a rough flat surface. The paint was applied over a very thin, light red plaster.

Fancy Doorways and Rare Colors

In addition to the walls, doorjambs (frames) were also decorated. In the KRO Dump material, I found several remains of doorjambs covered with painted plaster. Sample PL73 has a smooth square surface and very sharp corners on both sides. The surface was first covered with blackish-red paint and then one side was painted over with white, the other side with red. Some white irregular brush lines can be seen on one side.

Sample PL24 (facing page, top) bears a rare combination of three colors: a band of pale red and white applied over pale yellow marl clay plaster.

Possible Palaces?

The painted plaster remains from HeG, KKT, and KRO homes show that they were very carefully built. The degree to which a house was decorated with painted plaster depended on status. Given the level of finish on the KRO painted plaster wall samples, there is no doubt that they came from a very high-ranking official's building(s), possibly palaces. Where were they?

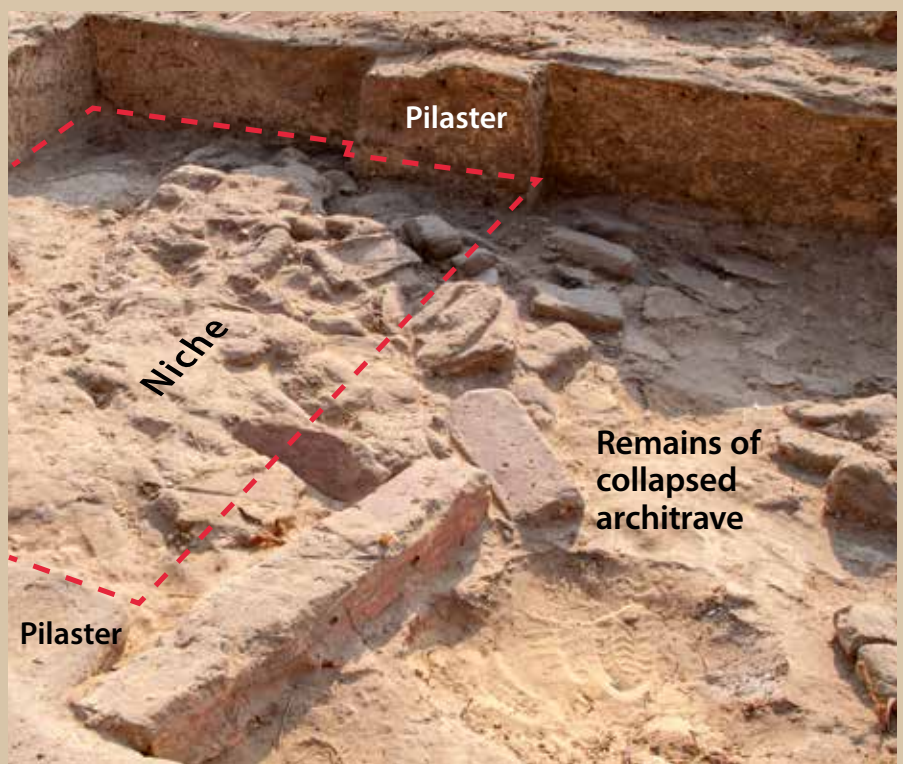
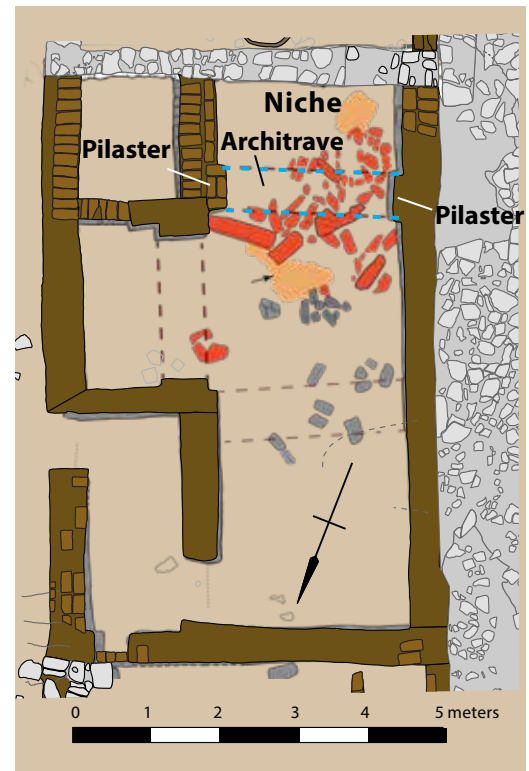
The KRO deposits were dumped from two different directions; a deeper, older deposit came from the east, almost cer-

