AERA GRAM

ANCIENT EGYPT RESEARCH ASSOCIATES

Groundbreaking Archaeology

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Egypt's Oldest Olive

Rainer Gerisch, charcoal analyst, has identified olive wood at the 4th Dynasty Lost City of the Pyramids settlement, the earliest olive in Egypt to date.

3

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Archaeological Science: Deciphering Ancient Code

Most of what we analyze is not entirely natural stuff. It is products or material left over after people have processed, worked, or digested it in some way. Archaeologists call it "material culture." People select natural material (clay, stone, mud, plants, animals, earth, wood, etc.), modify it, and distribute it according to the shared ideas that make up culture—the ideas behind their social organization, needs, perceptions, beliefs, and patterns of behavior. Culture influences the shape potters give vessels, the ornamentation they add, the people who use the pots, the means by which they procure them, how they use and reuse the vessels, and how they discard them. Material culture both passively reflects and actively influences the ideas and values that people share. (The gigantic pyramids are material culture writ large!)

Below: Looking something like a tiny guard's hut, or a secret entrance into the Great Pyramid, this diminutive entryway to the AERA Field Laboratory gives access to six rooms on two levels where scientists study material culture from the Lost City of the Pyramids. Nestled among the tombs of the nobles in the Western Cemetery, the lab is home to the AERA Archaeological Science and Material Culture program. View to the east. The circles show the lab interior.

Raw Data and Code

So in a sense material culture is like certain computer software (especially in object-oriented programming) in that it contains both raw data—the clay, bone, stone, etc.—and code—the ideas. In our work we are not so much interested in things-as-such. We want to know the "software" that created the "hardware" of the pyramids, tombs, and temples. This highly symbolic, monumental material culture not only reflects the ancient Egyptians' "software" passively. In various ways material culture, from the monumental to the elementary structures of everyday life, actively affected the evolution of ancient Egyptian society. The task of building on such a colossal scale required that the Egyptians organize and adapt their human and natural resources, their social order and bureaucracy. They also had to adapt their most basic structures, like bread pots and bakeries, for an intensification of production that in turn may have affected how people used those structures back in their everyday lives.

In search of the code—the software—we compulsively, scrupulously try to recover every scrap of material culture, from the largest objects down to the smallest seeds. Our archaeologists assign every lot of material an ID tag, the number of the deposit from which they excavated the material. The "feature number" stays with the material through its registration and analysis in the AERA Field Laboratory.

Unlocking the Code

Thirty-eight scholars and scientists (specialists in pottery, animal bone, plant remains, chipped and ground stone tools, charcoal, clay sealings, faience, pigments, mudbricks, and objects of everyday life) methodically analyze the enormous quantities of material that we have amassed, in order to unlock the code: the ideas, and values of the people who created and inhabited the Lost City of the Pyramids. The lab team works under the aegis of the AERA Archaeological Science and Material Culture program, directed by Dr. Mary Anne Murray.

The results of the lab team, combined with the data from the site, allow us to "read" the patterns of everyday life in the Lost City, and to relate these patterns to the record of Old Kingdom monumental architecture, art, and texts long-studied by Egyptologists.

In this issue of AERAGRAM we present two of the stories to emerge from the Arch Sci Program: the earliest evidence of olive wood in Egypt to date and the mystery of the odd stones that hinted of a 4,500 year old crank-shaft drill.

~ *Mark Lehner*

By the Numbers

Specialists analyze enormous quantities of material every season. These are some of the numbers:

Royal Administrative Building
12,049 animal bone fragments (2007)
12,950 diagnostic sherds (2007)
12,837 chipped stone tools & waste
Nearly 10,000 plant items
81 pigment samples
459 mud sealings

Area AA (possible storage facility)
12,028 sherds
989 mud sealings

Egypt's Oldest Olive

AERA researchers have discovered new evidence suggesting that olive wood was present in ancient Egypt 500 to 700 years before previously believed, a find that may provide new insights into the life of the pyramid builders.

The discovery, made by AERA charcoal analyst Rainer Gerisch, suggests that olive wood was at least present, if not grown, in Egypt as early as the time of Pharaoh Menkaure (about 2551–2523 BCE), builder of the third Giza pyramid. Until now, the earliest known traces of olive were fruit pits found in 12th Dynasty deposits at Memphis. Even then, there are almost no other archaeological finds of olive until the 18th Dynasty (about 1569–1081 BCE). From this period and thereafter olive leaves begin to appear in tombs, suggesting that olive cultivation had begun in Egypt. But the first definitive evidence that Egyptians were growing olives dates from the Graeco-Roman era (305 BCE–337 CE).

Gerisch first identified several olive wood charcoal fragments in 2001 in charcoal samples from the Lost City of the Pyramids site. But there was not enough evidence to rule out the possibility that these were intrusive. Gerisch continued to find olive charcoal from different areas of the Lost City. With that and additional finds this year, we can now conclude that the olive wood is genuinely part of the Old Kingdom settlement remains, dating at least 500 years earlier than any other known specimens in Egypt. So how did olive wood turn up at the Lost City site at such an early date? The most likely possibility is that it was imported, and there is much evidence to support this idea. Egyptians carried on a lively trade with the Levant going back to the 1st Dynasty (roughly 2900–2730 BCE). The main imports were woods, as well as oils, resins, and wine. Egyptians sought wood for buildings, ships, and funerary equipment since their native trees offered very little good timber. The Palermo Stone mentions 40 ships arriving with wood during the reign of Sneferu (2543–2510 BCE). It is possible that olive was among the wood imports during the Old Kingdom.

But two important facts undermine this hypothesis. First, it is unlikely that olive wood ended up in the timber trade. Olive trees are extraordinarily long-lived and valued for their fruit. The tree does not yield good timber as it is pruned vigorously to keep it short and productive. Second, the specimens found at AERA's site are mostly from twigs. Thus the wood was probably not imported for carving small objects either. Carving could have left scraps for firewood that might have ended up as charcoal.

Perhaps then, our olive wood was not an import in its own right, but rather entered Egypt with other products, possibly olive oil. Beginning in the 1st Dynasty, combed ware pottery vessels from the Levant appeared in Egypt. Made of a very hard ceramic decorated with striations impressed with a comb, the jars were used to transport oils. Some archaeologists believe they carried olive oil because they have been found in olive oil factory sites in the Levant, where people have pressed olives since the 4th Millennium BCE. AERA ceramicist Anna Wodzińska has identified 14 combed ware sherds at the Lost City site. If the imported jars carried olive oil, this might explain the presence of the wood. Prunings from the orchard might have come along with the jars as some sort of packing material or shipping crates.

It is also possible that Egyptian workers brought in the olive twigs with wood shipments. When crews were dispatched to the Levant to fell trees and transport the logs back, they may also have taken firewood to use on their return voyage or to fill out extra space on their ship. Gerisch found the olive with small pieces of charcoal from other Levantine trees—cedar, pine, and deciduous and evergreen oaks—suggesting that they may have come from the Levant together.

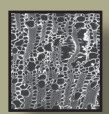
But what about the possibility that Egyptians were growing olive trees? In the New Kingdom Queen Hatshepsut maintained a botanical garden of exotic plants. Perhaps Menkaure made an early and undocumented effort to cultivate olive trees in palace gardens.

The Pyramid Age is early for olive in Egypt, but few Old Kingdom town sites have been excavated extensively and sampled methodically for wood charcoal. Gerisch's work may inspire others to carry out similar studies and perhaps discover more early olive remains.

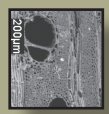
~ Rainer Gerisch, Wilma Wetterstrom, and Mary Anne Murray

Olive
(Olea europaea)

Nile acacia
(Acacia nilotica)



Olive



Nile acacia

Under the Microscope: Identifying Wood Charcoal

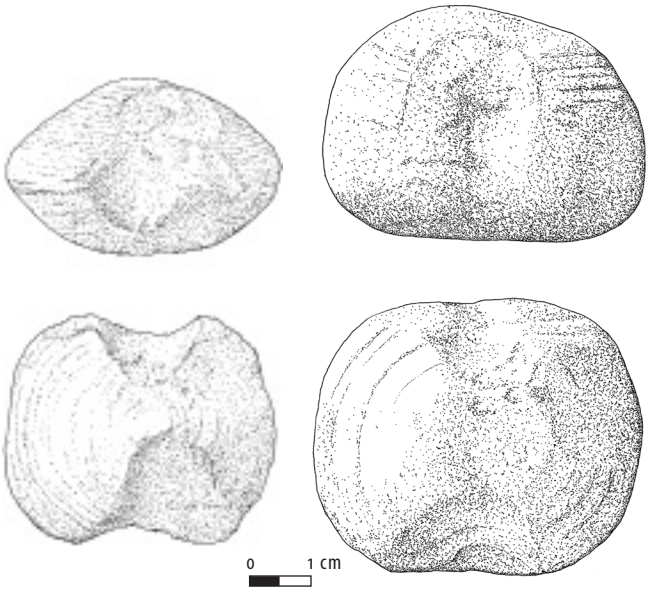
All woods have distinctive patterns of cells and other microscopic structures that are used to distinguish one species from another. Rainer Gerisch examines these features in split surfaces of the charcoal fragment, working at magnifications of 40 to 500 x. Transverse (cross) sections of Nile acacia and olive are shown in the circles at different magnifications to illustrate the differences in structure. The sections in the squares are at the same magnification. Nile acacia is the most common wood at the site, accounting for 99.3% of all the charcoal that Gerisch has identified (143,482 pieces). Olive wood accounts for 15 pieces.

