AERA

Annual Report

Ancient Egypt Research Associates

2007–2008 Report

AERA

Contents

Ancient Egypt Research Associates, Inc.
26 Lincoln Street, Suite 5
Boston, MA 02135-2608
USA

E-mail: information@aeraweb.org
Website: http://www.aeraweb.org

Ancient Egypt Research Associates is a 501(c)(3), tax-exempt, non-profit organization dedicated to research on ancient Egypt.

Cover photo: Our Khentkawes Town (KKT) excavations (see page 8) at Giza. Kasia Olchowska maps the ramp in area KKT-E (see page 14). Her north–south datum measuring tape crosses the line of the outer wall of the ramp, of which traces show on the lower right. View to the north.

Mark Lehner

A Message from Mark Lehner

AERA saw such dramatic growth during 2007–2008 that we are still coming to terms with a huge harvest of discoveries and achievements. As I write—only weeks after the last of our very exhausting, but fulfilling, activities (the Saqqara Laser Scanning Survey in mid-June)—I am amazed and deeply gratified that AERA comes into our new operating year in sound financial and organizational health.

Accomplishments

We come into 2008–2009 after many accomplishments over the previous year:

- **Salvage Archaeology Field School:** Field Directors Mohsen Kamel and Ana Tavares ran major projects on two fronts, in both Upper and Lower Egypt. In Luxor they launched and fielded the Salvage Archaeology Field School (SAFS) between January and March, with up to 150 archaeologists, students, workers, and support staff.
- **KKT Excavations and Survey:** Ana and Mohsen also set up and directed two months (March–April) of excavation and mapping at the Khentkawes Town (KKT) in Giza. This season I was delighted to work, for the first time in many years, as a regular archaeologist in Area KKT-E. Here we began to explore a large mudbrick building, previously unrecorded, lying on a lower terrace below the L-shaped KKT. This is very possibly the valley temple attached to the Khentkawes Town by the long causeway running the length of the "leg" of the town.
- **Lost City Site Conservation:** Ana and Mohsen also directed the Giza team of workers in conservation measures for our main HeG (Heit el-Ghurob, "Wall of the Crow") site, aka Lost City of the Pyramids, after the groundwater rose so tragically that it formed small lakes and pools across the site.
- **Archaeological Science Program:** Dr. Mary Anne Murray launched and directed our Archaeological Science program, a major three-month (March–May) workshop in our Giza Field Laboratory (GFL), where 37 specialists in ceramics, botany, zoology, lithics, and artifacts analyzed cultural remains, collected over 20 years of excavation, that yield insights into the daily lives of the pyramid builders of 4,500 years ago.
- **Report Writing Tutorial for Supreme Council of Antiquities (SCA) Inspectors:** In May and June, Ana and Mohsen established the Report Writing Tutorial for senior Egyptian supervisors of the SAFS. The objective of this was to have these advanced field school students prepare the report of the SAFS excavations for publication as a special supplement to the official archaeological journal of the SCA.
- **Saqqara Laser Scanning Survey**: Giza Laser Scanning Project Director Yukinori Kawae organized and fielded the Saqqara Laser Scanning Survey (SLSS) and a Japanese team that "captured" the entire Step Pyramid of Djoser in three dimensions.
- **Fiscal Year:** Beginning in 2007 we changed our fiscal year from the calendar year to July 1–June 30 to better fit with the cycle of our January to June fieldwork in Egypt.
- **Management Restructuring:** We reorganized AERA management to include Dr. Richard Redding as Chief Research Officer and John Nolan as Chief Financial Officer. Richard and

Archivist Mari Rygh examines a field drawing in a portfolio stored in the map cabinets, shown on the right, in our Boston archive. Mari spent July–August 2008 in Boston organizing the archives.

John report to me. Their work frees me for AERA development and to work more with the publication of our rich archive of material excavated at Giza over 20 years, as well as my own research going back 30 years to my unpublished survey of the Great Sphinx.

- **Communications and Advancement:** Cindy Sebrell joined AERA as Director of Advancement, overseeing AERA's communications and growth, and working toward sustaining AERA for the future. This spring she launched a major capital campaign, Legacy: 2012, aimed at supporting our team and ensuring the continuing high quality of our ongoing, year-round research. Cindy's second major initiative is a new AERA membership program, which will provide financial support for our programs and connect members with a community around the globe who support and follow research in Egypt.
- **Capital Campaign:** By the end of 2007, thanks to extraordinary gifts from Ted Waitt, Ann Lurie, Peter Norton, and Charles Simonyi's Fund for Arts and Sciences, we realized our goal of $1.8 million to purchase property in Giza for building our own facilities.

The AERA Team and Boston Office

These accomplishments are only possible thanks to AERA's incredibly dedicated team. The senior management team now includes Dr. Richard Redding who donates his time as Chief Research Officer, and eight full-time salaried members: myself as Director; John Nolan, Associate Director and Chief Financial Officer; Mary Anne Murray, Director of Archaeological Science; Mohsen Kamel and Ana Tavares, Field Directors and Directors of the AERA Field Schools; Wilma Wetterstrom, Science Editor; Erin Nell, Business Manager; and Cindy Sebrell, Director of Advancement.

The Boston AERA office has grown into three suites with a total of five large rooms at 26 Lincoln Street, a 100-year old brick building refurbished three years ago to modern standards. AERA shares one of these suites with the Dash Foundation for Archaeological Research thanks to AERA Board Member Glen Dash. Our Boston facilities, just off the Mass Pike (Interstate 90), include a reception, Director's office, study, meeting room, and a large back room for our archives.

Our Annual Transition and AERA's Future

Thanks to you, our benefactors, we transition from one fiscal and operating year to the next in good health. Thanks to your support, AERA has grown into an important institution making major substantive contributions to Egyptian archaeology through our survey, excavation, and archaeological science programs, as well as the educational and cultural contributions of our field school programs. As we move into 2008–2009, we still count on your participation for carrying out our mission for the year now unfolding, and for securing AERA's legacy for many years into the future.

Mark Lehner

AERA in Luxor:
The Salvage Archaeology Field School

The AERA Salvage Archaeology Field School in full swing at the site of the former Khaled Ibn El-Waleed Garden in Luxor. View to the south.

The Salvage Archaeology Field School (SAFS) was our biggest challenge in fiscal year 2007–2008. We like to say the Beginners and Advanced Field School sessions that we embed within our controlled excavations at Giza are like training students in first aid, then sending them back as medics to archaeological battle zones. With the SAFS, AERA took this kind of training into one major battle zone: modern Luxor.

We carried out the SAFS with the American Research Center in Egypt (ARCE) and Egypt's Supreme Council of Antiquities (SCA) in order to both train SCA archaeologists in the real-world tension between urban development and archaeology, and to work with them to save as much archaeological information as possible.

Rising to the Call in Luxor!

AERA fielded the SAFS in response to an urgent call from ARCE Director Dr. Gerry Scott, the USAID team in Cairo, and Dr. Zahi Hawass, Chairman of the SCA. Since we received the go-ahead from ARCE for USAID funding only in late June, we needed quick and effective preparations through the first part of our fiscal year (July–December 2007). Mohsen Kamel and Ana Tavares, Co-Field School Directors, launched the SAFS on January 5, 2008. The program ran for three full months, one month longer than the Giza field schools, ending on March 27.

Mohsen and Ana directed up to as many as 150 people, including students, workers, archaeologists, and support staff at the site of the former Khaled Ibn El-Waleed Garden (KIW), a few hundred meters northeast of the famous Luxor Temple. The rescue excavations were a response to rapid urban development, implemented by the Governor of Luxor, along the Avenue of the Sphinxes. That plan has been implemented further down the line of the ancient avenue, but the SCA obtained an agreement that the KIW site—so close to the original, ancient Luxor town mound—would be excavated slowly and systematically, and used as an archaeological training site. Eventually it will be taken into the protected area that surrounds the Luxor Temple.

Built by one of the last native Egyptian rulers, Nectanebo I, around 380 BCE, the Sphinx Avenue ran for nearly 3 kilometers (almost 2 miles) between Luxor and Karnak Temples, lined with sandstone sphinxes every 5 meters (about 16.5 feet), and interspersed by trees in brick-lined pits.

In the SAFS we trained 25 inspectors from Luxor and surrounding communities in basic archaeological field techniques and recording methods, with an emphasis on rescue or salvage archaeology. We chose the students on the basis of interviews and consultation with the SCA administrators. ARCE funded the SAFS with USAID grant funds for their Egyptian Antiquities Conservation Grant (No. 263-A-00-04-00018-00), directed by Michael Jones. AERA co-funded the SAFS with a major cost-share.

Team Structure

Mohsen and Ana designed and directed the SAFS under the overall supervision of Dr. Mark Lehner, with the support of Dr. Zahi Hawass, Chairman of the SCA, and Mansour Boraik, SCA Director of Luxor.

Mohsen, Ana, and Dr. Mary Anne Murray, AERA Director for Archaeological Science, recruited a team of professional archaeologists and specialists. They divided the work force into five groups of nine to ten people consisting of one professional archaeologist (foreign or Egyptian) who focused on

Egyptian SAFS Supervisor and Ceramicist Mohamed Aly Abd el-Hakiem Ismail draws pottery on site.

Hassan Ramadan (left) and Mohamed Naguib Reda Abd el-Kader practice drawing burials with a plastic skeleton.

rescue excavation, one professional archaeologist who focused on teaching, two SCA Supervisors who had graduated from the AERA Beginners and Advanced Field Schools, and five trainees. Each group undertook one of the major operations in the KIW site. Senior AERA team members and specialists joined the SAFS staff to teach sampling and analysis of material culture.

An Intense Program and Schedule

Each day started at 7:00 am with a meeting on-site for teaching staff and archaeologists to exchange information and plans for site work and afternoon lectures. On-site practice and tutorials in the basic techniques of archaeological excavation and recording continued until 1:30 pm when we broke for lunch. The afternoons were spent on site-recording, paperwork, and tutorials.

At the end of the day, Saturday to Tuesday, students and teachers attended a lecture on topics such as archaeological recording, databases, osteology, and archaeozoology. Each Saturday an exam quizzed students on all topics covered in lectures and in the field during the previous week.

We conducted weekly practical checks on site, to make sure that students made steady progress in site drawing and recording, laying out survey grids, composing stratigraphic matrices (standard charts of temporal relationships), and site photography.

Every Wednesday afternoon students from each group presented to the rest of the field school their work and a synopsis of what they had learned during the previous week. Every Thursday each group submitted a written progress report.

Analyzing Ancient Culture

We included a one-week course that we teach in the Beginners Field School at Giza introducing laboratory analysis of various classes of material culture. It covered both sampling during excavation and practical work in the laboratory. We introduced archaeological drawing (Will Schenck), ceramics recording and analysis (Dr. Teodozja Rzeuska), archaeobotany (Dr. Mary Anne Murray), archaeozoology (Dr. Richard Redding), and conservation (Lamia el-Hadidi).

As part of on-site training, Ana Tavares and Giza Field School graduate Mohammed Abd el-Basit taught survey and mapping. AERA team member Jessica Kaiser and Giza Field School

Field school groups excavate sondages (test pits) along the Avenue of the Sphinxes. The bases of the sphinxes, all that remain of these monuments, line up along the avenue, interspersed by the circular tree pits.

Lamia el-Hadidi teaches conservation in a lab set up in a tent on site.

SAFS students write in their daily diaries. At the end of the week they compile these into a weekly report.

graduate Ahmed Gabr taught osteo-archaeology. Students were able to do additional work on a subject that especially interested them for one and a half weeks.

Archiving for the Future

The SAFS was distinct from our previous field schools in that the students and supervisors were fully responsible for all aspects of the archive and for different stages of report writing:

- Photographic archive: On a rotating basis, Egyptian supervisors downloaded, logged, and archived photographs.
- Written and graphic archive: Students and Egyptian supervisors did data entry and archived written and graphic records.
- Survey data: The student surveyors downloaded, processed, and plotted all survey data. They assembled the archive and prepared illustrations for the end of season reports.

Building upon the Weekly Reports and the Interim Area Reports each group prepared a Data Structure Report (DSR), which is a thorough documentation of the excavation and the background of the site.

Workshops and Seminars

The students participated in workshops and seminars on a diverse range of topics. They visited the libraries of the Epigraphic Survey of the University of Chicago and the Franco Egyptian Center at Karnak (CFEEK) to look at published and archival sources relevant to the KIW site. They learned to conduct desktop assessments: an evaluation of a site before, or without, excavation. They participated in group exercises in constructing matrices of the site stratigraphy. They learned about archaeological databases.

Highlights & Notable Achievements

Several highlights of the SAFS speak to the success of our Beginners and Advanced Field Schools at Giza and indicate the effect our teaching is having within Egyptian archaeology.

- Our teaching was much more effective with SCA Supervisors who are graduates of the Giza Field School. They taught in both English and Arabic and excavated to a high standard. As a result we completed far more excavation and recording than in the basic field school excavations at Giza.
- The distinction between foreign and Egyptian teachers and team members is now blurred, with experienced foreign archaeologists working side by side with SCA teachers.
- The message that we "excavate for information, not for things" was clearly understood during this field school.