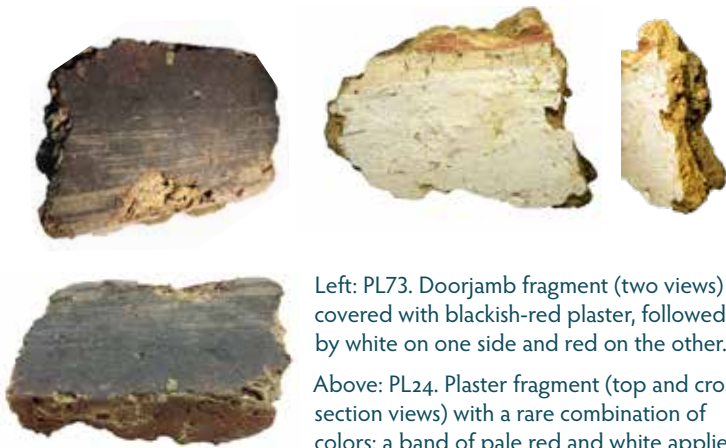
tainly from an early phase of HeG. The younger deposit, closer to the top of the mound, was dumped from the west. So it seems reasonable to hypothesize that there were two palaces, one was in the northwest, around the vicinity of the MVT and KKT, and the other at the HeG.

When Selim Hassan excavated KKT, he noted two levels of occupation and remains of red, black, and white-painted plaster in House M, a large residence on the southeast end of the town. It's possible that the early phase of the building was the source of the KRO samples, or they may have come from a structure located nearby. The building would have been used for a period

Right and below: The master's reception hall in ES2 at the north end of SWI. ES2 was a large compound that probably served as the home/office of a high official. The red objects on the floor are fragments of mudbricks covered with red-painted molded plaster. They probably are the remains of an architrave that once spanned the pilasters and framed the niche. Photo by Mark Lehner, view to the south.

Below left: The master in his red-frame niche conducting business, from a 3D reconstruction.





Left: PL73. Doorjamb fragment (two views) covered with blackish-red plaster, followed by white on one side and red on the other.

Above: PL24. Plaster fragment (top and cross-section views) with a rare combination of colors: a band of pale red and white applied over pale yellow marl clay plaster.

of time, as suggested by two small, repaired, black-painted plaster fragments (page 25, center left). Menkaure might have built a royal resthouse here, before Shepseskaf later built over the ruins of earlier structures when he constructed KKT. The site might have offered a secure location for a building where Menkaure stayed when he came to inspect and oversee construction on his pyramid. Future excavations planned for KKT will be probing the earlier phases of House M and may shed light on whether it was Menkaure's pyramid-visit resthouse.

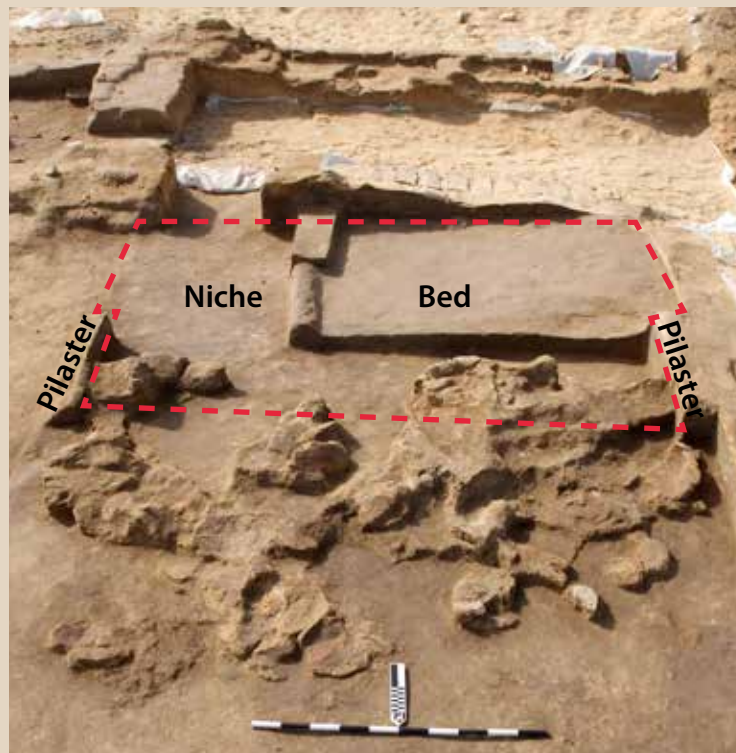
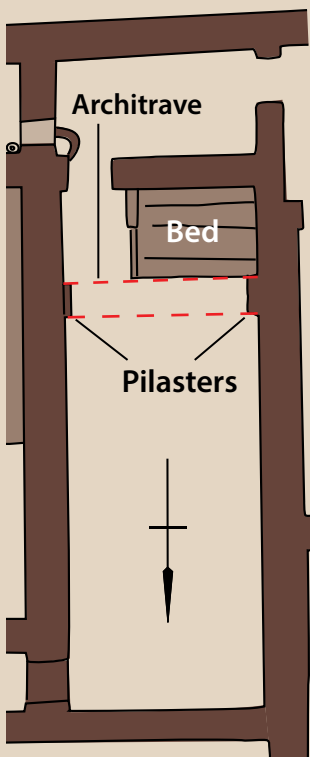
The KRO plaster samples that likely came from HeG included samples that also suggested a special level of care in the construction of some of the structures. Three specimens bear very rare color combinations that we have not seen in the later HeG remains: PL24 (photo above right), PL73 (photo above left), and PL74 (dado, black-white-black painted plaster, photo, page 23).