Mark Lehner

Small Finds, Big Results

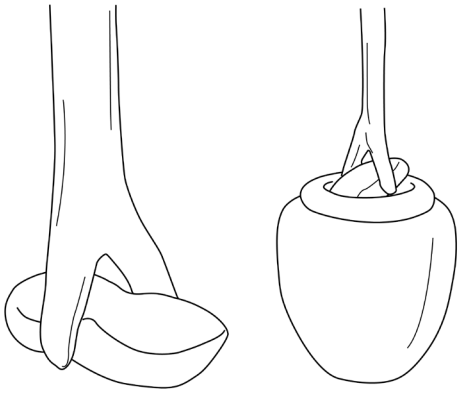
Inconspicuous Stones a Key to an Ancient Industry

by Ana Tavares, Co-Field Director



Left: Ana Tavares and Emmy Malek search through small finds from the Lost City of the Pyramids site in the AERA Field Lab.
Above: Two examples of drill stones, bottom and side views. (Drawings by Johnny Karlsson.)

Below left: Forked wooden shaft fitted with stone drill bit. Below right: Shaft with drill bit being lowered into the stone vessel. (After Stocks 2003.)



The most unassuming little objects can sometimes carry much information about daily life and industry. But we can easily overlook them because they are inconspicuous. Removed from their original context they are often incomprehensible. Then, during careful scrutiny in the lab, some attribute catches our eye and provides a clue to the story the object has to tell.

As I examined ground stone tools at our AERA Field Lab, a small quartzite piece caught my eye as highly unusual. Indentations on either side gave it a figure-eight shape, like a dog biscuit. Then I found other examples, including stones with a second set of indentations—making a sort of stone flower with four petals. What were these curious stones?

The objects offered several important clues: the indentations, or grooves, did not develop during tool use, but were prepared deliberately when the object was shaped. On the other hand, the very fine, regular striations around the circumference, along with a bruised, glossy surface, were scoured by friction when the tool was in use. It was not used for hammering, grinding, or cutting, but held horizontally, it drilled out small areas in a circular motion.

The tools are drill-bits, or borers, for hollowing out stone vessels. Scenes of craft work, such as in the tomb of Ti, show these drills placed between forked rods at the end of a tall wooden crank drill. As a craftsman turned the handle, the sides of the borer ground through the mass of stone.

The hieroglyph for "*ḥm*,"  , used in writing the word for craftsman, is a detailed depiction of this type of drill. It shows a central wooden shaft with two stone weights placed just under the crooked, tapering crank handle. A second shaft, with a forked end fitted with the stone borer, was lashed to the central shaft. This made the drill long-lasting as the forked shaft would be replaced just as one replaces a modern drill-bit.

The drill was very versatile. Different sizes of stone borers could be fitted to cut the internal shape of stone bowls and vessels, especially in vessels with wide shoulders where the internal diameter is wider than the vessel's mouth.

A conical stone borer, shown upside down, would have been fitted on the forked shaft with the tip downwards.

Mark Lehner

Craftsmen used crank-shaft drills from Predynastic times until at least the 26th Dynasty; the hieroglyphic depiction of the drill appears as early as the 3rd Dynasty.

How to Start the Hole

The figure-eight, or flower-shaped, stones drilled through the vessel once it had an opening. How was that opening created? How did the craftsmen begin the mouth of the vessel? They might have used a tube-drill, a hollow copper tube force fitted onto a wooden shaft. Tube-drills were used to drill hard stone sarcophagi and stone vessels, but they were very "expensive." Copper was precious and cutting a hole ground up the metal.

Amidst our objects we found an alternative: inverted conical quartzite pieces, with hafting grooves on the upper part and cutting surfaces on the blunt pointed end. Craftsmen used these bits to start the hole and then replaced them with different sizes of circular or figure-eight borers as the cutting progressed. From the thousands of stone fragments and tools excavated at our site, we have identified 11 drill-stones of fine quartzite, ranging in color from dark purple, through red, to light orange.

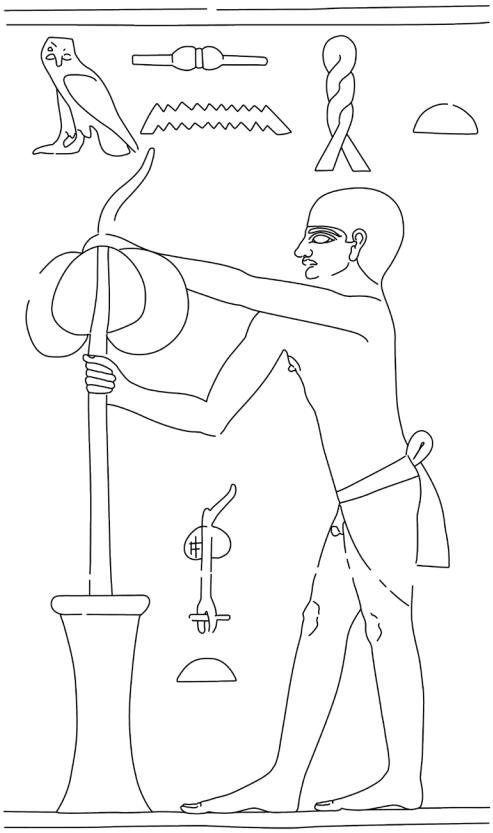
A Craft Industry

Our archaeologists have recovered borers from the Royal Administrative Building, the Eastern Town, production areas such as East of the Galleries, and Main Street East, as well as from House Unit 3 in the Western Town, where we found three examples.

Did these sites include specialized workshops in separate buildings or areas within the town? Or was stone drilling and vase-carving a cottage industry, an activity done within domestic areas, as was the case with textiles, faience, and glass in the New Kingdom town of Tell el-Amarna (Shortland 2000)?

Vessels for the Sacred or the Secular?

Egyptologists have thought that ancient craftsmen used the crank drill and borers for making stone vessels intended primarily for temples and tombs as offerings to gods and the deceased. The Lost City craftsmen, as workers in a pyramid city, were undoubtedly producing objects for mortuary purposes on the Giza Plateau. We have evidence of other stone working on a more massive scale for structures on the plateau,



A craftsman using a crank-shaft drill in a workshop scene in the 5th Dynasty tomb of Ti at Saqqara. The end of the drill is inside the vessel that he is boring out. But next to him the hieroglyph for craftsman is a clear representation of the actual drill fitted with a borer. (After L. Épron 1939.)

including stone pounders and granite dust left by masons. We also have evidence of finer craft industries, such as the manufacture of faience plaques and amulets, which also may have been for funerary purposes. Still, while the focus of the settlement was probably the Giza Necropolis, not all the workers' products necessarily went to tombs and temples. Some items, including some of the stone vessels, may have been intended to support daily life in the city. We do not know to what extent the settlement sustained itself. Some goods were clearly provisioned, such as cattle, sheep, and goat meat; grains; and wood fuel. But textiles made here may have been for the residents' use.

A Hidden Industry

Most of the crank-shaft drill assembly—the wooden shafts, the lashing, and the nets holding the stone weights—has disappeared. Only the quartzite stone borers remain to tell us that this rather complex and very effective drilling tool was used on our site. We have excavated fragments of stone vessels, remains of the products of the drill assembly, but until we identified the stone borers we had no direct evidence that people might have been making stone vessels in the pyramid city. Just as a weaving industry was revealed at the Lost City (*AERAGRAM* 7/2, 2004) through careful analysis of small, inconspicuous finds—spindle whorls, bone points, and needles—another hidden industry came to light through our work with the artifacts in the Giza Field Laboratory.

Acknowledgements

I would like to thank Emmy Malak, Marie-Astrid Calmettes, and Henan Mahmoud for all their meticulous work on the Lost City artifacts.

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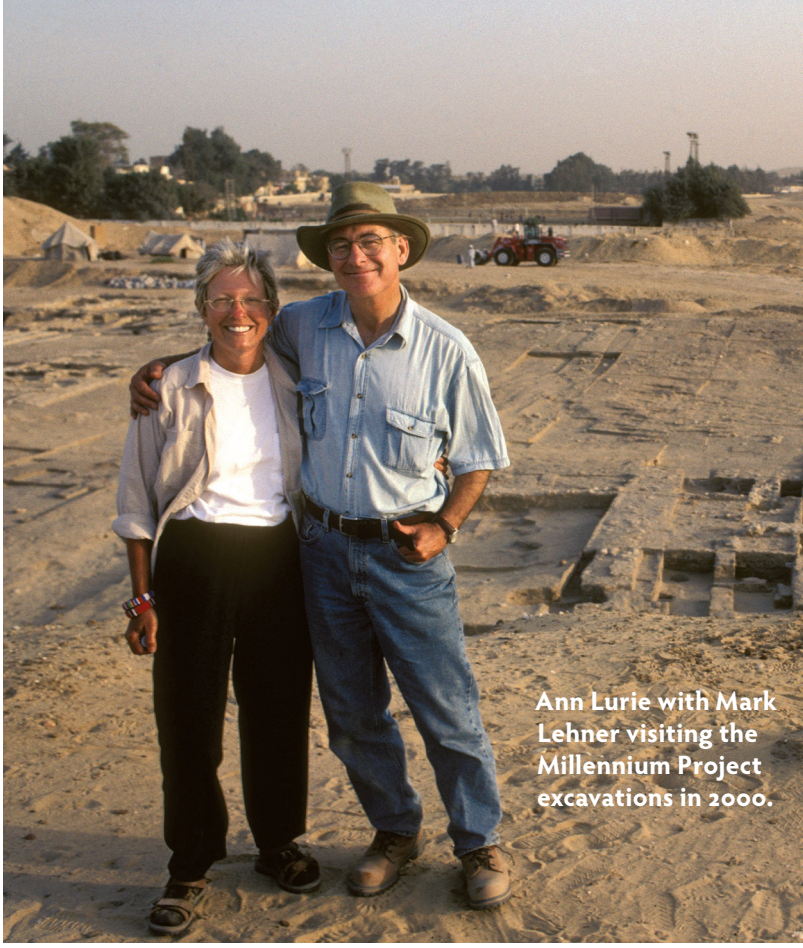
Ann Lurie on Board!