After excavations closed on March 11th, we trained students in post-excavation analysis and technical report writing. On March 27th, we held the SAFS graduation ceremony at the SCA Mummification Museum.

Getting into Print

AERA continued to support the SAFS well after graduation by helping with a publication on the excavation. One of the major deficiencies in Egyptian archaeology is the lack of published reports on salvage and rescue excavations that inspectors are compelled to do throughout the country. To address this need, and with the view that the success and value of the SAFS would truly be conveyed if the work of this session were published, AERA organized and funded a tutorial for the senior SCA Supervisors of the SAFS. The aim was to produce a report for publication as a special supplement of the *Annales du Service des Antiquités de l'Égypte*, the official journal of the SCA .

We expect this publication, under the authorship of the SCA Supervisors—all graduates of the AERA field schools—will equal some of the best archaeological work and reporting by foreign missions now working in Egypt. It will testify not only to the effectiveness of the AERA field schools, but to the cooperation between AERA and SCA inspectors in making substantive contributions to Egyptian archaeology.

Resurrecting the Khentkawes Town: Giza Field Season 2008

The Tomb of Queen Khentkawes stands in the center of the photo. Behind are the Pyramids of Khufu (right), Khafre (center), and Menkaure (left). The Khentkawes Town (KKT) extends east (right) of the queen's tomb. The modern Muslim cemetery fills the foreground. View to the north.

All the while we were excavating the Lost City of the Pyramids, we knew of a neighboring community, roughly contemporary with the final days of our city, about 300 meters (984 feet) to the west. This was the town attached to the tomb of Khentkawes, a queen who ruled at the end of the 4th Dynasty. Our Lost City settlement must be assessed in the context of this town and of an adjacent settlement attached to the Menkaure Valley Temple (MVT).

Realizing the importance of the KKT for understanding our own site, we applied in 2004 for the concession to survey it, but we only began work in 2005 when the site was under threat from the construction of a new road and the high security wall around the Muslim cemetery nearby.

Town First Revealed

Selim Hassan excavated the KKT in 1932 and found an L-shaped mudbrick settlement with modular houses arrayed 150 meters (492 feet) east–west along a causeway leading to the Khentkawes tomb. Hassan produced little more than a map from his work. He did not retrieve and publish pottery and other cultural remains in a way that would inform us as to how long the site was occupied. Egyptologists currently assume the town dates to the late 4th Dynasty.

AERA Discoveries of Earlier Seasons

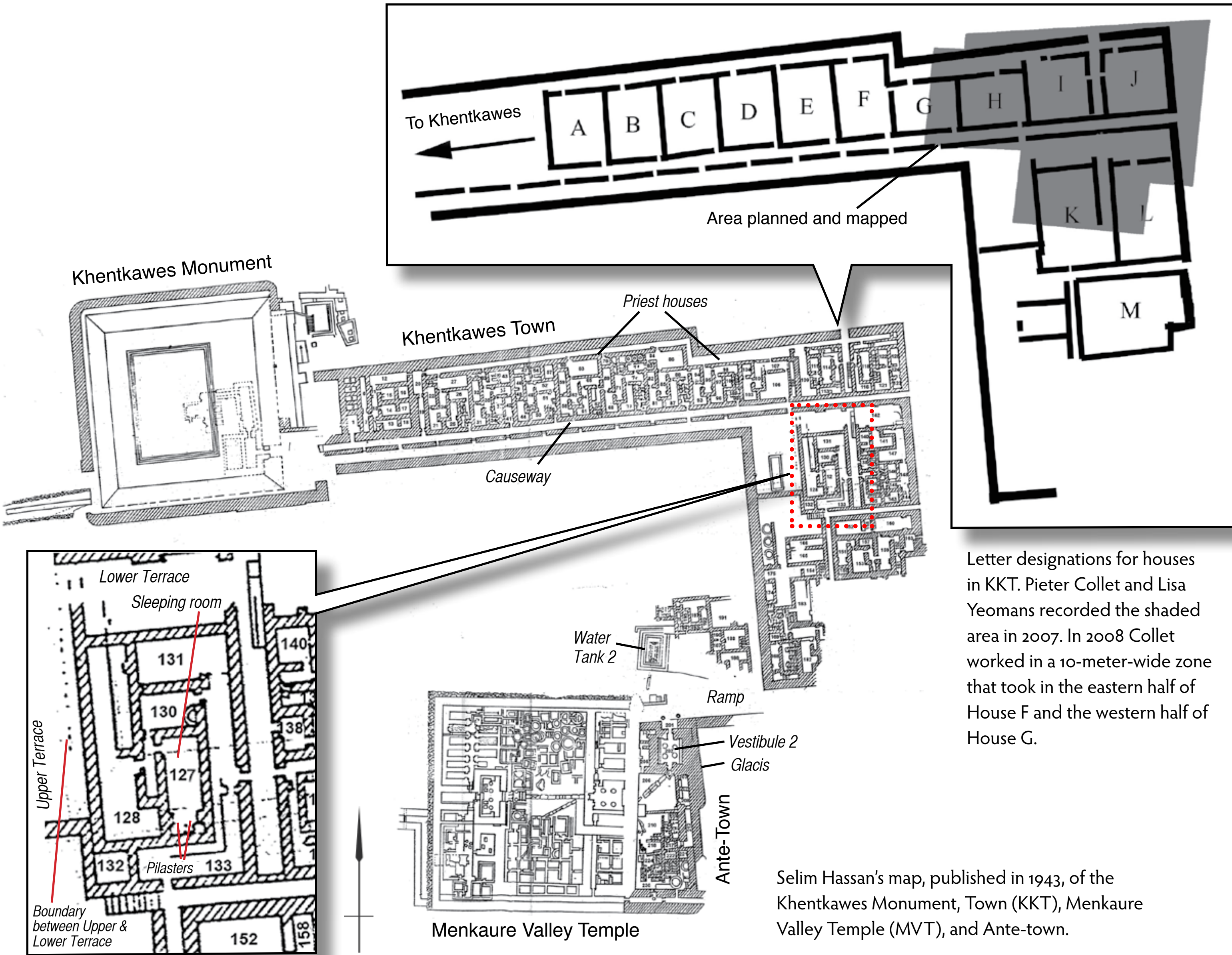
In 2005 Pieter Collet and Mark Lehner found that the builders created the "foot" of the town on two terraces. The upper terrace included a water tank, round granaries, and magazines. Many of the mudbrick walls were eroded down to the last few centimeters or millimeters, or completely scoured away. Hassan's crew found many of the walls waist-high or taller 76 years ago.

In 2007, working at the eastern end of the town, Lisa Yeomans and Pieter Collet found definitive evidence of two phases, despite the severely eroded walls. Most surprisingly, they discovered the remains of a building to the east founded on a lower terrace. This building was not included on Selim Hassan's map. Nor does it show in any archival photographs from Hassan's work, or those of George Reisner, who also worked at Giza during the 1930s.

Goals of Season 2008

We began a 6-week season at KKT (March 1–April 24) with the following goals:

- Study the previously undocumented buried building.
- Continue mapping whatever remained of the leg of the town, westward along the causeway to the queen's tomb.
- Trace the stratigraphic relationships between the south end of the KKT settlement and the MVT and investigate the road leading east between them.



Letter designations for houses in KKT. Pieter Collet and Lisa Yeomans recorded the shaded area in 2007. In 2008 Collet worked in a 10-meter-wide zone that took in the eastern half of House F and the western half of House G.

Selim Hassan's map, published in 1943, of the Khentkawes Monument, Town (KKT), Menkaure Valley Temple (MVT), and Ante-town.

Noha's House

- Complete a geophysical survey of the Menkaure Valley Temple in order to get a geophysical record of what might remain of the temple and surrounding unexcavated structures.

Exploration and Discovery 2008

Mapping Houses in KKT-North (KKT-N)

The KKT consists of one row of large "priest" houses lined along the northern side of the causeway, which leads from the funerary monument to a large building (the valley temple?) on the east. This northern strip has six large houses on the west and four smaller houses on the east. Lisa Yeomans and Pieter Collet recorded the scanty remains of the eastern houses in 2007. During the 2008 season Pieter continued mapping adjacent to this area. In House F he found evidence of at least two phases of use and rebuilding. Houses G and F show characteristic features of Giza houses such as zigzag entrances, secluded rooms with sleeping(?) niches, and long, narrow storage magazines.

Noha's House

On the lower terrace of the foot of KKT, Giza Inspector and 2007 Field School graduate Noha Bolbol recorded what appeared to be a discrete house unit: House K (dubbed "Noha's House), set apart from a larger complex by an open court on the north, a corridor on the south, and a street on the east. Although the house is large—137 square meters (1,475 square feet)—it is much smaller than the largest house that we have identified in our Lost City settlement, House Unit 1 in the Western Town, which is 400 square meters (4,306 square feet).

Although smaller, Noha's House shares some features with House Unit 1, such as a room with a "sleeping" niche. The niche in Room 127 is defined by pilasters, like Room 125 in House Unit 1. Both the niche and the "sleeping room" were smaller than those of Room 125. Were it not for the severe erosion in House K, the niche might have enclosed a bed platform, such as the one in Room 125.

House K and House Unit 1 were also similar in that anyone passed through several turns and doorways to reach the sleeping room. To access Room 127, one passed through a doorway through the eastern wall, turned right into Corridor 133, then left into Room 130, left again into the long, narrow vestibule, and finally left into the sleeping room. In House Unit 1, one had to likewise pass through room after room and make multiple turns before entering Room 125.

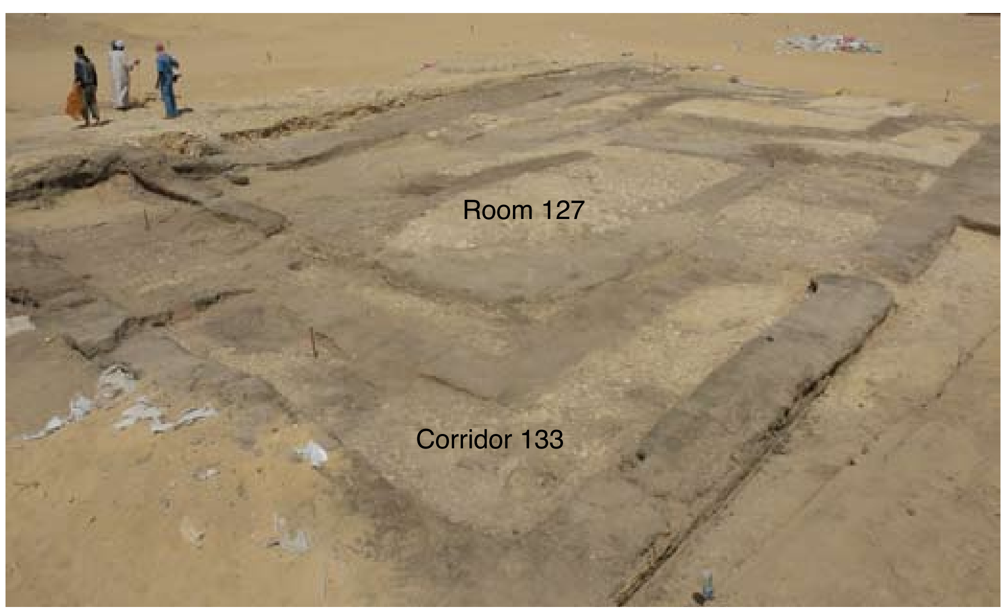
Hassan's excavators found traces of earlier walls suggesting that the core of House K had been nearly leveled and rebuilt during the life of the settlement. The older walls belonged to a general earlier phase of the KKT, which predated the causeway. Traces of House K's western wall continued north across, and under, the remains of the causeway where the wall aligns with the western wall of House I. This suggests that House I and K belonged to a common north–south complex on the east that predated the causeway.