Many plaster fragments from KRO and from HeG await analysis in the Ministry of Tourism and Antiquities Magazine Lab. I will be working on these in coming field seasons and expect to learn more about the function of the Old Kingdom buildings at Giza.

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8. Kawae, Y., "House Unit 1 in SFW (SFW.H1)," in *Giza Plateau Mapping Project, Season 2005-2007, Preliminary Report*, Giza Occasional Papers 3, edited by M. Lehner, M. Kamel, and A. Tavares, Boston: Ancient Egypt Research Associates, pages 87-91, 2009.

Below: The bedroom in House 1 at the HeG site. The map shows the location where an architrave probably spanned the pilasters. In the photo (center), fragments of the architrave lie on the floor, where they fell when it collapsed. Right top: Piece of architrave with red-painted plaster. Right bottom: Red-painted plaster from architrave in situ on the floor. Photos by Y. Kawae, except top right by M. Yahata.

0 1 2 3 4 5 meters



RAIN too much, too little



The runoff from torrential rain can be powerful, easily cutting canyons through the sand and limestone debris that fills the southern Giza quarries. Photo by Mark Lehner.

Water played a surprising, and unexpected, role throughout our Season 2020. On March 12 a violent two-day rainstorm struck Egypt and shut down Cairo—and our excavations in the Menkaure Valley Temple (MVT). It made us first-hand witnesses to the horrifying power of a “dragon storm,” a type of cyclone. After the skies finally cleared on March 14, we could see how torrential rains had ravaged the Giza Plateau. Just north of the MVT, runoff from high up on the plateau tore deep channels through the sand and limestone debris.

The dragon storm did not spare our fieldwork and lab in a Ministry of Tourism and Antiquities Magazine store-room. The old roof could not stand up to the onslaught of two days of steady, hard rain. Water pooling on the roof eventually leaked through. The day after the storm ended, team members rushed in to rescue papers, equipment, and samples. They succeeded in drying everything that water seeping through the roof had touched, so in the end there was no damage, except to the roof, which we had to have repaired. At the end of March, workers spread heavy-duty plastic over the roof and covered it with cement.

Water also impinged on our work well before the dragon storm hit. The high water table that has plagued Giza for some time stymied our efforts to explore deep down into the stone foundation that Menkaure built for the massive valley temple he had envisioned (see page 4).

Water figured in our discoveries this season too. George Reisner, who excavated the MVT in 1908 and 1910, documented a devastating flash flood that tore through the back wall in the Offering Hall and brought an end to the First Temple phase of occupation. We found evidence of an earlier flood, probably as destructive as the one that Reisner documented (see page 5). We also found that during the Second Temple phase, residents faced the opposite



Above middle: Cartons containing archaeological materials spread out to dry. Bottom: Workers spread cement over the new heavy duty plastic that they laid to reinforce the roof. Photos by Mark Lehner.

problem: a shortage of water. It appears that late in the occupation, with Egypt suffering from severe drought, the last residents of the temple dug wells, one right in the temple, the other just outside, in an effort to secure water (see pages 4 to 5).