When Ann Lurie came to Giza in 1999, on a cool day in February, she and Mark Lehner walked together over the immense mounds of sand and debris that covered the site of the Lost City of the Pyramids. Already an AERA supporter for two seasons, Ann took in the scene, but she could see nothing of the bakeries, workers' houses, and hints of long galleries that we had glimpsed in our small excavation trenches because, after every season, we backfill our trenches to protect the ancient city ruins. Sweeping her gaze over the sand that blanketed the surface stretching the length of two football fields from us to the Wall of the Crow, Ann asked, "What would it take to find out what is really underneath all this?"



Ann Lurie with Mark Lehner visiting the Millennium Project excavations in 2000.

A Challenge

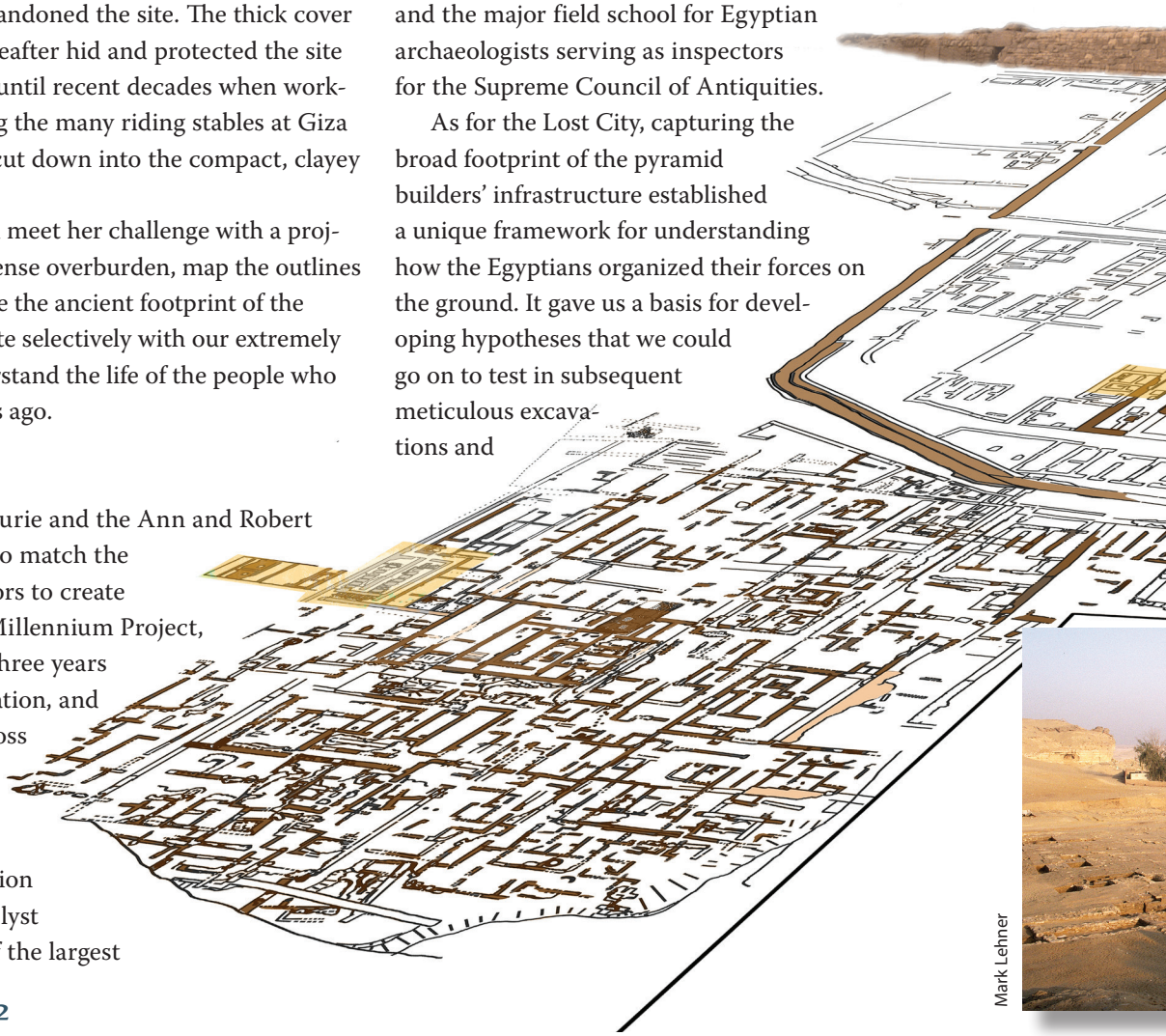
Ann couched a challenge within her question: Could the AERA team plan, fund, and manage a long-term, major archaeological project to retrieve what we knew were the ruins of a major settlement dating to the time of the pyramids? We already knew from our small looks down through the overburden, that underneath the sand we had what is essentially a horizontal section through the ancient city of the pyramid builders, cut by powerful forces of erosion, signalling a dramatic climate shift not long after people abandoned the site. The thick cover of windblown sand soon thereafter hid and protected the site for the remainder of history, until recent decades when workers removed sand for cleaning the many riding stables at Giza and mechanized equipment cut down into the compact, clayey settlement ruins.

We told Ann that we could meet her challenge with a project that would clear the immense overburden, map the outlines of many of the walls to salvage the ancient footprint of the pyramid builders, and excavate selectively with our extremely meticulous methods to understand the life of the people who inhabited this city 4,500 years ago.

The Marathon Project

The challenge was on! Ann Lurie and the Ann and Robert H. Lurie Foundation agreed to match the donations of other contributors to create what would become AERA's Millennium Project, a marathon 21 months over three years (1999–2002) of survey, excavation, and mapping the ancient city across an area of 5 hectares. The results? The AERA team unveiled the Lost City of the Pyramids, true, but Ann's vision and challenge was also a catalyst for AERA's growth into one of the largest archaeological missions working in Egypt and the major field school for Egyptian archaeologists serving as inspectors for the Supreme Council of Antiquities.

As for the Lost City, capturing the broad footprint of the pyramid builders' infrastructure established a unique framework for understanding how the Egyptians organized their forces on the ground. It gave us a basis for developing hypotheses that we could go on to test in subsequent meticulous excavations and



Mark Lehner

analyses in the Giza Field Laboratory, nestled among the tombs of the nobles in the cemetery west of the Great Pyramid.

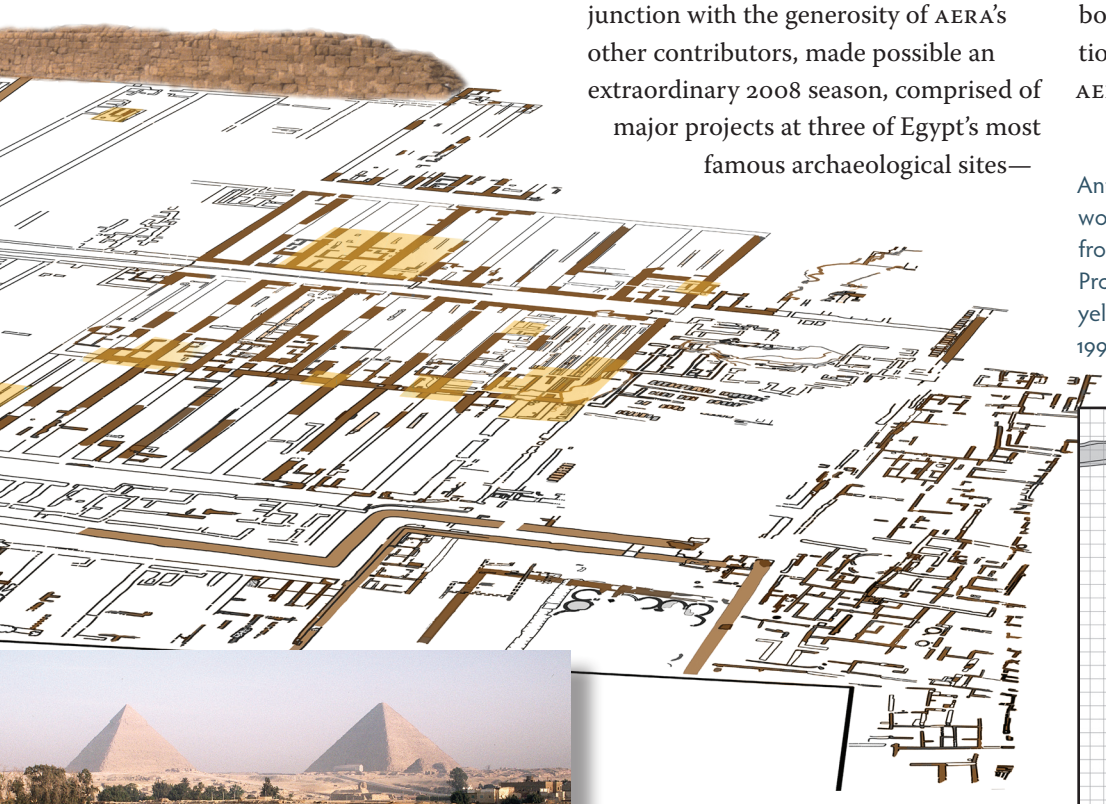
Continuing Support

Since that day with Mark on the sand mounds of Giza, Ann and the Ann and Robert H. Lurie Foundation have continued to help AERA grow. Ann's very significant role in our work shows what impact a donor can have. The Lurie Foundation has been key to AERA's capital campaign, with another challenge grant to help AERA establish a permanent facility in Giza to house the Archaeological Center and Field School.

In 2008, realizing that a great part of what we know of life in the ancient pyramid city comes from the analysis of our material culture finds by ceramicists, botanists, zoologists, and geologists in the Giza Field Laboratory, Ann supported AERA's Archaeological Science Program. Her donations, working in conjunction with the generosity of AERA's other contributors, made possible an extraordinary 2008 season, comprised of major projects at three of Egypt's most famous archaeological sites—Giza, Saqqara, and Luxor—the Salvage Archaeological Field School, the Saqqara Laser Scanning Survey of the Step Pyramid, and the work at Giza, which we report in this issue.