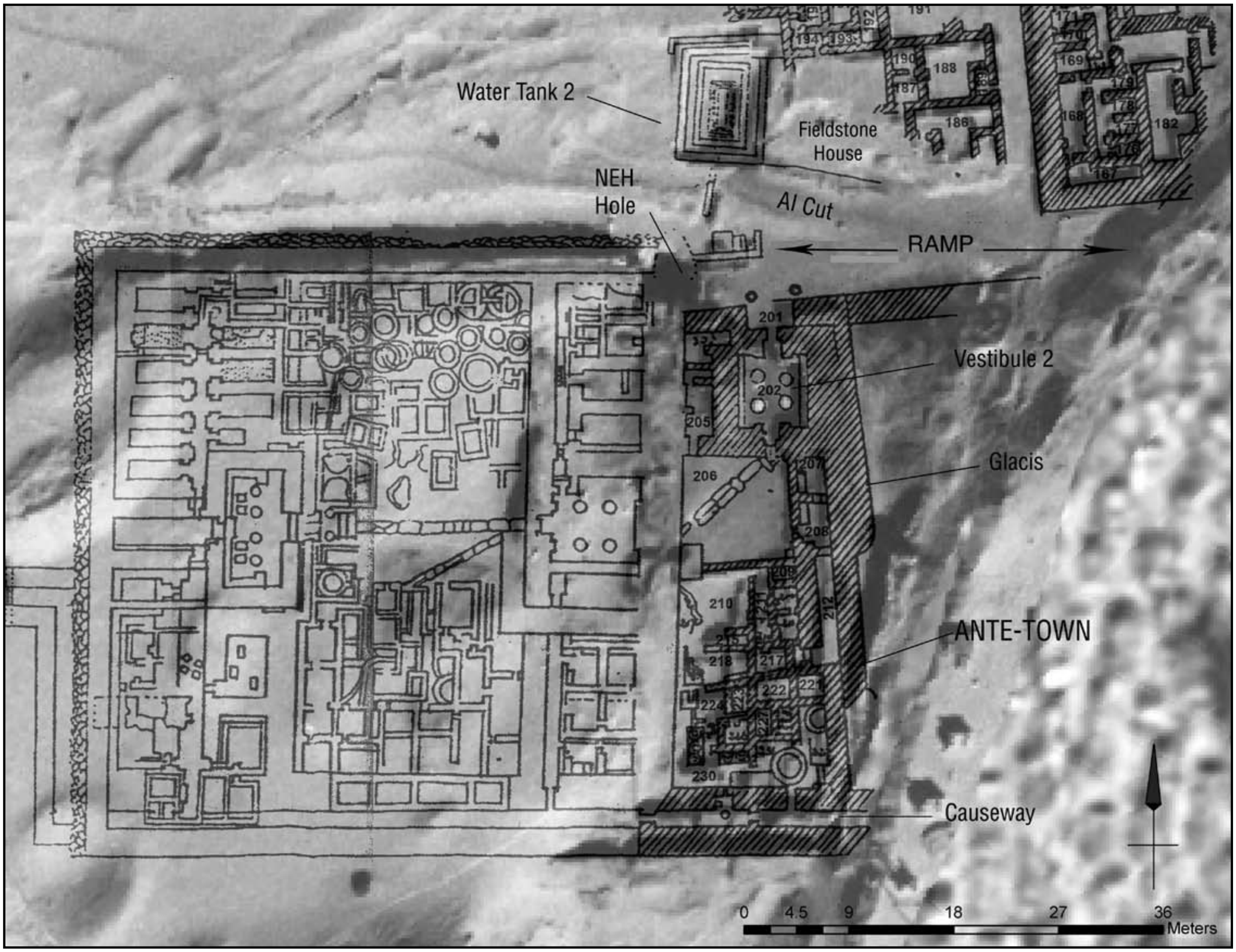
"Dan's Cut": The Terraced Town (KKT-F)

We discovered in 2005 that the builders founded the western part of the foot of the southern town (KKT-F) on a higher terrace of dumped limestone debris. To sort out the sequence of construction here, Daniel Jones excavated two trenches along the large north–south wall that separates the upper and lower terraces. He found that the builders cut into the limestone fill of the upper terrace, and then erected the lower terrace mudbrick walls flush against the vertical cut through the debris. This indicates that the debris existed before the construction of the brick wall. It might be the case that the builders did not create the upper terrace by dumping limestone quarry debris, but rather they cut into an existing debris fill in the area between the east–west leg of the KKT and the MVT. They leveled this fill to create the upper, western terrace, and cut down into it to make the step down to the lower terraces. Dan revealed details of the building sequence of the lower terrace mudbrick wall. To the north it consists of two thick mudbrick faces with a rubble core, while in the south it is entirely built of brick. During the occupation, the residents repaired the wall, which, along with repairs and rebuilds of other structures, suggests that the town was long-lived.

Dan Jones in Trench A along the boundary between the lower terrace (left) and upper terrace (right).

Left: Noha Bolbol excavates in the eastern part of House K, aka "Noha's House." Right: Noha's House cleared. The southeast corner of the core house shows an underlying, older phase projecting into Corridor 133 (foreground). View to the northwest.





Area KKT-AI and MVT from Hassan's 1943 map overlaid onto a geo-referenced Royal Air Force aerial photo.

The KKT-MVT Interface

One of the main aims this season was to make a stratigraphic link between the KKT and the MVT in order to determine how they were related to each other chronologically.

In 1908 Reisner excavated the Valley Temple of Menkaure, recovering magnificent artifacts and statuary. At the time, little was known of the elements that comprised a pyramid complex (which is typically an upper temple, causeway, valley temple, boat pits, and subsidiary pyramids). Reisner, a visionary archaeologist, established that Menkaure had conceived his valley temple on a massive scale comparable to the monolithic valley temple built to the northeast by Khafre. However, the masonry work of large limestone blocks, weighing several tons, stopped with the pharaoh's premature death. Workers under his son and successor, Shepseskaf, finished the project in plastered mudbrick. Reisner investigated two major phases of temple building and of the residential structures that pressed against the façade and invaded the courtyard. In 1932, twenty-two years after Reisner's work here, Selim Hassan extended his excavations of the KKT southward to the front, eastern part of the MVT.

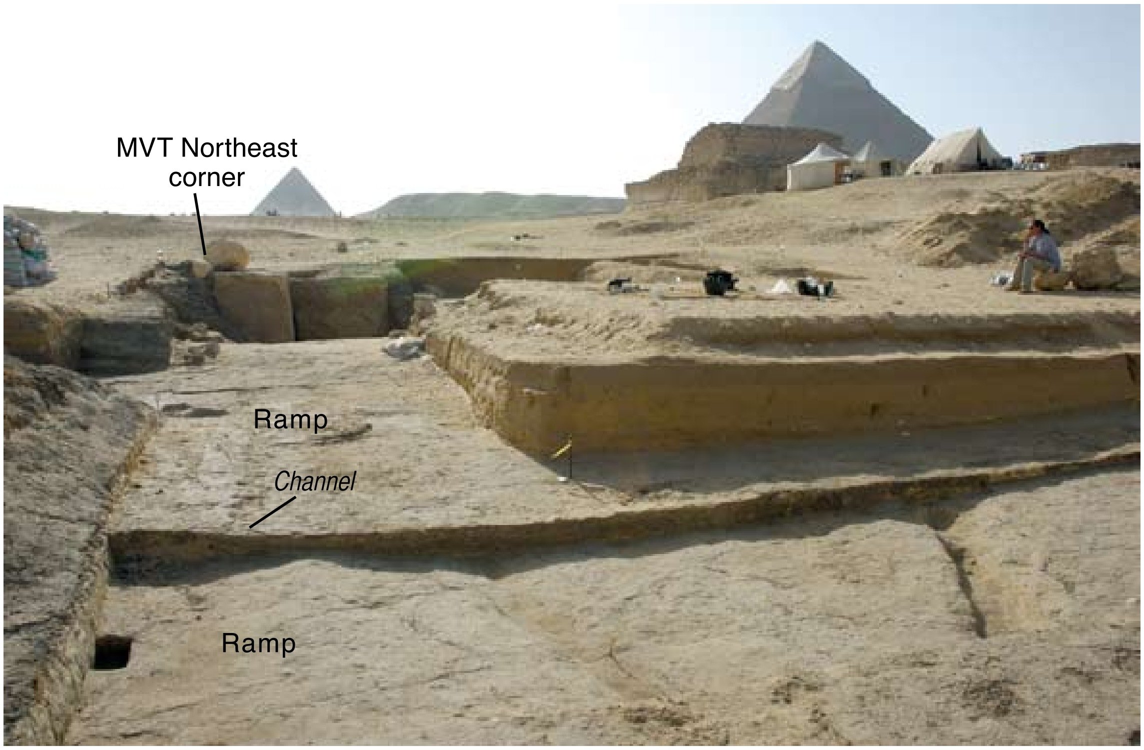
The MVT Ante-town

Hassan found more residential structures, small mudbrick chambers and bins, as well as an open court in front of the MVT, in a thick-walled enclosure we refer to as the Ante-Town (as in "in front of the town"). The doorway through the thick northern wall provided a northern access to a vestibule similar to one just inside the original MVT entrance. When we cleared the face of the eastern wall of the Ante-town in 2005, we found a stout, formidable structure dropping dramatically—3.5 meters (about 10.5 feet) to a much lower level than the vestibule floor, prompting us to dub it "the Glacis." We wonder how one approached and climbed up to the original MVT entrance before the Ante-town was built.

In 2008 Amelia Fairman supervised work in the area from the southern end of the KKT foot to the vestibule in the Ante-town. We called this area KKT-AI, for "Amelia's Interface." Mike House, Kelly Wilcox, and Amanda Watts also worked in KKT-AI.

Right: The Ramp in area KKT-AI with a shallow cross trench excavated by Amelia Fairman and Mike House. The uppermost alluvial silt-paved concave surface shows a faint channel parallel to the southern wall. Two other channels show in the lower surface exposed in the trench. View to the west.

Below: The second vestibule floor quartered with floors that were excavated in diagonal quarters. Amelia Fairman and Mike House excavated through a thick rebuild or accretion of the interior eastern wall. View to the north.



The Ramp

Hassan's map shows both the KKT and the MVT with its Ante-town, but leaves them unconnected, separated by a blank strip. He wrote that access into this area "is gained by means of a broad causeway running westwards from the valley and lying between a thick mudbrick wall attached to the Khentkawes Valley-Temple," by which he meant the vestibule, "and the [southern] girdle wall of the City [KKT]."

In 2005 we exposed 9 meters (29.5 feet) of this causeway, an east–west monumental ramp composed of silt paving over a limestone debris core held between thick mudbrick walls. This season we exposed 21 meters (69 feet) of the ramp, from the east where it disappears under the modern road to the northeast corner of the MVT. Rising at an angle slightly more than 3°, the Ramp widens as it climbs to the west, broadening to 10.40 meters (34 feet) about midway into our cleared area.

The builders appear to have designed the ramp with a concern for rainwater runoff. The surface is concave, with a long gradual slope descending from the north to the lowest point on the south side where runnels and a built channel drained rainwater down the slope to the east. The channel runs northwest–southeast across the ramp. It is formed over a bedding of crushed limestone and lined with alluvial mud, similar to the channel we discovered in Main Street in our Lost City settlement.

Ana Tavares supervised work at the western end of the Ramp where someone in the past excavated a deep pit, exposing the foundation for the upper, western end of the Ramp. The pit cut through the Ramp and exposed layers of limestone rubble 2.46 meters (about 8 feet) thick, probably dumped as a foundation for the Ramp. The large limestone rubble of the lower layer is similar to the fill of 4th Dynasty construction ramps elsewhere

Surveyor Azab Ahmed Hassan stands with his Total Station on a massive core block of the MVT, which we exposed when we cleared a large hole at the northeast corner of the MVT. Each day when he set up on survey point GIII.1 of our Giza Plateau Survey grid, he rose higher and higher as we cleared deeper and deeper.

at Giza, which prompts us to ask: was this ramp first constructed to deliver building materials from the east, such as the granite blocks used to clad the Upper Temple?

The Vestibule

After the development of the Ante-town and Glacis, there was no direct approach into the first vestibule in the center front of the MVT. Instead, people entered from the north through a small portico and a swinging double-leaf door, as suggested by the pivots and socket in the limestone threshold, and then through the second vestibule in the northern end of the Ante-town.

The village that developed within the MVT spans 300 years, from the time when our Lost City site was occupied to the end of the Old Kingdom. Amelia Fairman and Mike House excavated through an intricate sequence of wall remodeling and floors, exposing round sockets for pottery vessels, including a nearly intact vessel, put in by the residents during a long occupation. They discovered that the occupants thickened the walls up to 1.69 meters (5.5 feet) with a series of accretions, possibly to support the roof after they had removed four columns that once stood on four round alabaster bases, each about one meter in diameter. Just outside the vestibule, they examined the Ramp and found evidence of repairs and resurfacing. It appears that the Ramp and vestibule functioned together in at least the later phases of occupation.

Water Tank 2

Water Tank 2 is a rectangular basin located north of the MVT. An important feature of Water Tank 2 is that two massive limestone revetments shore up the quarry debris on its southern side to a height 1.40 meters (4.6 feet) higher than the silt-paved roadbed of the Ramp. The sides of the tank are therefore higher than the floor levels of the top of the Ramp and the MVT and Ante-town. The interior sinks in three steps through the debris and down into the limestone bedrock. The builders designed Water Tank 2 as a higher reservoir from which water could be let down, like modern water towers. We exposed the southern terrace and retaining wall of the basin and the mouth of a drain at the level of the Ramp. Selim Hassan related this drain to a plastered mudbrick building that he designated as the embalming tent for Khentkawes' funerary rites.

The Enigmatic AI Cut (AIC)

A long ragged trench cuts north-northwest to east-southeast through the fieldstone house just west of the KKT foot, through the upper terrace of the KKT, and along the northern side of the Ramp. It impedes our understanding of the stratigraphic relationships in the interface between the KKT and the MVT. We believe that flowing water, perhaps from wadi flooding, scoured out the cut during the time people occupied the KKT-F and the settlement within the MVT. This would be consistent with Reisner's observation that a flash flood destroyed the first mudbrick phase of the temple, after which it was rebuilt in the 6th Dynasty. Reisner thought that people added thick fieldstone walls, which he found appended to the western and northern sides of the temple in its second phase, as protection against another violent flood. In fact, the AIC begins about on line with the path that Reisner projected for the flash flood. Water Tank 2 might have been intended as a catchment basin and reservoir for flood water.