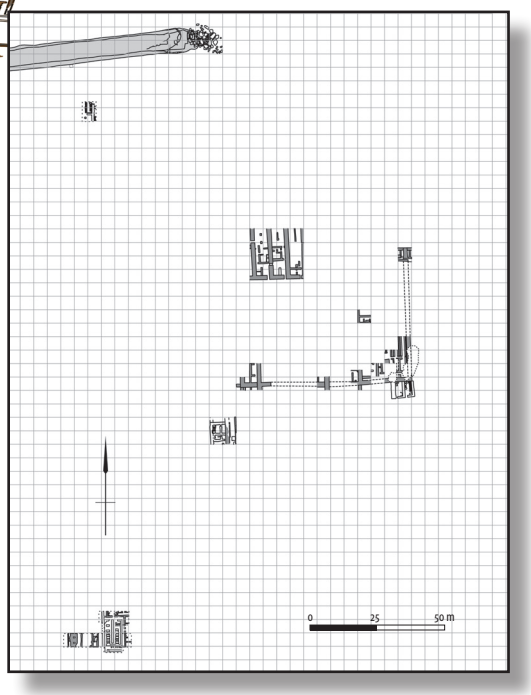
AERA could only carry out this important work on three fronts with the support of all our contributors. The David H. Koch Foundation, the Ted Waitt Family Foundation, the Peter Norton Family Foundation, and the Charles Simonyi Fund for the Arts and Sciences provided major support. The Dash Foundation for Archaeological Research funded the 2008 Geophysical Survey at Giza.

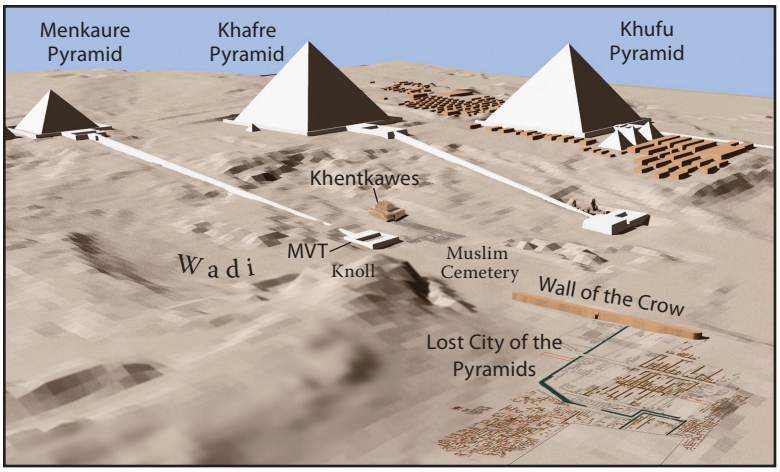
We are deeply grateful to Ann Lurie and the Lurie Foundation for making possible the results we report in this issue of AERAGRAM. And we are very pleased to announce that this year Ann has joined AERA's Board of Directors, so appropriate considering that our work is as much Ann's as that of the AERA team members. It is good to have Ann on board. We hope our scientific contributions honor Ann's trust and loyalty to AERA's core mission at Giza.



Left: The site during the 2000 field season with the Millennium Project in full swing. Much of the work involved clearing a massive blanket of overburden. Note the "cliffs" at the edge of the excavations. View to the northwest.

Ann Lurie's very significant impact on AERA's work can be seen by comparing our site map from 1999 (below), before the Millennium Project, with our current map on the left. The yellow areas on the left are the squares in the 1999 map below.





Two Royal Towns: Old Digs, New Finds

by Ana Tavares, Co-Field Director

If you stand at Giza on the high desert knoll overlooking our Lost City site, you will see just "around the corner" the remains of two other 4th Dynasty settlements, both of which were excavated in the early 20th century: a town built in front of the tomb of Queen Khentkawes and nearby, the Valley Temple of Menkaure with a village "grafted" onto it. Since 2005 AERA has been working at these two towns in order to better understand the context in which the Lost City functioned.

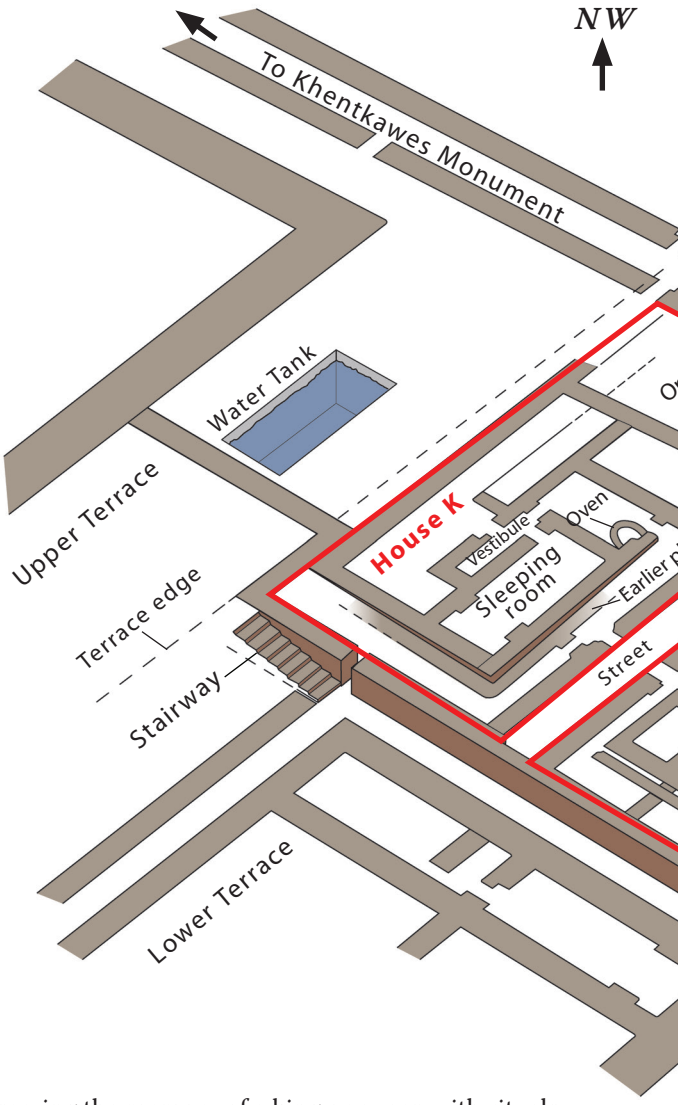
Our work over three seasons has incrementally shed light on the architecture and history of the settlements. But the 2008 excavations yielded some truly surprising discoveries, offering new insights into life on the Giza Plateau in the late Old Kingdom. We were most surprised to find a building that had never been reported before, deeply buried in front of the Khentkawes Town—perhaps a valley temple for Queen Khentkawes. Valley temples are a standard part of a pyramid complex and each of the pharaohs buried at Giza had his valley temple.

Another remarkable find was evidence of gateways into the Giza Plateau, one through the Khentkawes Town and the other between the town and the Menkaure Valley Temple. This area may have been a portal for people and goods going up to tombs that continued to be built on the plateau long after the pharaohs left Giza. Perhaps the inhabitants of the two towns even exerted some control over the flow.

Temporary Towns vs Temple Towns

In the waning years of the 4th Dynasty people occupied at the same time the Lost City, the Khentkawes Town, and the Menkaure Valley Temple village, but these settlements served different functions. The large Lost City (aka Heit el-Ghurob site, Arabic for Wall of the Crow, HeG, for short), where AERA has worked since 1988, was a short-lived "company town" put up to house the infrastructure for pyramid building and decommissioned when construction ceased.

The two other communities nestled at the southeastern foot of the plateau, slightly higher than the spread of the Lost City on the low desert. The plateau communities were "sacred towns," attached to temples, and probably inhabited by priests



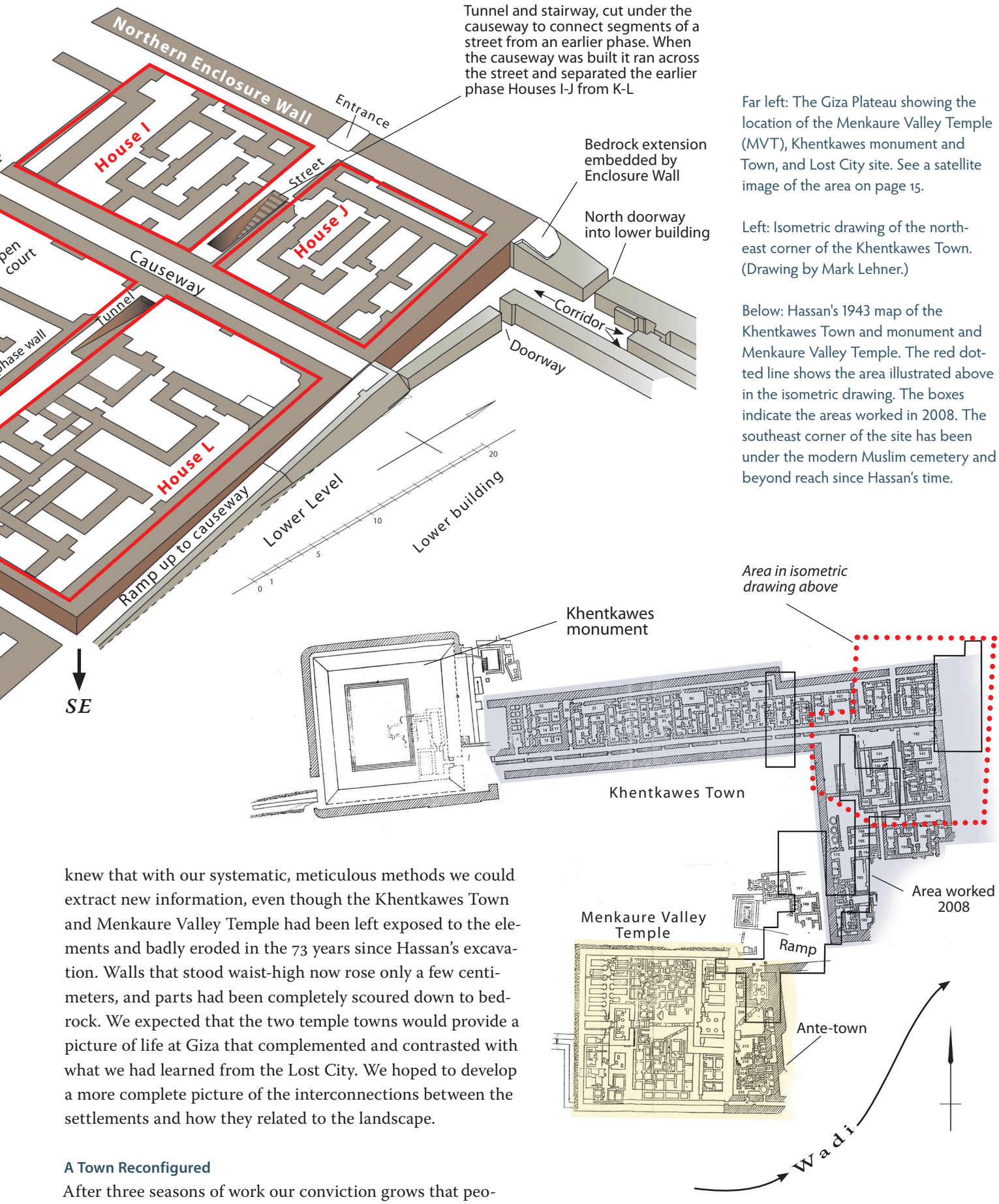
ostensibly serving the memory of a king or queen with rituals.