The Northeast Corner of the MVT Exposed!

The work that Ana Tavares supervised in the large hole (NEH) cut through the Ramp surface at the northeastern corner of the MVT provided valuable evidence about the MVT architecture and the structure of the Ramp. The pit cut through the massive limestone debris of the foundation and fill of the Ramp and through the mudbrick casing at the northeast corner of the MVT, exposing five massive core blocks of the temple foundation. These huge core blocks, stacked in three courses, make it clear that Menkaure intended a colossal stone valley temple like that of his predecessor, Khafre.

Evidence of 1932 trenching along the bedrock drop. The worker in the upper left corner cleans the scant remains of the KKT eastern enclosure wall. Selim Hassan's workers left narrow, shallow trenches along the face of the bedrock edge as they tracked the run to the south of the edge and the underlying mud mass. They cut down into the mud mass to find the marl lines marking the northeast corner of the building (background). Then they sunk a trench across the western wall of the buried building (ending at the worker with the orange dustpan). View to the north.

As a result of this season's work, we have a new understanding of the MVT. At the end of its use and occupation it presented a blank eastern facade, dropping dramatically to the east (the Glacis), with a broad access road (the Ramp) rising to the vestibule and Ante-town, and continuing westward along the northern side of the valley temple.

KKT-E: The Buried Building

In 2007 Lisa Yeomans made three important discoveries to the east of the KKT: 1) Along the eastern foot of the eastern KKT enclosure wall the bedrock drops; 2) The wall enclosing the KKT on the north continued east beyond the bedrock edge and beyond the limits of the complex as previously mapped; 3) A large mudbrick building, which had never been documented, stood on the lower level.

KKT-E Goals in 2008

A principal goal was to find how the lower building related to the eastern end of the Khentkawes causeway. As far as we knew from the 2007 work, the causeway ended abruptly at the bedrock edge. How did people ascend from the lower level up over the bedrock face to the causeway?

Finding the Lower Terrace

Mark Lehner and Kasia Olchowska supervised the removal of overburden between the two trenches that Lisa had excavated in 2007. They determined that Selim Hassan's workers had found the lower building. But, for reasons unknown, the structure was not mapped. It may be that Hassan's cartographer mapped the KKT later than his 1932 season (he continued to excavate at Giza until 1938). In fact, the map may have been based on RAF aerial photos. By then rapidly drifting sand might have already filled the probe trenches, obscuring them from RAF cameras and from surveyors working on the ground.

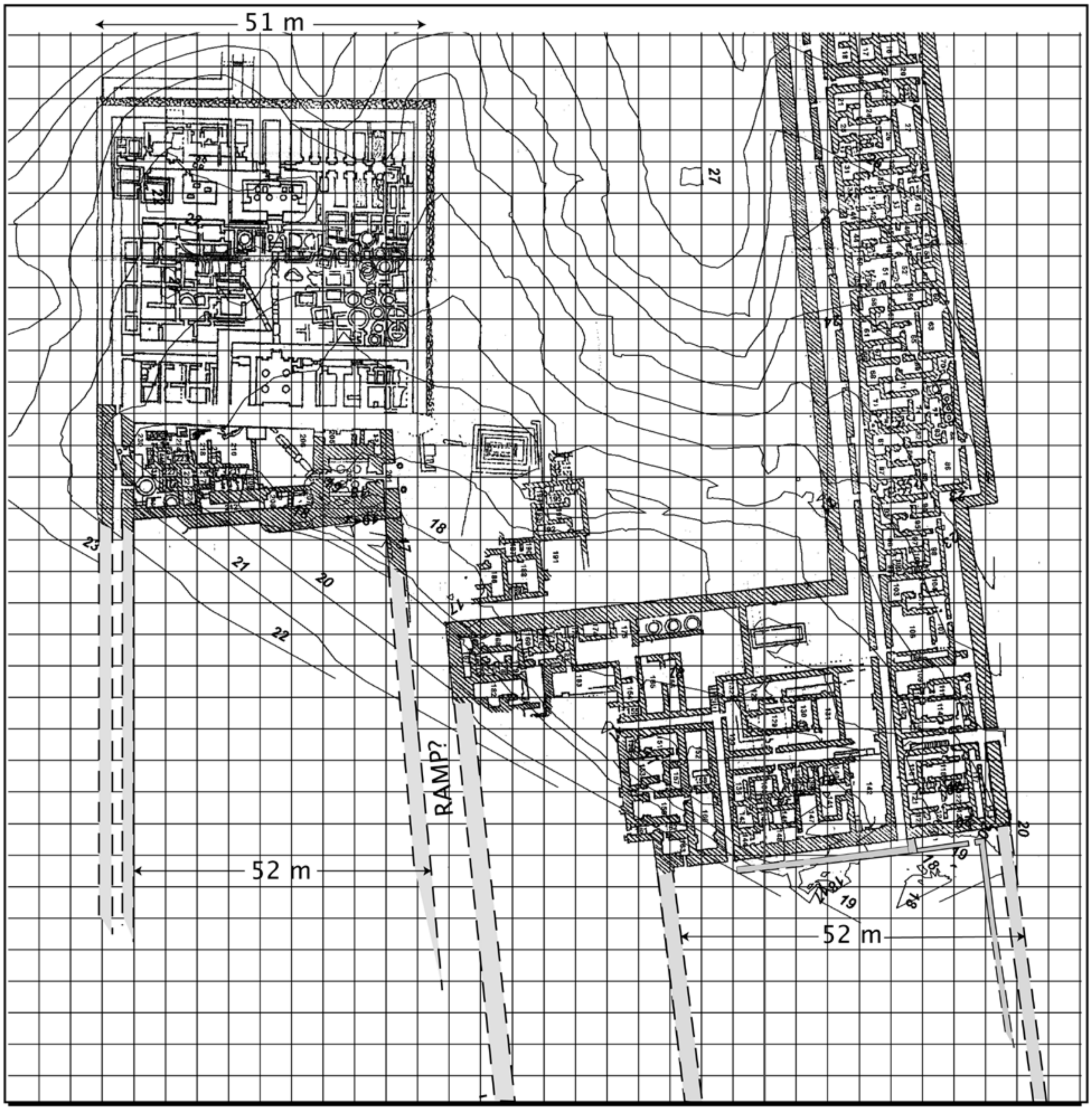
In clearing a deep, exploratory pit of Hassan's workers, Kasia found the bedrock floor of the lower eastern terrace at elevation 16.53 meters above sea level, a vertical drop from the KKT causeway threshold of nearly 2 meters (about 6.5 feet). This discovery only increased the mystery of how one ascended from the lower terrace up to the causeway.

Stairway to Heaven?

Once the team members worked through the pits and upcast deposits of previous digs and sand deposited post 1932, they uncovered the eroded remains of another ramp, composed of a limestone debris core encased in mudbrick. This one was only 2 meters (6.6 feet) wide, and rose in a gentle gradient along the bedrock face from the south up to the causeway threshold (see cover photo). To enter the Khentkawes causeway, one ascended from south to north on this ramp, then turned 90° west to enter the causeway. There might have been a straight-on stairway to the causeway in this sloped, deteriorated mass. It would have been very steep, but steep stairways were not usual in ancient Egyptian architecture. We are certain of the ramp, which may have been used until the end of the Old Kingdom. We found, at its base, a bread pot common to the 6th Dynasty, some 300 years after the 4th Dynasty and the heyday of our Lost City settlement.

Valley Approach, Future Work

The Ramp at the MVT-KKT interface and our discovery of another ramp in front of the Khentkawes causeway draws our attention to access into the whole complex and into the Giza Necropolis as a whole. If we project the lines of both ramps downslope, they



A projection of the possible arrangement east of the MVT and KVT. The MVT, measured off the geo-referenced 1:1,000 map, is 51 meters (167 feet) wide north to south. The angle of the northern Ante-town would place its northern face 52 meters (100 cubits, 170.6 feet) from the northern wall of the MVT causeway, if both walls are projected about 50 meters (164 feet) east, roughly on line with the eastern wall of the KKT foot. Hassan's map shows a turn to the east of the eastern KKT enclosure wall. If projected, the distance from the northern face of this wall is 52 meters from the northern face of the eastward extension of the northern enclosure wall of the KKT. The MVT would fit within this space, which contains what remains of a mudbrick building, possibly the Valley Temple of Queen Khentkawes.

point to the southeastern part of the KKT, which is toward the low end of the dip of bedrock into the central wadi between the Moqattam and Maadi formation outcrops at Giza. It is just this part of the settlement, the southeastern corner of the KKT, which was unobtainable already in 1932 because of the proximity of the modern cemetery, hence leaving it missing from Hassan's map. In our next season we hope to gain a little more of this low corner.

We will also begin excavations into the buried building in KKT-E. Is it in fact a discrete building, or just an enclosure around a broad, open reception area? Hassan's map appears to show the eastern wall of the KKT projecting slightly to the east at a point south of our newly discovered ramp. This hints that the whole foot of the town might have turned to the east and continued in that direction. With the northern KKT enclosure wall continuing eastward, it is possible that it and a southern wall enclosed a rectangular space 52 meters (100 cubits, 170.6 feet) broad. This is about the width of the MVT (51 meters [167 feet], probably intended to be 100 cubits). If the buried building is indeed a discrete building, it is most likely the true valley temple of Khentkawes, possibly of a size equal to that of Menkaure's valley temple.

Rainer Gerisch identifies wood charcoal samples in the Giza Field Lab.

Under the Microscope:
Life Stories from the Pyramid City Unfold

The Giza Field Lab, under the direction of Dr. Mary Anne Murray, hosted the first full season for our new Archaeological Science program from March 1 to May 31, 2008. The core of the program is an interdisciplinary team of specialists who analyze the cultural and biological material from our excavations: ceramics, human bone, animal bone, plants, mud sealings, chipped stone, pigments, wood charcoal, roofing material, mudbrick, faience, and other artifacts. We also have an experienced team of photographers, illustrators, and a videographer on board. In addition, this season a team of material scientists from Japan carried out chemical and elemental analysis of several classes of material culture using X-ray diffraction and X-ray fluorescence (XRD/XRF).

During our first major session in the Giza Field Laboratory, we strongly encouraged collaboration for a comprehensive, integrated, and holistic narrative of life in the ancient settlement. Toward this end, most of the specialists worked on materials from two areas of the site that will be fully published in our ***Giza Reports*** monograph series in the next two years: Area AA and the Royal Administrative Building (RAB). Area AA takes in the Pedestal Building, a large structure enclosed in thick walls with two rows of enigmatic pedestals, which may have been used for storage. The excavations in the RAB uncovered rooms and courtyards on the west side of the Royal Administrative complex.

Here are some of the highlights of our 2008 Archaeological Science season in the Giza Field Lab:

Pots and Plates at the Pyramids

Our team of Polish and Egyptian ceramicists, led by Dr. Anna Wodzińska, made good progress on the *Manual of Egyptian Pottery*. Originally compiled for the AERA Field School for SCA inspectors, the manual describes and illustrates ceramics from all periods of Egyptian history. Since there is nothing comparable in print, the *Manual of Egyptian Pottery* will be a valuable reference for anyone working on archaeological sites in Egypt. We expect to publish it in 2009.

Our ceramics team also analyzed 12,950 diagnostic fragments recovered from the 2007 RAB excavations and nearly finished the very rich ceramic assemblage from Area AA: 12,028 sherds from our 2007 excavations alone.

Firewood for the Pyramid City

While studying his 500th wood charcoal sample this season—he has done thousands in previous seasons—Rainer Gerisch made a truly remarkable discovery: olive wood among the Area AA samples. Prior to this discovery (and several other fragments of olive wood from past seasons), olive had not been known from Old Kingdom Egypt. The earliest find had been from 12th Dynasty Memphis. Our olive raises the question: Is the find from imported olive wood or is it possible that Egyptians were trying to grow olive trees so early?

The remaining wood charcoal in the Area AA samples was primarily the ubiquitous Nile acacia, present in nearly all the wood charcoal samples from the site. Given the large quantities of acacia throughout the settlement, the residents would have quickly exhausted all the local acacia if they had collected nearby. A central authority must have brought in wood from a large area of the countryside, perhaps as prepared charcoal, a high quality fuel.

Seeds and Weeds

During 2008, AERA archaeobotanist, Dr. Mary Anne Murray and her team analyzed 253 samples of plant remains from the RAB excavations, which were recovered through a water separation technique called flotation. The samples, primarily from houses and floors, produced nearly 10,000 individual plant items, including barley and emmer wheat grains and chaff; lentils; fruits; edible roots and tubers; as well as many weed species associated with cereal agriculture.

These results offer clues to economic activities here and to the diet of the residents. The cereals and wild species suggest that barley and emmer may have been cleaned of contaminants and chaff in this area before being sprouted for beer or ground into flour. The grains may have come from the large silos on the eastern side of the RAB. Other plant remains were probably also the products of processing or preparation. Some of the plant foods may have been intended for use elsewhere, but a portion must have been the residents. In the RAB we see evidence of a more diverse diet than in many other areas of the site. This would complement the findings of our archaeozoologist (see below), who also found evidence of a better-than-average diet in the RAB.

Prof. Nakai views data on the laptop screen showing the elemental composition of a sample he is analyzing in the XRF/XRD spectrometer to his right.

Fillets, Fish, and Fowl

Dr. Richard Redding completed his analysis of the animal bone from the 2007 RAB excavations. The 12,049 bone fragments he examined included domesticated cattle, sheep, goat, and pig; several wild mammals, such as gazelle; as well as Nile catfish, Nile perch, other fish, and ducks.

Based on the types of animals, their ages, and the "cuts," Richard was able to draw some conclusions about the diet of the RAB occupants. They did not have the privilege of a "prime-rib" diet, but they were fed better than many others in the town. A central authority probably supplied them with slightly older, less desirable cattle, as well as fish, which was possibly dried to preserve it over storage and delivery time. This amounted to a richer diet of meat than that of the workers whom we believe rotated through the barracks of the Gallery Complex. The RAB folk supplemented this with cuts of sheep/goat and pig from some other area of the town, perhaps a market in Eastern Town.

The Mystery of the "Pink Stuff"

In April, Dr. Paul Nicholson examined several classes of material that were products or by-products of burning, e.g. from the bakeries and a possible faience production area. His main focus was to determine the probable origin of the material we refer to as the "Pink Stuff" (PS), pinkish burnt earth that formed a massive dump, more than a half meter thick, in the area East of the Galleries (EOG), an industrial/production yard. We speculated that the PS might be related to faience production because it was adjacent to the area where most of our faience objects have been found. Thus Dr. Nicholson's second goal was to ascertain if the PS was indeed related to faience manufacturing.

The PS was also associated with bread molds, prompting Professor Izumi Nakai of the XRD/XRF team to compare it with the material used to make the bread molds. The XRD spectra of the two were essentially the same, suggesting that the PS might be crushed bread molds. But Dr. Nicholson concluded that it was simply fired/burned Nile silt, the material used to make bread molds as well as mudbricks, mud flooring, and kilns throughout most of Egyptian history. The PS, therefore, represents largely the remains of a surface on which heating took place, mixed with fragments from structures used in such activity.

Does this mean that the PS was related to faience production? The burned earth clearly indicates contact with fire of some kind. Faience production, intensive baking, and metalwork would all be possible options. Faience production seems the most likely candidate, however, since the deposits from the bakeries are so different and evidence for metal working on the site is minimal. In addition, other materials that Nicholson examined, such as probable drying trays, were similar to those found associated with faience production at Amarna.

Elemental Analysis from Japan

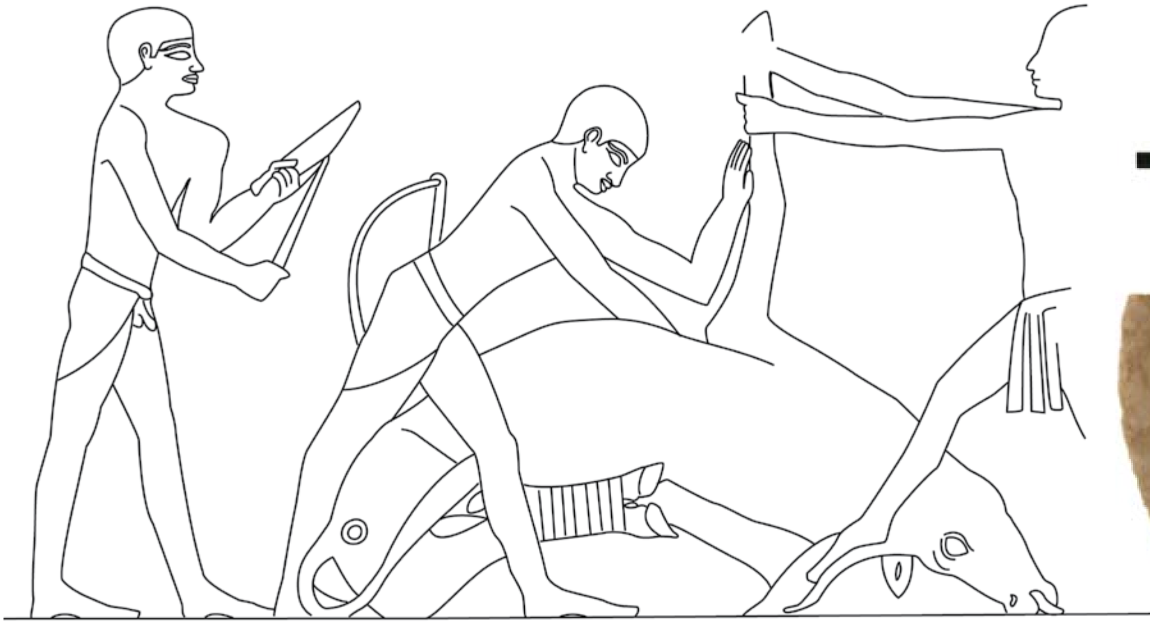
In addition to the PS, the XRD/XRF team analyzed faience and faience-related materials, as well as metal, pigment, mineral, bone, and pottery sherds. They were particularly interested in the following, related to their on-going study of faience:

1) Source of alkaline: plant ash rather than natron (a naturally occurring compound of sodium carbonate and sodium bicarbonate, a kind of salt), which is believed to have been the usual source. The plant might have been *Acacia nilotica*, ubiquitous as charcoal across our site. Acacia ash is a well-known medium for dyeing because of its strong alkaline content.

2) Source of green-blue color: copper. The XRF/XRD team analyzed several "mineral" samples from our site with green-blue components and found that some of these are actually copper-bearing minerals (malachite and cuprite). These may be directly linked to faience production.

3) Source of black color: manganese, applied through a multi-step process. Manganese is distributed throughout Egypt and Sinai and several examples of black faience from the Early Dynastic period onward have been noted.

During their study the Japanese team analyzed faience wasters, quartz chips, slag, half-melted minerals, kiln furniture, and possible kiln wall fragments from EOG, which gave them many clues for reconstructing the faience production process. Their hypothetical flow chart for 4th Dynasty faience manufacturing



Left: A butcher (far left) sharpens his knife by pushing off small flakes with a rod in a slaughter scene from Ti's Tomb, 5th Dynasty, Saqqara. Right: Giza tools. A butcher knife. Far right: A triangular scraper that has been sharpened by "retouching," that is, by chipping off flakes. The small flakes above the scraper can be fit back on the tool like puzzle pieces. The scales are marked in centimeters.

included the following steps: Grind quartz pebbles into a fine powder, then mix the powder with plant ash or a solvent of plant ash (possibly *Acacia nilotica*) and calcium, possibly from fossilized limestone in the vicinity, and prepare a paste. Leave the faience pieces to dry and then fire them in a kiln. The ancient craftsmen might have added copper powder to achieve an efflorescence effect when it dried. Another alternative method was to apply a slurry of quartz powder, lime powder, alkaline, and copper powder on the surface of faience products.

The exact size and form of the kiln used for faience is not presently known, but it probably resembled cylindrical bread ovens depicted in the Old Kingdom tomb scenes. We have found no kiln or oven in EOG, but kiln furniture and masses of red- or pink-baked earth there suggest a kiln facility nearby.

Flakes and Stones

We refer to all chipped stone tools, or flakes and other pieces from making chipped stone tools, as "lithics." Our new lithic analyst, Marina Milic, analyzed all the lithics from RAB, 12,837 pieces (weighing 45,281 kilograms, nearly 50 tons). She found that about 90% of the tools were made of local desert chert, a poor quality stone. Workers could have easily collected chert cobbles in the high desert near Giza. Marina determined that they quickly knapped the cobbles into tools without initial preparation or special skill. Most of the material that she examined was discarded flakes from tool preparation rather than the tools themselves.

Marina also found tools of imported, good quality, quarried flint. Probably produced elsewhere, these tools are far more variable than the locally made products. As yet, we do not know the sources of the imported stone, but will include a program to determine stone sources during the 2009 season.

Among the tools, the most common types are imported knives and scrapers. The products of highly skilled technologies, they were probably made in specialized workshops, perhaps near quarries. The most common scrapers are triangular and fan-shaped. Some of the triangular ones have notches on opposite edges, which may have been useful for attaching a handle. Fan scrapers may have simply been held in the hand.

We found evidence that workers resharpened these scrapers. About 30 small chips, recovered from wet-sieving, could be matched to a large fan scraper retrieved through dry-sieving the same feature that yielded the chips.

Small blades used in sickles were another common tool in the RAB. The flint blades with one serrated or sharper edge were fitted in rows into crescent-shaped sickles to provide a cutting edge for harvesting crops. They could be evidence for agricultural activity near the site. Their defining characteristic is sickle gloss, visible to the naked eye along one margin, which is a polish from silica in plant stalks. The gloss is always on one edge while the other edge was inserted in a crescent-shaped haft.

Skeletons in the (Lab) Closet: Human Osteology

The AERA human osteology team headed by Jessica Kaiser, with researchers from Sweden, Egypt, and the US, excavated ten skeletons in the KKT and analyzed them in the Giza Field Lab. With the information they collect, Jessica and her team determine the incidence of diseases and age-related changes, and identify gender differences in occupation, lifestyle, and diet.

The KKT burials were all poorly preserved and extremely fragmentary. As a result only one individual could be aged very precisely: a young adult male, 16-21 years of age. Among the others, four were between 18-79, three were older than 50, and two could not be aged. Since there appear to be no children, these individuals may have been interred in a larger burial ground where people were segregated by age. Sex could be determined for only two males and three females.

Three individuals had arthritic lesions on their spines. In ancient Egyptian cemetery populations osteoarthritis is common in the lower spine in men and in the cervical spine (neck) in women. This has been interpreted as evidence of men engaging in heavy lifting and hard manual labor, while women carried heavy loads on their heads. The pattern in the KKT material is the opposite: the lower spine osteoarthritis occurred in the females, while one male had osteoarthritis in the neck.

The dating of the KKT burials was problematic, but we know that they post-date the KKT architecture and might come from the end of the Old Kingdom/First Intermediate Period.

Colors from the Past

Dr. Laurel Flentye analyzed 81 samples of pigment and painted plaster recovered from the RAB excavations. The predominant color was yellow, probably from yellow ochre, followed by reddish/purple and red specimens. The XRD/XRF team analyzed similar looking reddish/purple specimens that came from other areas and identified them as hematite. Small amounts of purple, red/brown, green, blue-green, reddish/rust, light orange, and a pinkish/red were also recovered from RAB.

Artifacts 2008

Ana Tavares and Emmy Malek catalogued and reorganized objects from the RAB and other areas of the site. The artifacts ranged from heavy stone tools (weighing up to 15 kilograms, 33 pounds) to delicate powdery faience amulets. Thus they required different types of storage and recording specific to the types of objects.

The categories of objects from our site are very diverse: tools and instruments (including building tools, domestic, weaving, and fishing tools, weights, palettes); household items (such as tables, stools, tiles); non-ceramic vessels and lids; figurines and statuettes; gamers and tokens; architectural and sculptural elements; personal adornments (such as beads, amulets, rings); and of course miscellaneous and unidentified.

The objects excavated during 2006–2007 were particularly notable for several reasons. A tool cache that Ashraf Abd el-Aziz excavated in the area Main Street East doubled our collection of complete small axes. The cache included hafted tools (tools that would be attached to handles), and, rare for our site, complete tools. House Unit 1, a large residence in the Western Town that may have been home to a high administrator, produced a large number of fine artifacts not usually found at our site, including delicate stone vessels and a stone knob, perhaps from a box. However, despite these special finds, it was clear from the catalog of 2007–2008 finds that the corpus of material from the site is now fairly well defined; most objects fall within the major categories mentioned above.

Ashraf Abd el-Aziz with mudbrick from RAB, on the right, and components he separated from bricks on the left.

Mudbricks

Since 2004 our mudbrick specialist, Ashraf Abd el-Aziz, has carried out a comprehensive study of mudbrick from Giza in order to: 1) determine the temper (inclusions of material, such as fine sand, straw, or pottery fragments) in the bricks used in different kinds of construction, and 2) gain insights into the intrusive materials (e.g. ceramics predating the settlement) that may be introduced into the site as mudbricks break down.

Ashraf analyzed 1,576 bricks from the later construction phase of the RAB, after it was dismantled in 2005 to investigate the underlying structure. Ashraf established a typology of the mudbricks and carried out a detailed analysis of the contents of each type. This research provides an excellent baseline for comparative studies of mudbrick from other areas of the settlement and from other sites on the Giza Plateau.