The Khentkawes Town was planned and carefully laid out, while the Menkaure Valley Temple community looked like a squatters' village; it developed "organically" over time as mud-brick houses crowded up against the front of the sanctuary and squeezed into the interior spaces of the temple.

Both temple towns were longer-lived than the Lost City. People occupied the Menkaure Valley Temple community for three centuries, as we know from the 1908–1910 excavations that George Reisner published in 1931. He mapped the different phases of the town and published the pottery and other material. Selim Hassan's 1943 publication of his excavations in 1932 of the Khentkawes Town is not adequate to establish how long the settlement was occupied. Unlike Reisner, he reported little of the artifacts and other remains. The most important result of Hassan's work was the map, which took in the Khentkawes Town, the Menkaure Valley Temple, and the eastward extension of the Menkaure Valley Temple that we call the Ante-town.

AERA Reopens the Investigation

AERA began work at the Khentkawes Town in 2005 in order to understand the wider urban context of the Lost City site. We



Far left: The Giza Plateau showing the location of the Menkaure Valley Temple (MVT), Khentkawes monument and Town, and Lost City site. See a satellite image of the area on page 15.

Left: Isometric drawing of the north-east corner of the Khentkawes Town. (Drawing by Mark Lehner.)

Below: Hassan's 1943 map of the Khentkawes Town and monument and Menkaure Valley Temple. The red dotted line shows the area illustrated above in the isometric drawing. The boxes indicate the areas worked in 2008. The southeast corner of the site has been under the modern Muslim cemetery and beyond reach since Hassan's time.

knew that with our systematic, meticulous methods we could extract new information, even though the Khentkawes Town and Menkaure Valley Temple had been left exposed to the elements and badly eroded in the 73 years since Hassan's excavation. Walls that stood waist-high now rose only a few centimeters, and parts had been completely scoured down to bedrock. We expected that the two temple towns would provide a picture of life at Giza that complemented and contrasted with what we had learned from the Lost City. We hoped to develop a more complete picture of the interconnections between the settlements and how they related to the landscape.

A Town Reconfigured

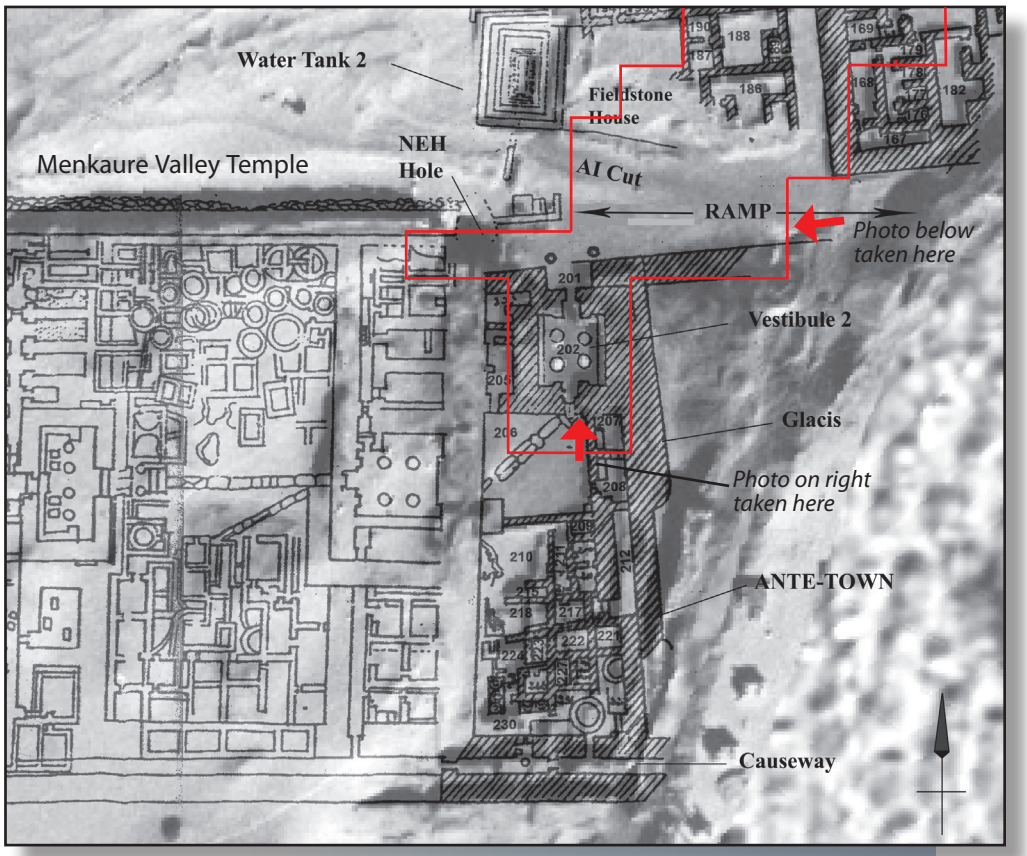
After three seasons of work our conviction grows that people inhabited the Khentkawes Town to the end of the Old Kingdom. We see two major building phases (Reisner also

found two major periods of building in the Menkaure Valley Temple), with complex rebuilding of various parts.

Modular houses arrayed along the northern side of a narrow causeway leading east from the Khentkawes monument make up the "leg" of the L-shaped settlement. The rectangular set of four buildings (I, J, K, and L) on the northeast, where the town turns south, belong to the earlier phase with an older entrance on the east that included a monumental limestone threshold and a large door jamb. When builders laid in the narrower causeway they quarried a tunnel under it so that people could still go between buildings I - J and K - L, via the north–south street.