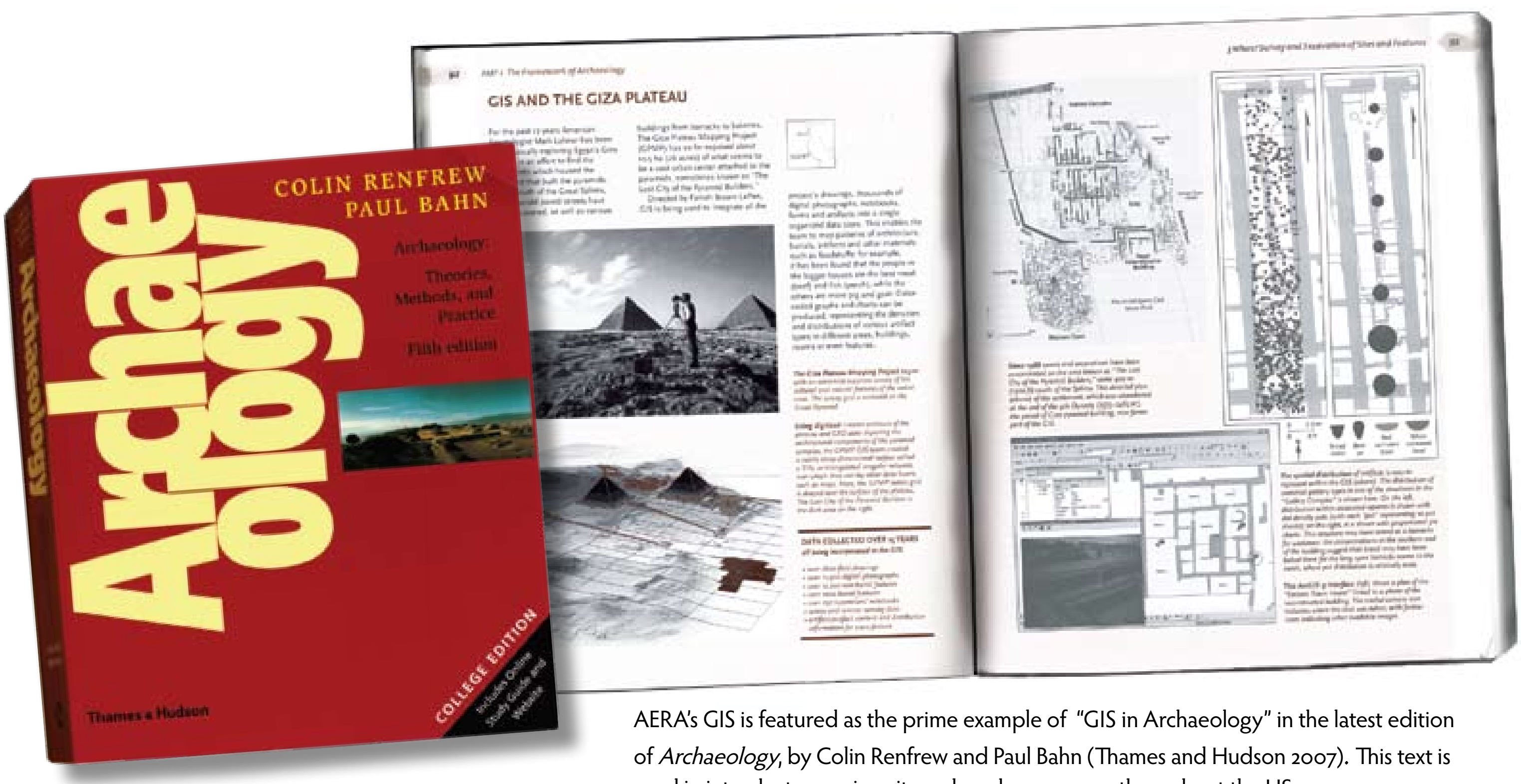
Ashraf found that four types of brick with various tempers and inclusions were used to build the walls of the RAB. The materials most commonly used for temper were pottery, limestone fragments and pebbles, and chert pebbles. But Ashraf found all manner of other materials incorporated intentionally or inadvertently, such as charcoal, bone, fossils, beads, lithics, and stone. A few pot sherds dating from a much earlier period were clearly incidental and demonstrate the potential for intrusive material to be incorporated into the site by eroding bricks.

AERA GIS
Geographical Information System

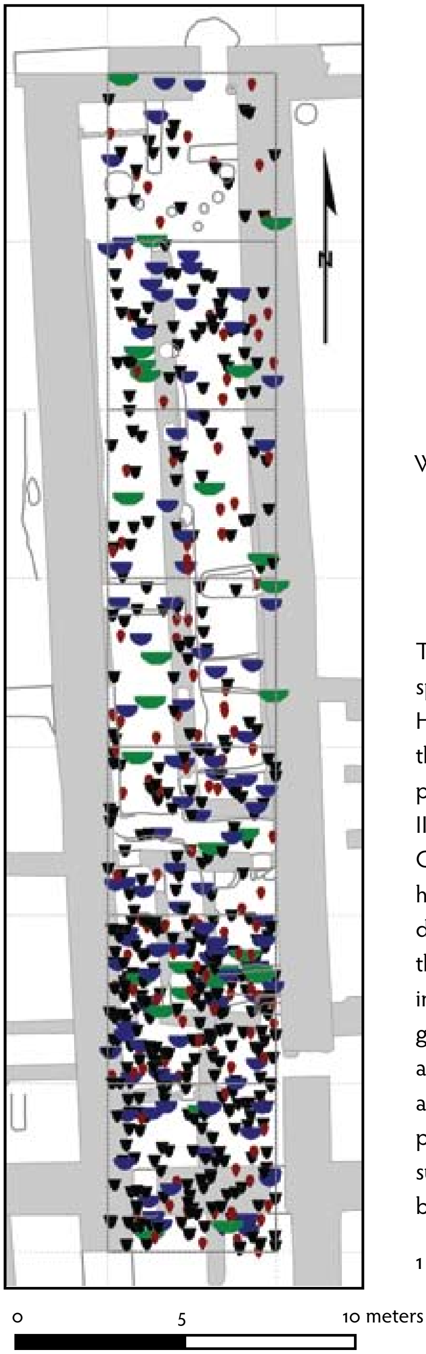
In 2005 AERA GIS Director Farrah Brown La Pan began developing the AERA Geographical Information System (GIS) funded by a generous grant from the Charles Simonyi Fund for Arts and Sciences. The AERA GIS brings together our collection of drawings, photographs, notebooks, feature-description forms, and artifacts in a comprehensive system that enables us to store, review, and interpret the enormous body of data we have collected over the last 20 years and continue to produce each field season.

Like a map, GIS displays information identified according to location, but GIS goes far beyond conventional mapping. Its real power lies in its ability to integrate. By combining methods and theories from geography and other disciplines with specialized hardware and software, GIS can store, retrieve, and analyze data for which location is an essential characteristic, as well as display this data in three dimensions. GIS can also include information from tables, as well as photos, drawings, and links to documents.

The Giza GIS is distinct (and groundbreaking), in that, unlike other archaeological GIS projects, we have used as our basic building unit the "archaeological feature." A feature (sometimes called a context) is the result of any change to the archaeological record: any deposit, layer, wall, hearth, floor, or the cut of a pit. Often GIS is used to analyze broad patterns in archaeology and landscape. We, however, started at a "micro" level with the archaeological feature, which is then associated with even more information such as its boundaries, association with other features, and the ceramics, lithics, objects, seeds and bone it might contain. The Giza GIS then allows us to analyze at a "macro" level the minutiae of data from the field. The success of our GIS program is



AERA's GIS is featured as the prime example of "GIS in Archaeology" in the latest edition of *Archaeology*, by Colin Renfrew and Paul Bahn (Thames and Hudson 2007). This text is used in introductory university archaeology courses throughout the US.



The GIS is used to display the spatial distribution of artifacts. Here dot density pots show the distribution of common pottery types across Gallery III.4. This structure in the Gallery Complex may have housed workmen. Pots were distributed evenly throughout the long, open (barracks) area in the northern part of the gallery, but they are far more abundant in the small rooms at the southern end. The large percentage of bread molds suggests that bread may have been baked in this area.

1 pot graphic= 10 actual pieces

reflected in the fact that it was chosen as the prime example of "GIS in Archaeology" in the latest edition of the prestigious basic text, *Archaeology*, by Colin Renfrew and Paul Bahn (Thames and Hudson 2007).

In order to achieve these results, every single archaeological feature, stratigraphically excavated and recorded as a single context, is digitized using ESRI's ArcGIS software and stored in a GIS geodatabase together with its relevant information. This enables the GIS team to display the data, query data to fine detail, and to reproduce features as part of new maps at any scale.

AERA's GIS is now capable of digitally archiving, displaying, managing, and analyzing the data collected during field work as well as information from specialists' analysis of material culture. On a daily basis, the GIS team records the data coming from the excavators' work on site (e.g. 1:20 plans and feature descriptions) and links it to the data coming from the specialists, resulting in a greater understanding of not only the location of each feature, but also its content and possible function. This involves synchronizing diverse databases, ranging from Excel sheets to interlinked Access databases, as each specialist needs to record quite different parameters for items like plant remains, animal bones, objects, chipped stone, and mud sealings. Integration of such diverse data is the archaeological motto at GPMP.

During the 2007 and 2008 seasons, the GIS team continued to refine this system, reinforcing the collaboration with the AERA archive in Giza and better defining the working practice with the archaeologists and specialists. We also focused on catching up with AERA's years of archaeological excavation and recording at the Lost City site. Many of the excavated features have now been scanned from the original field drawings, digitized, and uploaded into the GIS geodatabase, which forms an important element of the AERA digital archive. The main architectural features stored in the GIS geodatabase constitute a dynamic map that has been regularly updated each of the past four seasons. Using these data, the GIS crew continually provides archaeologists, specialists, and the survey team with accurate and complete overall maps of the Lost City as well as more detailed maps of specific areas on the site.

The GIS team also concentrated on upcoming AERA publications, functioning as a link between the archaeologists in the field and the specialists, producing highly accurate data and maps for use during analysis and for publication. In this case, the powerful analytical possibilities of GIS were used to produce distribution maps of artifacts and other material culture, allowing us to provide the specialists with another tool to highlight patterns.

The ability of GIS to organize, store, and display data was successfully applied during the 2007 and 2008 seasons to the Khentkawes Town (KKT) excavation. The GIS team gathered and stored together all the relevant information pertaining to the KKT area. (They entered and processed data into the GIS while fieldwork was ongoing, working on a daily basis with excavators and the survey team.) By mapping specific areas and survey points, the GIS team helped to clarify the archaeology and locations of features. This allowed the GIS team and others to visualize the archaeology while data were still being collected in the field, which in turn helped solve problems arising during field work. Working closely with the field archaeologists allows the GIS team to modify procedures as needed. Accurate data collection on the spot allowed the GIS team to create 3-D reconstructions of selected KKT feature like pits and layers.

SAQQARA LASER SCA

On June 3, 2008, Dr. Zahi Hawass, Secretary General of Egypt's Supreme Council of Antiquities (SCA), announced in a worldwide press release that the SCA collaborated with AERA and a Japanese consortium to use laser scanners to map the Step Pyramid in Saqqara. Dr. Hawass requested AERA's help in creating the Saqqara Laser Scanning Survey (SLSS) with the aim of producing a three-dimensional map of every millimeter of the Step Pyramid. Built around 2,700 BCE for the 3rd Dynasty king Djoser (or Zoser), this is Egypt's oldest pyramid and first gigantic stone monument. The laser survey is part of the SCA's salvage archaeology and restoration project for the Step Pyramid, which is threatened by centuries of erosion as well as the fragility of the stone and clay core masonry, exposed in ancient times by stone robbers who removed the protective outer casing.

Prelude at Giza: Laser Scanning Khentkawes

At the end of our 2006 season AERA collaborated with a Japanese team from the Tokyo Institute of Technology, Gangoji Institute; Osaka University; and the Tohoku University of Art and Design to launch the Giza Laser Scanning Survey (GLSS). In three weeks the team scanned the gigantic funerary monument of Khentkawes and produced elevations, plans, and a 3-D model. They also produced a 3-D record of the Worker's Cemetery for Dr. Zahi Hawass, who has directed work there since 1990.

With the powerful new technology of laser scanning, researchers use microwaves or infrared signals to gather the coordinates and elevations of points on a monument. As a light beam sweeps over a surface it "captures" tens of thousands of points per second, each located to x, y, and z coordinates. The product is a "point cloud" of the subject, an image that is highly accurate and highly detailed. A print of a point cloud could even be mistaken for a photo. The 3-D point cloud records the monument as it is at one point in time, which is especially useful in monitoring the condition of the structure. With the effects of weathering, tourism, and conservation and restoration efforts, ancient monuments are continually changing.

The plan for the GLSS as a sub-project of the Giza Plateau Mapping Project (GPMP) is to capture and conserve the state of major structures of the Giza Necropolis as "set pieces." Our next choice was the Sphinx Temple.

NNING SURVEY 2008

Scanning Egypt's Oldest Pyramid

However, prior to our 2008 fieldwork at Giza, Zahi Hawass asked AERA and the Japanese team to help with laser scanning the Step Pyramid at Saqqara. In 2007 an Egyptian construction company under the supervision of the Supreme Council of Antiquities had begun to restore the monument. Dr. Hawass urgently needed an intensive and comprehensive survey of the pyramid exterior, as soon and as quickly as possible, ahead of the changes effected by the restoration program. In response, the Japanese team and AERA shifted their focus from the GLSS to the Saqqara Laser Scanning Project (SLSS) with the goal of scanning the entire Step Pyramid in three weeks (late May to early June).