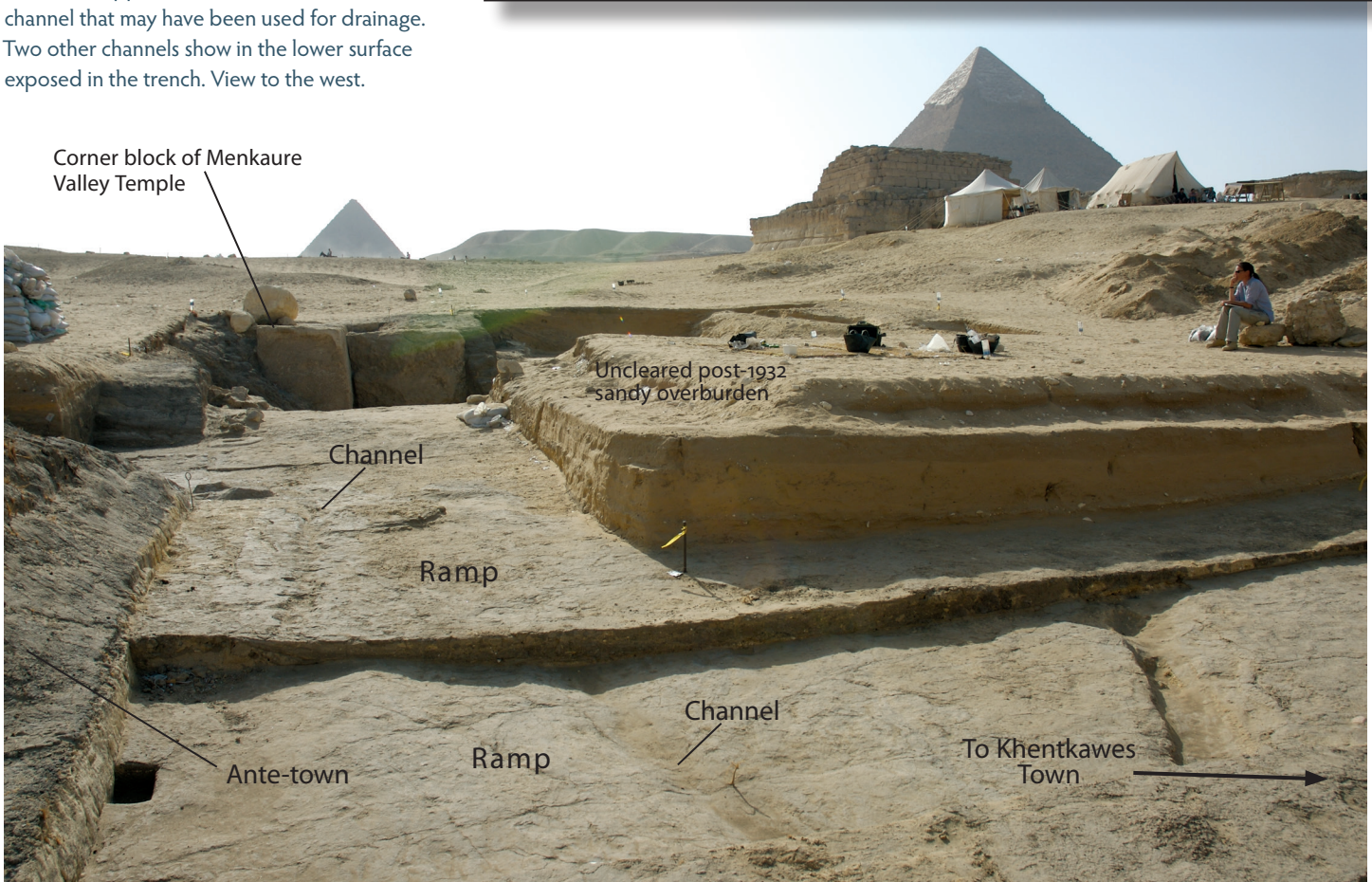
Town's Turn and Buried Building

Ever since Hassan's excavation, Egyptologists have wondered why the Khentkawes Town turned south so abruptly. In 2007 we discovered why. The eastern town wall runs exactly along a vertical bedrock ledge that drops more than 2 meters (about 6.5 feet). But then we found that the town actually continues eastward, but at a lower level! Geophysicist Glen Dash discovered the first indication of a building on the lower level during his 2006 radar survey. In 2007 we found the

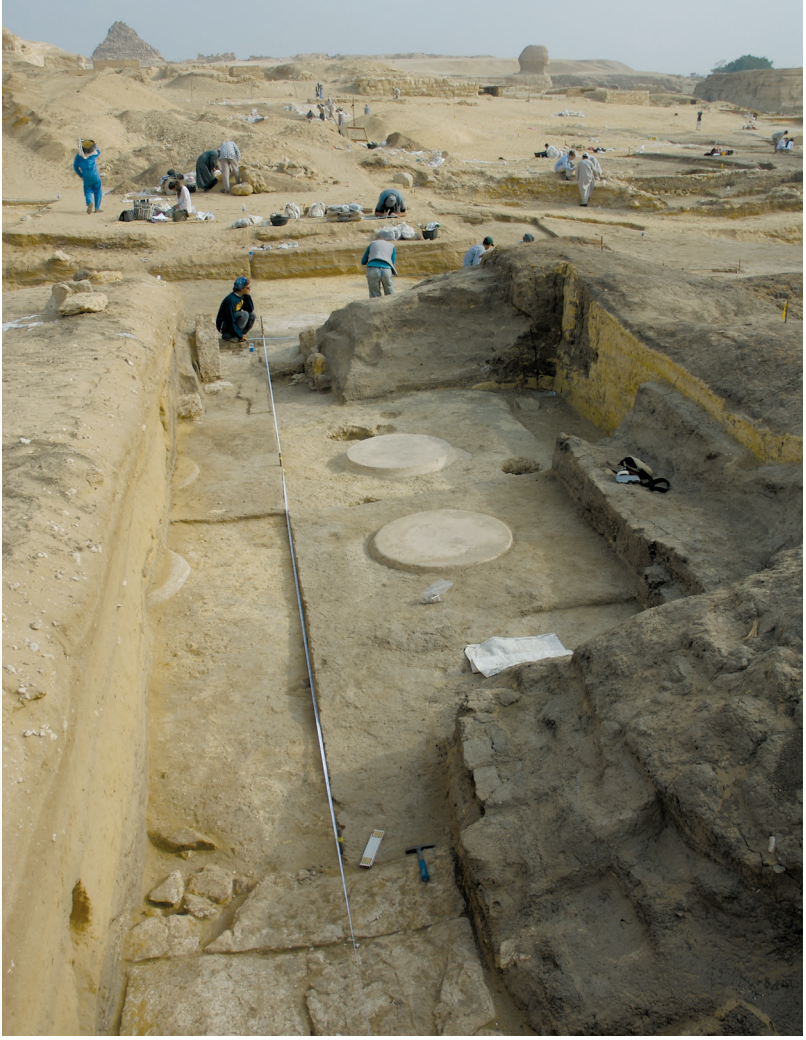


Right: Hassan's 1943 map overlaid onto a Royal Air Force aerial photo, both geo-referenced. The red outline shows the areas that AERA worked in 2008.

Below: The monumental ramp between the Menkaure Valley Temple and the Khentkawes Town. The uppermost surface shows a faint channel that may have been used for drainage. Two other channels show in the lower surface exposed in the trench. View to the west.



Mark Lehner



Excavations in the vestibule on the east end of the Menkaure Valley Temple. Two round alabaster column bases sit in the floor, all that is left of columns that once supported the roof. The ramp can be seen in the background and beyond, the Khentkawes Town operations. View to the north. (Photo by Mark Lehner.)

continuation to the east of the northern town wall, and a thick wall, with entrances, running parallel to and forming a corridor with the bedrock ledge, confirmation that this was a large mudbrick building, which Hassan's team had partially seen, but never excavated. Founded on a lower bedrock terrace, this could be a valley temple for Khentkawes.

We next had to ask, how did people reach the causeway threshold, 2 meters higher than the base of the lower building? Embedded in the ruined mass of mudbrick, we discerned a ramp on which people ascended from the south, along the face of the bedrock ledge.

Ramping Up Between Two Towns

Yet another monumental ramp came to light in our clearing between the Khentkawes Town and the Menkaure Valley Temple. Reisner's excavation of the Menkaure Valley was a virtual island in a sea of sand. Hassan's forces excavated south of the Khentkawes Town at the front of the Menkaure Valley Temple, but his map left a blank space in the area between the two towns.

Filling this space we found another ramp, much broader than the one east of the Khentkawes Town, and ascending from east to west. The core of massive limestone debris is similar to the cores of 4th Dynasty construction ramps elsewhere at Giza, prompting us to wonder if this was originally a building ramp for delivering materials from the east. When construction stopped on Menkaure's pyramid complex, the ramp served as a roadway to the town and temple, and to the necropolis higher on the plateau. Glen Dash's 2006 radar survey shows that the ramp continues as a broad roadway to the west along the northern temple wall.

During 2008 at the northern end of the Ante-town, we partially excavated the vestibule opening north onto the top of the ramp. This was the vestibule for the second phase of the Menkaure Valley Temple, after the Ante-town closed off the first vestibule inside the original eastern temple entrance. People who occupied the vestibule sunk pots in the floor, which they re-plastered numerous times. They successively augmented the interior walls, adding an additional 1.69 meters (over 5 feet), perhaps because they had removed the four columns that once supported the roof, leaving only the beautifully formed alabaster bases. By thickening the walls they narrowed the interior space that the roof beams had to span.

Egyptologists have thought that the Khentkawes and Menkaure Valley Temple settlements were "sacred towns;" that is, maintained and occupied for liturgical reasons. Given the monumentality of the ramps up into these complexes, and their location in front and left of the northern exit from the gate in the Wall of the Crow, and at the low southeastern access on the southern edge of the mouth of the wadi, it is possible that the two temple towns may have functioned as gateways to the necropolis. They may have controlled access up into the Plateau for generations of Egyptians who continued to make monumental tombs and receive burial in the great Giza Necropolis, long after the Lost City, the "company town," went out of business.

Future Explorations

In 2009 we will continue to investigate the Khentkawes Town and Menkaure Valley Temple. We will excavate the lower building on the east and clear and record more houses along the Khentkawes causeway. At the Menkaure Valley temple we will explore the course of the monumental ramp westward and the area between the two settlements.

This article is a brief overview of the work and insights of Mark Lehner, Mohsen Kamel, Lisa Yeomans, Pieter Collet, Amelia Fairman, Daniel Jones, and the teams they have supervised during three seasons in the Khentkawes Town. The remote sensing work was conducted by Glen Dash and his team.

AERA Field Notes

On a chilly morning in February 2008, ULI Governors watch excavators working in a trench on their tour of the Salvage Archaeology Field School site in Luxor. (Photo by Jason Quinlan.)

ULI Group Rallies to Support AERA's Research

A group of 25 members of the Urban Land Institute Governors have together donated $75,000 to AERA, given in honor of Bruce and Carolyn Ludwig.

A long-time AERA board member and friend, Bruce has been a fervent supporter ever since first meeting Mark Lehner. In 1985, on the recommendation of Kent Weeks, Bruce caught up with Mark mapping at the base of the Khafre Pyramid. The Giza Plateau Mapping Project was a modest operation with few resources and a meager budget. But Mark had ambitious goals—a database and computer model of the Giza Plateau, a long term excavation at the workers' settlement that supported pyramid building (which he had yet to locate). No sooner had Mark finished listing his goals than Bruce pulled out his checkbook and wrote a check. Ever since that first meeting, Bruce has continued to write checks and serve as an unofficial development officer, connecting Mark to other potential donors interested in his work. (For a profile of Bruce Ludwig, see AERAGRAM 3/2, 1999. Download at our website: http://www.aeraweb.org/aeragram.asp).

The Urban Land Institute, a non-profit organization founded in 1936, represents land use and real estate development disciplines in the private and public sectors. The ULI Governors group and Bruce and Carolyn toured Egypt in February with a stop at AERA's Salvage Archaeology Field School in Luxor. Divided into small groups, the attendees sat in briefly on Field School classes, observed archaeologists excavating, and spoke with our specialists in osteology, plants, and ceramics.

"Carolyn and I were thrilled when we were told on the last evening of our trip," Bruce Ludwig said. "We have been supporters of AERA for a long time, so we were very pleased to learn that our colleagues were impressed with AERA's work, especially the Field School and its mission to help protect Egypt's archaeological treasures. We are very grateful for their interest, support, and generosity." The ULI Governors' group donation will work with a match challenge placed by the Waitt Foundation to help us establish a permanent campus in Giza to serve as a home for the Field School and to support AERA's ongoing archaeological research.

Please Join Us for

A Holiday Open House

with Dr. Mark Lehner and members of the AERA Team

December 4, 2008, at 6 pm
Cocktails and light hors d'oeuvres

Ancient Egypt Research Associates
26 Lincoln Street, Second floor
Boston, MA 02135

RSVP to Jim Schnare
617-783-0737 ✦ jschnare@aeraweb.org

Save the Date! Join Our 20th Anniversary Celebration!

We are celebrating the 20th anniversary of our Giza excavation!

Special events on March 14–15, 2009:

- ✦ Lectures
- ✦ Tours of the site and the AERA Field Lab
- ✦ Invitation-only reception
- ✦ Other festivities

Please help us mark this important occasion by joining us in Giza next March. Contact Cindy Sebrell at csebrell@aeraweb.org for more information.

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Your Contributions Are Making a Difference in Egypt Today

The Field School class of 2009 is preparing for an intense certification program scheduled to begin in February. The Field School is funded in part by a grant from USAID. Additional funding is provided through the generosity of AERA's individual donors, benefactors, and members.

This year's student body of just 35 was selected from more than 180 applicants. Each prospective candidate was personally interviewed over a two-day period by the AERA Interview Committee. The selection process included a scoring system based on knowledge of the English language, professionalism, determination to advance archaeology, and experience in site work. The committee also assessed each candidate's ability to function in a fast-moving, motivated archaeological team.

"There were many superb candidates and it was difficult to narrow it down to 35," said Mohsen Kamel, AERA's Co-Field Director and a member of the Interview Committee. "But we are very pleased with the quality of the students this year and we feel it will be a very successful session."

This year marks AERA's fifth Field School session. This unique program provides Egyptian Supreme Council of Antiquities (SCA) archaeologists with the skills they need to carry out and monitor archaeological work throughout Egypt according to internationally accepted scientific methods. With well-trained SCA archaeologists in the field, Egypt's rich and vast archaeological heritage is protected and properly studied.

In light of recent economic news, the AERA team is working hard not to let this important and unique program lose momentum. Each year AERA's Field School teachers work hard to ensure that every student receives the support they need to successfully complete this rigorous program. Now more than ever your contribution is essential. Your tax-deductible donation goes directly to support the Field School and the archaeological research that makes it possible. Please consider a gift to the Field School today.

Sherif Abd al-Moneem and Mohamed Hatem, proud graduates of the 2005 AERA Field School, after the graduation ceremony.

Yukinori Kawae

Give the Gift of Discovery!

A gift membership to AERA is a great way to celebrate the holiday season this year. Join AERA today and receive a free gift membership for family or friends. Respond by December 15th and we will send you a gift card that you can wrap and present at gift time. Or, if you have another special event coming up and would like to give the gift of discovery, just let us know the date so we can ensure delivery in time.

Gift memberships to AERA not only help introduce a new reader to the world of archaeology and ancient Egyptian culture and history, but it also helps AERA continue its mission to advance and protect the quality of archaeological research while sharing new information about ancient Egypt with the rest of the world.

Your AERA membership and your *free* gift membership will each include:

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Giza: Overviews and Ground Truths

The Giza Plateau Mapping Project (GPMP) started with an analysis of the overall geomorphology (shape of the ground) of the Giza plateau. I wanted to understand the pyramids as a huge architectural landscape project. The landscape holds clues about how the Egyptians organized their forces to build the pyramids. My ideas about their quarries, ramps, delivery areas, and the urban infrastructure that fed and housed the labor force emerged from trekking across this landscape at all hours of the day and night over the years from 1973 until we started excavations in 1988. After I returned to the USA following 13 years of full time residence in Egypt, I walked the plateau less, and less so, too, after we began our intensive excavation seasons. But I still walk the plateau and experience completely new perceptions of the Giza Plateau and its ancient monuments. I find it sobering that understanding a site is learning how to see it, and that I am still learning to see Giza after more than 35 years of interacting with this special place.

The Ikonos Bird's Eye View

In recent years I have been able to virtually re-trek the plateau thanks to a large blow-up of a black and white photo taken by the Ikonos satellite. Ikonos, from the Greek eikōn for "image," is a commercial earth observation satellite launched September 24, 1999. Ikonos photographed the Giza Pyramids Plateau at a one-meter resolution (AERAGRAM 5/1:4, 2001) on November 17, 1999, a few weeks after we started our Millennium Project to clear and map the ruins of the Lost City. I had a copy of the image, 35 inches square (courtesy of Peter der Maneulian), dry-mounted and secured to the slanted ceiling of my attic home office. A glance up from my keyboard and I am looking straight down onto the pyramids, tombs, and temples of Giza. I sometimes ponder this aerial perspective and combine it with ground truth impressions derived from years of physically trekking the landscape.

With this issue of AERAGRAM I launch a new column on my observations. I start with ponderings about the location of the Khentkawes monument to accompany the report on our 2008 field season at the Khentkawes Town (page 8). ~ *Mark Lehner*

Khentkawes and the Great Circle of Quarrying

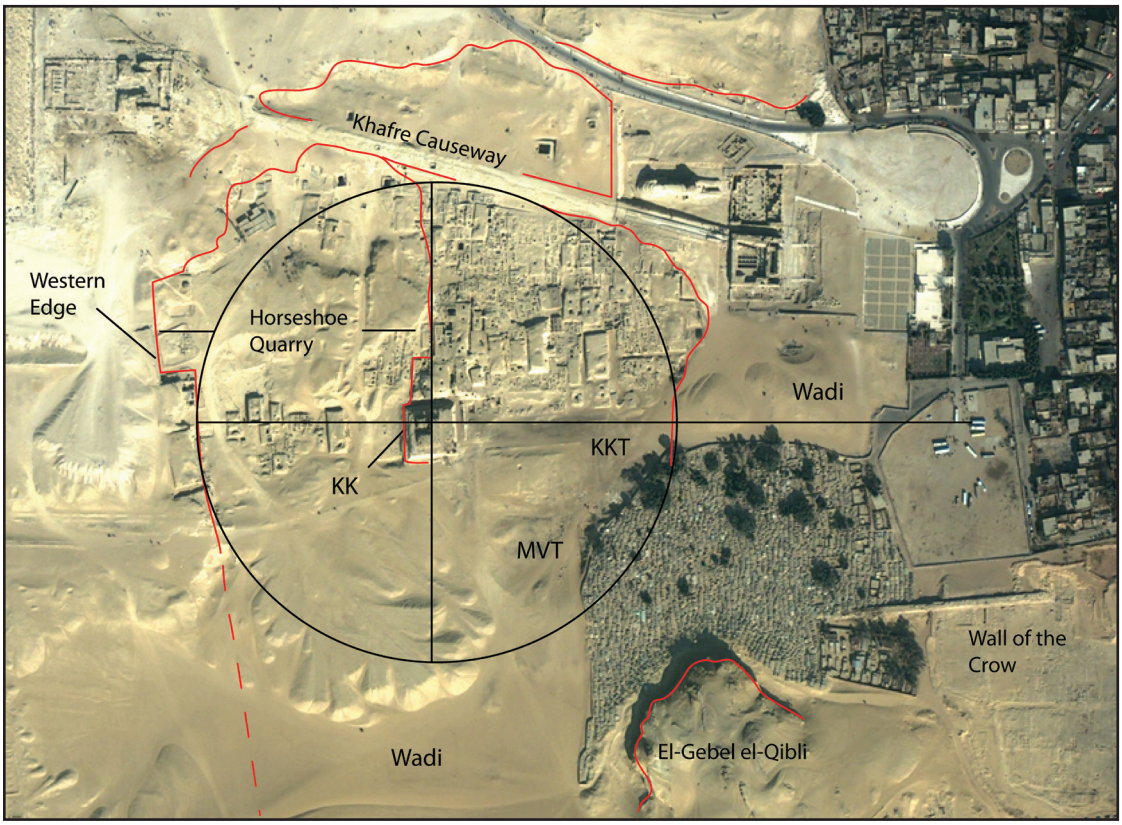
It appears to me that the Khentkawes monument occupies the center of a circle, actually a gigantic gaping hole, that pyramid quarrymen gouged incrementally into the plateau, leaving the bedrock immediately north of Khentkawes as a kind of reference to the original Giza Plateau surface. For the queen's monument, the quarrymen reserved a roughly square block of this unquarried limestone bedrock, 11 meters high, on which workers built a stepped, vaulted mastaba superstructure, rising another 7 meters.

If I line my half-meter ruler along the eastern side of the Great Pyramid of Khufu, it aligns to my left (south) with the Khentkawes monument to the south. The Khentkawes monument is like a great corner post of a horseshoe-shaped quarry within the greater circular depression, and both the eastern (Khentkawes) side and the western side of this quarry align rather neatly with the eastern and western sides of the Great Pyramid. Located 300 to 600 meters south of the Pyramid, the volume of missing stone is close to that of the pyramid (Lehner 1985:121). We might infer that this is the "hole" corresponding to the "pile" of the Great Pyramid.

A Tour of the Great Circle of Quarrying

Let us scribe a true circle, with the Khentkawes monument as its center, and the distance to the Khafre causeway (200 meters) as its radius, so about 400 meters diameter. The circumference corresponds with the Khafre causeway, approximates the line of the western quarry cliff, and roughly corresponds with the limit of the bedrock exposure east of the Khentkawes monument. The scribed circle shows that the western cliff and the Khafre causeway are about equidistant from the Khentkawes monument. If we quarter the circle by extending the center axes of the Khentkawes monument, we see that the lesser-worked part of the quarry fits nicely within the northeastern quarter.