AERA joined a new collaboration with the Egyptian SCA, Osaka University, Tokyo Institute of Technology, and the Ancient Orient Museum for the development and deployment of the custom-made "Zoser Scanner." Prof. Kosuke Sato, from Osaka University, led the SLSS team. AERA's Yukinori Kawae acted as SLSS Field Director. Carrying out most of the organization and fielding of the SLSS on AERA's behalf, he worked closely with Afifi

Above: The Step Pyramid of Djoser at Saqqara, southern side.
Below: Yukinori Kawae, who organized the SLSS for AERA, at one of two Topcon GLS-1000 laser scanners that the team used for the preliminary overall survey of the Djoser Step Pyramid.

Rappelling with the Zoser Scanner down the Step Pyramid southern face.

Roheim, chief SCA inspector and head of the Step Pyramid restoration project.

The Complex Topography of the Step Pyramid

The Step Pyramid posed special challenges to laser scanning. At 109.02 meters (358 feet) by 121 meters (397 feet) and 58.63 meters (192 feet) high, it is much larger than the Khentkawes monument, and it presents a far more complex topography. Five or six major building phases embedded within the fabric can be seen on the eastern and southern sides where some of the outer masonry was removed before modern times. The pyramid masonry overhangs a long, rectangular recess, punctuated by large gaps and by columns of stone left by recent restoration efforts to support the overhang. Also, there are deep gaps and irregularities in the pyramid core. When we scan the Step Pyramid from the ground with commercially available scanners, the laser beams do not reach the topsides of the stones, and when we scan from above, the beams miss the underside of overhanging masonry. Thus each course is left partly in shadow, resulting in an incomplete scan.

To survey and map this challenging surface, the SLSS team used multiple laser scanners in two basic systems. Katsunori Tomita and Kazuto Otani, from the Topcon company, Tokyo, employed conventional ground fixed laser scanners to scan all four sides and the top of the pyramid. This ensured basic, overall coverage of the pyramid, but did not resolve the problem of numerous small shadows left by the tilt of stones and larger shadows caused by recesses and gaps in the pyramid body.

To resolve the issue of shadows, Takaharu Tomii, of Develo Solutions, Osaka, designed and manufactured the "Zoser Scanner," which is, by itself, a multiple scanner system. Like the wings of Icarus, the Zoser Scanner was carried on the backs of professional climbers, Yoshihiko Yamamoto and Risei Sato. Instead of flying toward the sun, they rappelled, carrying the Zoser Scanner, down six gigantic steps on each face of the pyramid. As they descended, four miniature scanners, two on each wing, projected infrared signals that brushed the pyramid fabric and gathered coordinates and elevations at the exceedingly fast rate of 40,000 points per second. The radiating cone of infrared beams projected by each mini-scanner assured that the entire surface of the pyramid masonry, with all its nooks and crannies, would be swathed and points thereby captured. Gyroscopes measured its position, orientation and velocity at the rate of 10 hertz (100 times per second). The width of the wings required that the climbers rappel each face about 25 times. A miniature macro camera accompanied each scanner, taking rapid sequence photographs of the pyramid fabric. The result is complete photographic coverage of the pyramid, in addition to the x, y, and z coordinates of thousands of points on the surface.

The SLSS team members who sat at computers tested the data and assembled the scanned points into position, thereby forming the greater point cloud model. The were aided by GPS and survey points taken by a total station (theodolite and electronic distance measurer) set on the ground. The total station

A climber about to ascend with the Zoser Scanner mounted on his back. Each wing of the device carries two miniature laser scanners and two miniature macro cameras. The scanner also sports a cooling system, a gyroscope, and a prism for tracking location.

telescope moved automatically with the Zoser as the climbers rappelled the pyramid. A GPS timer eventually synchronized all the data.

Rebuilding the Step Pyramid: Thousands of Points of Light

Thanks to the SLSS visualization team, the point data was assembled into a ghostly 3-D image of the pyramid. Five hundred million points combine like spores into a cloud that is an abstraction of the physical structure of the pyramid. This "point cloud" pyramid is the first true, scaled, extremely detailed, 3-D model of the Step Pyramid, and actually, the first time the real fabric of any of Egypt's gigantic pyramids have been mapped in facsimile. In modern archaeology we try our best to make facsimile maps of any freshly excavated ancient surface. Yet, such mapping "as is" has never been done for the pyramids—because of their sheer size, for one thing—and so most of the theorizing about pyramid building has been based on mental template pyramids, usually of well-squared blocks (which is never the case in the physical reality of a pyramid core).

The miniature cameras on the Zoser Scanner were set up to take one photo per second. The team did not quite finish scanning all four sides with the Zoser Scanner (as they did with the Topcon scanners). When they do, the Zoser will have yielded around 400,000 photographs, each precisely located. The scanned points are far more numerous and far more evenly distributed than those from the GLSS 2006 Khentkawes survey. The Zoser Scanner eliminated most of the shadows and gave an accuracy of scanned data within +/- 25 millimeters.

It is amazing that the Japanese scanned the Step Pyramid so intensively in less than a month. After they completed the scans, much work remained and still continues in order to resolve the data and compile the 3-D model and its visual presentations.

From the point cloud model of the Djoser pyramid, architects, restorers, and archaeologists can produce detailed models, plans, profiles, elevation drawings, and ortho-photographs for scholarly and scientific studies. The SLSS recorded the effects of current restorations, already a *fait accompli* before the May–June 2008 survey, as well as the untouched fabric of the pyramid. Conservators can use this detailed model of the Step Pyramid for monitoring future restorations and the condition of the Step Pyramid in the long term.

AERA contributed the major part of the cost of development for the project, and underwrote food, transportation, and lodging for the SLSS team while in Egypt. Develo Solutions underwrote the development, design, and manufacture of the Zoser Scanner. Osaka University and Tokyo Institute of Technology also contributed to development costs for the project.

Point cloud model of the Djoser Step Pyramid, eastern side. Looking like an infrared photograph or negative image, the model is assembled from five hundred million points located precisely in space and arresting the pyramid in time: late May–early June 2008.

SHARING O

Mark Lehner explains AERA's work at the Lost City site to a group from Japan.

Jessica Kaiser speaks with the Ambassador Randt's tour group.

During 2007-2008 we welcomed many visitors to our work sites in Luxor, Giza, and Saqqara. Team members presented our work through publications and lectures given across the world from Egypt, to Poland, to Japan, to the US. Here are some of the highlights.

In Luxor we showed our excavations and Salvage Archaeology Field School (SAFS) operations to colleagues and dignitaries. Mark lectured to the touring group "Nile Adventurer Friends" of US Ambassador to China Clark T. Randt. The group visited the SAFS in full swing at the Khalid Ibn el-Waleed Garden site in Luxor. We were pleased to show our work there to the Director of USAID in Egypt, "Bambi" Arellano, and her husband, Jorge Arellano.

At Giza we discussed our work in detail on site with a class from the American University in Cairo, taught by Dr. Lisa Sabbahi, who is using the Giza Plateau Mapping Project as a case study for her "Method and Theory" class. We were pleased to also host AERA Board member John Jerde and his family at Giza.

A large group from the Urban Land Institute visited both the KIW site in Luxor and our Lost City site in Giza.

At Saqqara, on June 4, 2008, members of the Saqqara Laser Scanning Team held a press conference and demonstration on site at the Step Pyramid of the Zoser Laser Scanning during a descent of the pyramid's eastern face, attended by Egyptian, American, and Japanese correspondents. The Japanese Ambassador to Egypt, H. E. Kaoru Ishikawa, also attended the event.

Scholarly Publications for 2007-2008

LEHNER, M. Pyramid City, Giza, in *Discovery! Unearthing the New Treasures of Archaeology*, Brian Fagan (ed.), London 2007: 160-164, Thames and Hudson.

LEHNER, M. & F. SADARANGANI, Beds for Bowabs in a Pyramid City, in: Z. Hawass and J. Richards (eds), *The Archaeology and Art of Ancient Egypt: Essays in Honor of David B. O'Connor*, Cairo 2007, Supreme Council of Antiquities.

LUTELY, K. & J. BUNBURY, The Nile on the Move. *Egyptian Archaeology* 32 (2008): 3-5.

WODZIŃSKA, A. Tell er-Retaba 2007: Ceramic Survey, in: Panagiotis Kousoulis (ed.), *Tenth International Congress of Egyptologists. Rhodes 22-29, May 2008. Abstracts of Papers* 2008:281.

During this past year we also submitted papers for publication that will be coming out soon. Please see our website (http://www.aeraweb.org) for a list of these forthcoming papers and a complete list all of our publications.

Lectures and Conference Presentations

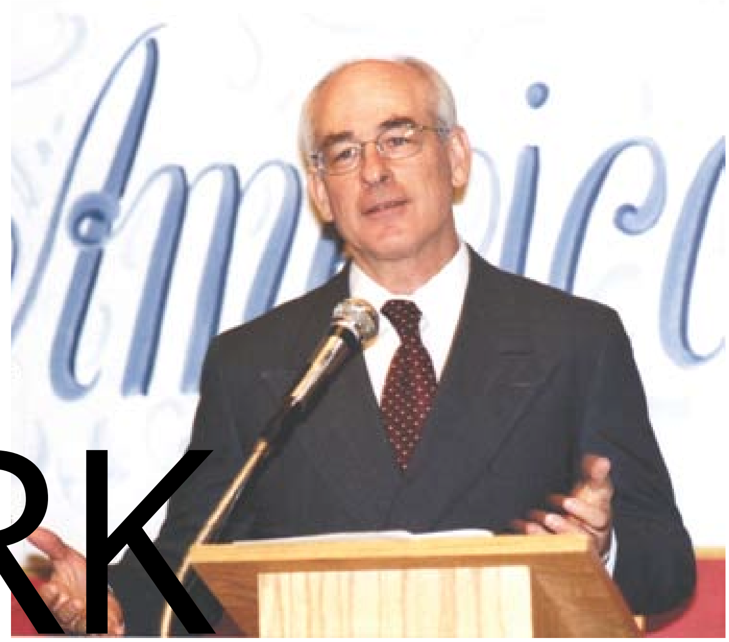
LAUREL FLENTYE
"A Comparative Study of Iconography and Style in the Eastern Cemetery at Giza, with Reference to the Royal Pyramid Complexes." The Egypt Exploration Society, Cairo, January 2008.

MOHSEN KAMEL
"The AERA/ARCE Luxor Salvage Archaeology Field-School." ARCE Annual Meeting, Seattle, April 2008.

YUKINORI KAWAE
"The Giza Laser Scanning Survey." Japan Foundation, Cairo, March 2007.

UR WORK

Mary Anne Murray lectures to the Urban Land Institute tour group.



Mark Lehner speaks at the Scandinavian American Hostfest in Minot, ND.

"The Giza Laser Scanning Survey: 3D Scanning of Khentkawes's Tomb." Showa Women's University, Japan, June 2007.

"The Giza Plateau Mapping Project." Tohoku University of Art and Design, Japan, June 2007.

"Recent Discoveries by the Giza Plateau Mapping Project." Nanzan University, Japan, July 2007.

MARK LEHNER

"Finding the Lost City of the Pyramids." The Curtis School, Los Angeles, September 2007.

"Recent Discoveries at Giza." Harvard Semitic Museum, October 2007.

"AERA Archaeological Field Schools." Egyptological Society, Centro Italiano Studi Egittologici (CISE), Imola, Italy, June 2008.

JOHN NOLAN

"Cattle-counts in the Heb-Sed during the Old Kingdom." International Workshop on Chronology and Archaeology in Egypt: the late 4th and 3rd Millennium BC, Prague, June 2007.

"New Findings from Giza: Mud Sealings and Administration in the Shadow of the Pyramids." ARCE, Boston Chapter, Boston, November 2007.

RICHARD REDDING

"The Pottery Mound at the Worker's Town, Giza: Using Faunal Remains to Explore Socio-Economic Structure." Museum of Anthropology, University of Michigan, November 2007.

"The Workers' Town at Giza." Michigan Archaeological Society, Clinton Valley Chapter, January 2008.

RICHARD REDDING, MARY ANNE MURRAY, & WILMA WETTERSTROM

"Feeding the Pyramid Builders." Annual Meeting of the Society for American Archaeology, Dallas, April 2007.

ANA TAVARES

"The AERA/ARCE Giza Field-Schools." ARCE Annual Meeting, Seattle, April 2008.

"Recent Work in the Town of Queen Khentkawes, in Giza," Egyptological Society, Centro Italiano Studi Egittologici (CISE), Imola, Italy, June 2008.

WILMA WETTERSTROM

"Bread and Beer in Old Kingdom Egypt." Culinary Historians of Boston, February 2008.

ANNA WODZIŃSKA

"White Carinated Bowls from Giza and Dating of the GPMP Site." International Workshop: Chronology and Archaeology in Egypt, the late 4th and 3rd Millennium BC, Prague, June 2007.

"Giza Plateau Mapping Project in Season 2006-2007." Symposium: Poles on the Nile: Archaeological Research in Egypt and the Sudan in Season 2006-2007. Institute Of Archaeology, Warsaw University, Warsaw, June 2007.