The western side of the horseshoe quarry within the larger circular area is the human-made 10-meter-tall cliff, studded with dark tombs hollowed out of bedrock, the earliest belonging to some of the children of Khafre. The farthest western edge of the quarry is about 200 meters due west of the Khentkawes monument. The horseshoe-shaped quarry broadens out to the north to just over 230 meters—about the width of the Khufu Pyramid, to which it aligns! This western rock-cut edge curves around toward the east-northeast to meet the Khafre causeway. Khafre's workers founded his causeway on a linear ramp reserved in the bedrock. We could take this ramp as the northern edge of the greater circle; indeed, the causeway is just about 200 meters north of the Khentkawes monument, just as the western edge is about 200 meters west of the monument. The greater circle of quarrying brushes the Khafre causeway tangentially and then curves toward the southeast just behind the Khafre Valley Temple. On a southwest–northeast diagonal, the quarry and later Old Kingdom rock-cut tombs extend about 224 meters from the Khentkawes monument. On a direct line due east of the monument, the bedrock quarry exposure disappears under sand along a line 175 to 195 meters from the monument.



The Quarry Circle superimposed on an excerpt from a Quickbird Satellite Sensor Image of the Giza Pyramids Plateau, taken in February 2002. Copyright 2007 Digital Globe. MVT is the Menkaure Valley Temple; KK is the Khentkawes monument; and KKT is the Khentkawes Town.

The bedrock in the southern part of the great circle of quarrying is buried under an immensely thick blanket of sand that fills the central wadi between the Moqattam and Maadi Formation outcrops at Giza. The southern knoll, the Qebel el-Qibli, of the Maadi Formation, located 273 meters due southeast of the Khentkawes monument, gives a sense of a border to the greater quarry area.

Counterclockwise Quarry? What Does It Mean?

It is possible that the 4th Dynasty Egyptians exploited the great circle of quarrying counterclockwise. Khufu's forces may have begun in the northwestern quarter, the closest to his pyramid. As they quarried deeper, they extended farther south, into the southwestern quarter, forming the southern end of the horseshoe shape. Khafre's quarrymen may have quarried bedrock farther south yet, and then east into the southeastern quarter. The Menkaure Valley Temple and Khentkawes Town fit rather neatly into the southeastern quarter. We know from our work in the Khentkawes Town that its builders founded the settlement on a quarry plane, the top of one of the natural limestone beds, which they exposed by stripping off the higher layers for building material, perhaps carrying on from Khafre's reign. At the end of major quarry works, they had isolated great rectangular blocks of bedrock in the northeastern quarter where they had not worked the bedrock down nearly as deeply as in the other three quadrants of the quarry circle. These bedrock blocks stand tall along the northern side of the Khentkawes Town where people used them for rock cut tombs in the 5th and 6th Dynasties.

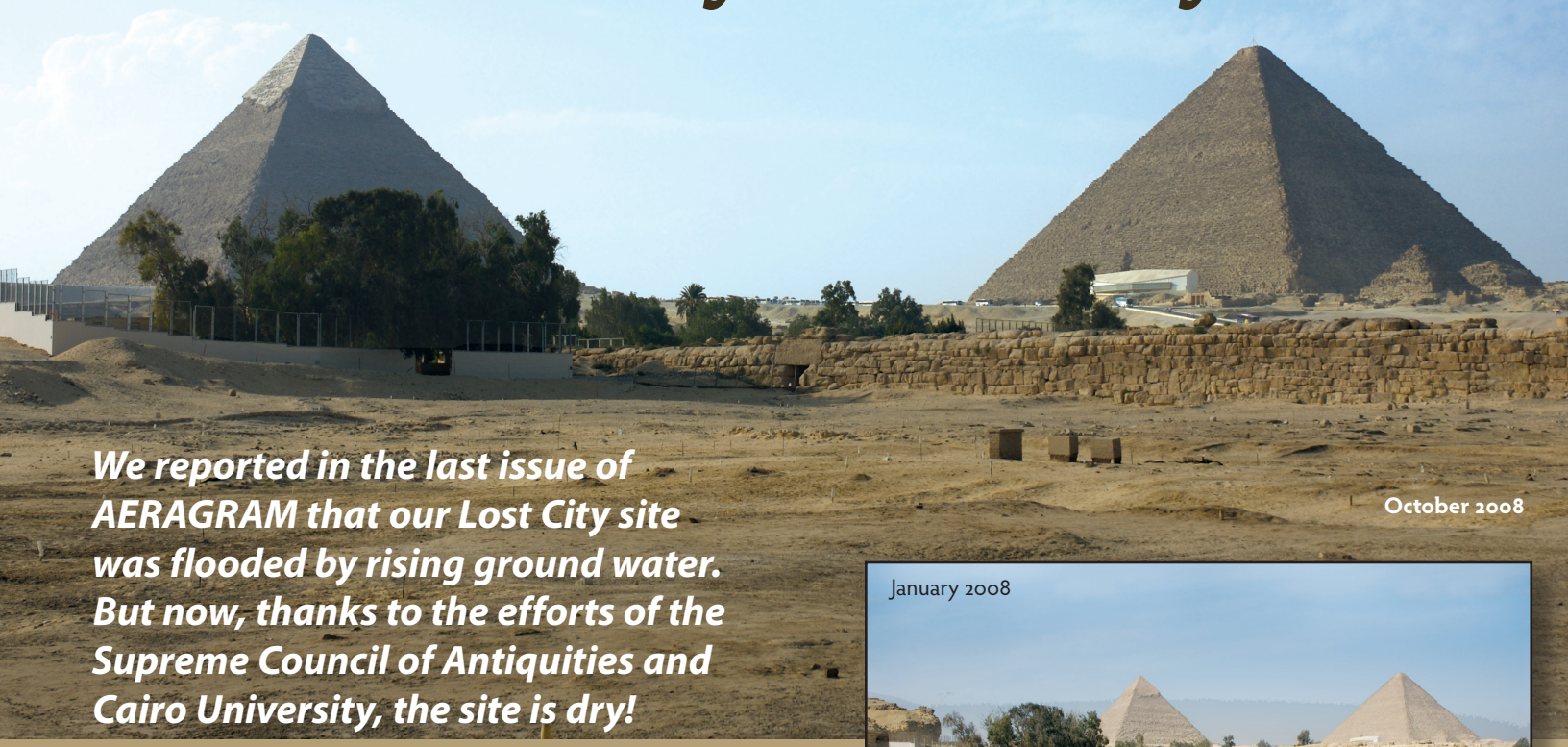
We certainly would be wrong to think the 4th Dynasty surveyors and quarrymen intended to create such a neat and perfect circle, but it seems they did approximate a center to their greater quarry area. They reserved much of the original height of the plateau immediately around this center point. They cut a deep and yawning corridor to separate off a squarish pedestal as a base of Khentkawes' tomb. They leveled and lowered the top of that pedestal to build upon it the stepped and slightly vaulted mastaba for the queen. The quarrymen never cut down the irregular block of bedrock north of the separating corridor. Why did they reserve the original plateau surface at this point? This may have been a result of quarrying by quadrant: they never got around to working the northeastern quadrant deeply, so they left its corner standing tall. But the fact that the Khentkawes monument pedestal juts forward from the corner, as it occupies the center of the greater quarry circle, suggests that they reserved this patch of bedrock as some kind of benchmark. We might guess the purpose was to calculate volume of stone or to monitor work.

How appropriate that at the end of the 4th Dynasty of pyramid building kings, the benchmark at the center of the great quarry circle entombed a queen named Khentkawes. Her name could mean, "may her life force predominate" (James Allen, personal communication 2008), from the term *khent*, "in front" or "predominant," and the plural of *ka*, generic life force transmitted through generations. A parent could say of a child, "my *ka* repeats itself." The Egyptians said of burial in the necropolis, "the *kas* of your ancestors reach out to you." The Khentkawes monument stands like a sentinel on the eastern front of the gigantic pyramid tombs of her ancestors. Together the Menkaure Valley Temple and Khentkawes monument and town closed off the passage up into the plateau, and dominated the quarries that had served to build the pyramids.

Reference

Lehner, Mark. 1985. The Development of the Giza Necropolis: The Khufu Project. *Mitteilungen des Deutschen Archäologischen Instituts, Abteilung Kairo* 41:109–143.

Lost City Site, Dry!



October 2008

We reported in the last issue of AERAGRAM that our Lost City site was flooded by rising ground water. But now, thanks to the efforts of the Supreme Council of Antiquities and Cairo University, the site is dry!

January 2008

Like the Lost City, the Sphinx and nearby temples have been threatened by rising ground water. In an effort to lower the water table, the Supreme Council of Antiquities began a test program to pump the water away. Since late June, Dr. Hafiz Abd el-Azim Ahmed, from the Engineering Center for Archaeology and Environment, and Dr. Reda M. el-Damak, from the Center of Studies and Designs for Water Projects, both of Cairo University, have been working with Dr. Zahi Hawass, Chairman of the Supreme Council of Antiquities, to test three pump sites. They set up a pump in front of the Sphinx and Khafre Valley Temple, another in the Sound and Light Show building complex, and the third in the slope east of the Khentkawes Town. Operating continuously, the pumps drew water from the wells, about three meters deep, a level roughly commensurate with the inundation of our site.

January 2008

Pumping over two or three months seems to have worked wonders. The water is now gone from the low area around the Sphinx, the target for Drs. Reda and Hafiz. And gone too are all the puddles and ponds across the Lost City.

Drs. Hafiz and Reda suggested setting up two or three wells at the north and south ends of our site. With a diameter of about one foot, these wells are not intrusive. Mohsen Kamel, AERA Co-Field Director, and I gladly accepted and encouraged the efforts of the Cairo University team, and conveyed our support to Dr. Zahi Hawass, hoping for an even drier site by the time we resume excavations in January 2009. ~ *Mark Lehner*

All photos by Mark Lehner.

October 2008

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