"Work Organization in the Old Kingdom Pottery Workshop – Ceramic Type/Family" and "Domestic and Funerary/Sacral Pottery from the 4th Dynasty Giza." Old Kingdom Pottery Workshop, Institute for Archaeology, University of Warsaw, August 2007.

"Potmarks of the Early Dynastic Buto and The Old Kingdom Giza: Their Occurrence and Economic Significance." Conference on Egypt at its Origin, London, July 2008.

Thank You to Our Contributors

AERA has been able to achieve all that we have described here in our annual report because of the generous contributions of our benefactors and members. Each and every tax-deductible donation supports AERA's archaeological excavations, the publication of our findings, and educational programs aimed to advance and protect knowledge about our common human heritage. We are extremely grateful to the following foundations, businesses, and individuals who generously supported our work this year.

LEADERS CIRCLE: $100,001 and up

Ann and Robert H. Lurie Foundation
David H. Koch Foundation
Charles Simonyi Fund for Arts and Sciences
Ted Waitt Family Foundation
Peter Norton Family Foundation
Myhrvold Family Charitable Foundation

KHUFU SOCIETY: $10,000 to $100,000

Glen Dash Foundation
Marjorie Fisher
Ed and Kathy Fries
Bill and Melinda Gates Foundation
J. Michael and Marybeth Johnston
Jason G. Jones and Emily E. Trenkner-Jones
Bruce and Carolyn Ludwig
David Marguiles
Ann Thompson

KHAFRE SOCIETY: $5,000 to $9,999

Joseph F. Azrack
COSI Columbus
Del Rio Family Foundation
Katie Ford
Michael and Janet Fourticq
Ed and Lorna Goodman
Glenn P. Hart
Frederick and Sydene Kober
Robert and Bonnie Larson
Buzz and Barbara McCoy
Ronald Nahas
Richard Redding
Jon Q. and Ann S. Reynolds Fund
Seven Wonders Travel
Stephen Jay and Amy Sills
Jim and Sharon Todd
Julie Middleton and Barry J. West

MENKAURE SOCIETY: $1,000 to $4,999

Ray and Mary Arce
Henry Becton, Jr.
James and Catherine Callard
James and Betsy Chaffin, Jr.
Edgar M. and Elissa F. Cullman
James and Cynthia DeFrancia
Donna L. Dinardo
Phillip William Fisher
Hanley Family Charitable Fund
James and Mary Ann Harris
Rick and Kandy Holley
Brian Hunt
Significance Foundation-Brian and Alice Hyman Foundation
Clyde C. and Betsy Jackson, Jr.
William C. and Victoria E. Johnston Family Foundation
Koss Family Fund
Dr. Susan and Mark R. Kroll Family Fund
Don Kunz
James and Dianne Light
George and Barbara von Liphart, Jr.
Robert Lowe
Michael K. MacDonald
McLeod Family Trust
Edward Robert and Angette D. Meaney
Meyers Charitable Family Fund
Ambassador and Mrs. Charles T. Randt
Theresa L. Rudolph
Bonnie Sampsell
Robert M. Sharpe
George Sherman
Shiloh Foundation-Carol and Tom Wheeler
Craig and Nancy Smith
Frank P. and Irene Stanek Fund
Charles J. and Caroline Swindells Charitable Fund of the Oregon Community Foundation
Marilyn Taylor
C. Wendell and Mila Tewell
Robert M. Weekley
George and Pamela Willeford
John D. Wilson and Susan Hudson Wilson

SUPPORTING MEMBERSHIP: $250 to $999 per year

George Bunn, Jr.
David Goodman
Charles and Wanda Guttas
Dan and Debby McGinn
Mary Perdue
Rheinstein Family Trust
Harold G. Shipp
Kathryn Steinberg
Peter and Michele Serchuk
Robin Young

BASIC MEMBERSHIP

Bob Brier
George Bunn
Richard Cook
Susan Cottman
Laurel Flentye
Barbara S. Gaerlan
Ann and Stanley Jaffin
Leonard H. and Barbara S. Lesko
Barbara Russo
Gregory Thomas

The AERA Team 2007-2008

PRESIDENT AND TREASURER
Dr. Mark Lehner

BOARD MEMBERS
Glen Dash, *Secretary*
Matthew McCauley
Dr. James Allen
Ed Fries
Jon Jerde
Bruce Ludwig
Peter Norton
Dr. Richard Redding

SENIOR STAFF
John Nolan, *Chief Financial Officer, Associate Director, Egyptologist*
Richard Redding, *Chief Research Officer, Archaeozoologist*
Mohsen Kamel, *Co-Field Director*
Ana Tavares, *Co-Field Director*
Mary Anne Murray, *Director of Archaeological Science, Archaeobotanist*
Cindy Sebrell, *Director of Advancement*
Erin Nell, *Business Manager*
Mari Rygh, *Archivist*
Brian Hunt, *Website Manager*
Farrah Brown, *GIS Manager*
Wilma Wetterstrom, *Science Editor*

GIZA: KHENTKAWES TOWN TEAM
2008 Excavations Team
Noha Bolbol, *SCA (Supreme Council of Antiquities)*
Pieter Collet
Delphine Driaux
Amelia Fairman
Mike House
Daniel Jones
Mark Lehner
Andrea Nevistic
Kasia Olchowska
Ana Tavares
Amanda Watts
Kelly Wilcox
Hassan Mohamed Ramadan, *SCA trainee*
Gaber Abdel Dayem, *SCA inspector for KKT excavations*
Nagla Hafez, *SCA inspector for KKT excavations*

2008 Remote Sensing Team
Glen and Joan Dash
Richard Kosowsky

2008 Osteoarchaeology Team
Jessica Kaiser
Johnny Karlsson
Afaf Wahba, *SCA*
Ahmed Gabr, *SCA*
Amanda Agnew
Brianne Daniels
Sandra Koch
Sara Hassan Maraie, *SCA trainee*

LUXOR: 2008 SAFS TEAM
Dr. Zahi Hawass (*SCA*) & Dr. Mark Lehner, *Project Directors*
Mohsen Kamel & Ana Tavares, *Co-Field Directors*

Students
Mansour el-Badry Mostafa Aly
Mona Fathy Sayed
Yasser Abd el-Razik Mahmoud
Mohamed Naguib Reda Abd el-Kader
Ezzat Abo Bakr Saber
Nagwan Bahaa Fayez el-Hadidi
Saad Bakhit Abd el-Hafez
Emad Abdallah Abd el-Ghany
Omar Ahmed Abo Zaid
Hazem Salah Abdalla
Ahmed Hassan Ameen
Sayed Ahmed Sayed Ahmed Said
Ahmed Boghdady Ahmed
Hanem Sadeek Qnewy
Ayman Mohamed Damarany
Adel Abd el-Satar Mohamed
Amer Amin el-Hifny
Hussien Rikaby Hamed
Shimaa Montaser Abo el-Hagag
Ahmed Abd el-Raof Abd el-Rady
Shereen Ahmed Shawky
Hasan Ramadan Mahmoud
Mohamed Ahmed Abd el-Rahman
Mohamed Zarad Shaban Hasan

Archaeologists, Field School Supervisors
Ahmed Mohamed Sayed el-Lathiy
Ali Mohamed Ahmed Ibrahim
Amer Gad El Karim Abo el-Hassan
Essam Mahmoud Mohamed Ahmed
Essam Mohamed Shihab
Mohamed Hatem Ali Soliman
Rabee Eissa Mohamed Hassan
Susan Sobhi Azeer
Moamen Saad

Archaeologists, Field School Teachers
Ashraf Abd el-Aziz
Amelia Fairman
Mike House
Freya Sadarangani
Hanan Mahmoud Mohamed Mahmoud
James Taylor
Lauren Bruning
Francois LeClere

Archaeologists
Alison Jane Roberts
Daniel Hounsell
Daniel Jones
Kasia Olchowska
Nora Abd el-Hamid Shalaby
Lisa Yeomans

Specialists and Support Staff
Mary Anne Murray, *Archaeobotanist, SAFS Teacher*
Menna Allah el-Dorry, *Archaeobotanist, Object Registrar*
Mohamed Aly Abd el-Hakiem Ismail, *Ceramicist, SAFS Supervisor*
Sherif Mohamed Abd el-Monaem, *Ceramicist, SAFS Supervisor*
Teodozja Rzeuska, *Ceramicist, SAFS Teacher*
Lamia el-Hadidy, *Conservator, SAFS Teacher*
Jessica Kaiser, *Osteologist, SAFS Teacher*
Ahmed Mohamed Gabr, *Osteologist, SAFS Teacher*
Will Schenck, *Illustrator, SAFS Teacher*
Yasser Mahmoud Hossein, *Illustrator, Photographer, SAFS Teacher*
Yukinori Kawai, *Photographer, SAFS Teacher*
Jason Quinlan, *Photographer, Videographer*
Mohamed Abd El-Basit Mohamed, *Surveyor, SAFS Supervisor*
Mari Rygh, *Archivist*
Erin Nell, *Business Manager*

2008 ARCHAEOLOGICAL SCIENCE TEAM
Anna Wodzińska, *Ceramicist, team leader*
Edyta Klimaszewska, *Ceramicist*
Sherif Mohamed Abd el-Monaem, *Ceramicist, SCA*
Mohamed Aly Abd el-Hakiem Ismail, *Ceramicist, SCA*
Katarzyna Danys, *Ceramicist*
Karolina Gorka, *Ceramicist*
Sylwia Gromadzka, *Ceramicist*
Aleksandra Ksiezak, *Ceramicist*
Jessica Kaiser, *Osteologist, team leader*
Johnny Karlsson, *Osteologist*
Afaf Wahba, *Osteologist, SCA*
Ahmed Gabr, *Osteologist, SCA*
Amanda Agnew, *Osteologist*
Brianne Daniels, *Osteologist*
Sandra Koch, *Osteologist*
Sara Hassan Maraie, *Osteologist, SCA trainee*
Mary Anne Murray, *Director of Archaeological Science & Giza Field Lab, Archaeobotanist, team leader*
Menna Allah el-Dorry, *Archaeobotanist*
Claire Malleson, *Archaeobotanist*
John Nolan, *Mud sealings specialist, team leader*
Richard Redding, *Archaeozoologist, team leader*
Kelly Willcox, *Archaeozoologist*
Izumi Nakai, *XRD/XRF specialist, team leader*
Kyoko Yamahana, *XRD/XRF specialist*
Abe Yoshinari, *XRD/XRF specialist*
Kriengkamol Tantrakarn, *XRD/XRF specialist*
Ana Tavares, *Objects specialist, team leader*
Emmy Malek, *Objects team*
Hanan Mahmoud Mohamed Mahmoud, *Objects team, SCA inspector*
Ahmed Ezz, *Objects team, SCA inspector*
Laurel Flentye, *Pigment specialist*
Rainer Gerisch, *Wood charcoal specialist*
Marina Milic, *Lithics specialist*
Ashraf Abdel Aziz, *Mudbrick specialist*
Paul Nicholson, *Ceramics/Faience specialist*
Yukinori Kawai, *Lab Photographer*
Jason Quinlan, *Lab Photographer, Videographer*

2008 GIS TEAM
Farrah Brown La Pan
Camilla Mazzucato
Rebekah Miracle
Shaimaa Fouad

2008 GIZA ARCHIVES TEAM
Mari Rygh, *Archivist*
Manami Yahata, *Data entry*
Maha Ahmed Haseeb, *Office assistant*
Fayrouz Ahmed, *Office assistant*

2008 GIZA PUBLICATIONS TEAM
Dan Hounsel, *Archaeologist*
Freya Sadarangani, *Archaeologist*
James Taylor, *Archaeologist*
Julia Jarret, *Illustrator*

2008 GIZA IT TEAM
Ahmed Basoumi
Jack Tavares
Mohamed Said

2008 SAQQARA LASER SCANNING SURVEY TEAM
Zahi Hawass, *(Secretary General, SCA), Director*
Mark Lehner, *Co-Director*
Kosuke Sato, *(Osaka University) 3-D Team Leader*
Hiroyuki Kamei, *(Professor, Tokyo Institute of Technology) Sub-Leader*
Tomoaki Nakano, *(Researcher, Ancient Orient Museum) Sub-Leader*
Yukinori Kawae, *(AERA) Laser Scanning Project Director*
Afif Roheim, *(Chief Inspector, SCA) Field Director*
Ichiroh Kanaya, *(Associate Professor, Osaka University) Visualization Team Leader*
Takaharu Tomii, *(CEO, Develo Solutions) 3-D Specialist*
Toshikazu Kameoka, *(Develo Solutions) 3-D Specialist*
Manami Yahata, *(AERA) Archaeological Documentation/ Archive*
Yoshihiko Yamamoto, *Natural Consultant, Professional Climber*
Risei Sato, *Natural Consultant, Professional Climber*
Katsunori Tomita, *(Topcon) Laser Scanning Expert*
Kazuto Otani, *(Topcon) Laser Scanning Expert*

AERA

Ancient Egypt Research Associates, Inc.
26 Lincoln Street, Suite 5
Boston, MA 02135-2608
USA

E-mail: information@aeraweb.org
Website: http://www.aeraweb.org