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Workman Abbas Eid Shaban and AERA *Reis* Sayed Salah Abd el-Hakim mount the new signage at the entrance to the Open Air Museum at Memphis while Richard Redding wipes clean one of the signs. Photo by Dan Jones.

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Conclusion at the Capital: The Memphis Site and Community Development Project by Freya Sadarangani

After two years and two months our ambitious Memphis Site and Community Development (MSCD) Project finally came to a close on September 30, 2017. During this long and intensive program we succeeded in re-designing facilities that will provide visitors with an entirely new experience of Egypt's first capital city, while also employing 179 local workmen and craftsmen and training 77 Egyptian Ministry of Antiquities Inspectors in basic site recording, conservation assessment, and site and heritage management.

Project Beginnings

The MSCD Project was generously funded by USAID-Egypt as a program that would "conserve, preserve and promote…effective management of Egypt's cultural heritage resources with the aim of enhancing cultural tourism potential." We planned to achieve this by creating a new Walking Circuit of Memphis, which would take in previously neglected sites that were suffering from a range of conservation challenges, including fluctuating levels of ground water, plant growth, and modern garbage.

All the sites of the Walking Circuit had previously been exposed through excavation, so none of our work was intrusive. These eight sites included the West Gate of the Great Ptah Temple, the Apis House, chapels of both Ramesses II and Seti I, a temple dedicated to the goddess Hathor, tombs of several High Priests of Ptah, a temple of Ramesses II, and the Open-Air Museum at Memphis. The project was directed by Mark Lehner, with field direction by myself and Mohsen Kamel.

Project Field School

Embedded in the design of the project, and key to its long-term success after our departure, was the deployment of our tried and proven field school program. Over the course of the two-year grant, we held four separate field schools, each six weeks long, training Ministry of Antiquities inspectors from inspectorates all over Egypt. AERA was fortunate to collaborate with Sara Perry of the University of York, UK, and with a cohort of University of York graduate volunteers, who brought a customized syllabus and lectures to the heritage management portion of the field school experience.

Early Activities

The preparation and installation of the Walking Circuit was an incredibly complex task, with numerous sub-activities. Early in the program we began with cleaning the eight sites and fully recording them. The cleaning and subsequent re-cleaning meant the removal and disposal of tons of modern garbage and dense forests of reeds, camelthorn, and other pervasive vegetation. Recording consisted of the archaeological data capture of all eight sites, via photography, survey, mapping, 3D recording, and, of course, research. The archaeological dataset we now have for Memphis is impressive and will be accessible to all through USAID in report form and in ArcGIS.

Our initial recording also captured the pre-existing features of the area—every modern building, every information panel, even every tree. Each feature was surveyed and integrated into ArcGIS. Using this we are able to show the "baseline"—that is, Memphis before we made any changes—in addition to every garbage bin, bench, and sign panel installed once our work was completed.

Walking Circuit

Designing the new Walking Circuit was our biggest challenge, and the trainees of our field schools were intimately involved in this aspect of the work. The field schools combined theoretical training and applied training wherein students used their new knowledge in creating project outputs. For example, they worked with a graphic designer to create the Circuit signage, or prepared promotional videos for social media targeted towards the different groups of tourists that may visit the site—all activities that aided in increasing visitor accessibility and enhancing the Memphis tour experience.

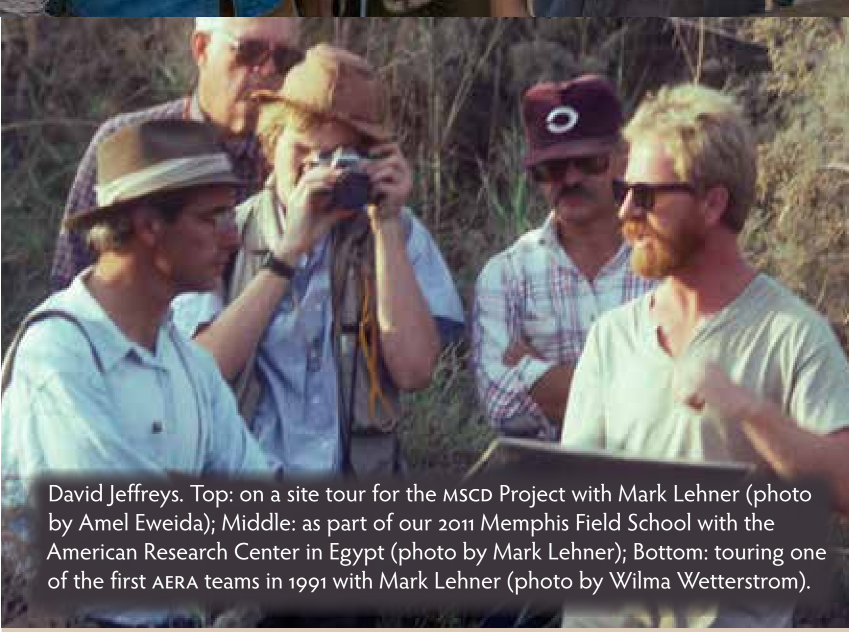
In September 2017 we completed the Circuit's installation. The physical trail consists of 1,413 meters (4,636 feet) of paths linking the eight sites, 74 information panels, and rest areas where visitors can sit and relax in the shade during their visit. This new visitor experience is complimented by a bespoke Memphis website (memphisegypt.org), promotional

(continued on page 8)

MSCD Project Co-Field Director Mohsen Kamel (center), Mit Rahina General Director Ibrahim Rifat (left), and Director of Mit Rahina Essam Khamis (right) pause to look at the camera while discussing work on site. Photo by Sayed Abd el-Hakim.

VOICES OF MEMPHIS

As our time with the MSCD Project draws to a close, we want to share the experiences of five different members of the team: our resident Memphis expert, a field school instructor, a field school student and supervisor, our foreman, and one of our field directors. Here they recall the MSCD project in their own voices and explain what the project meant to them.



David Jeffreys. Top: on a site tour for the MSCD Project with Mark Lehner (photo by Amel Eweida); Middle: as part of our 2011 Memphis Field School with the American Research Center in Egypt (photo by Mark Lehner); Bottom: touring one of the first AERA teams in 1991 with Mark Lehner (photo by Wilma Wetterstrom).

DAVID JEFFREYS

Survey of Memphis Director

I have been closely involved with the site of Memphis, Egypt's only real ancient capital, for most of my working life (now going on forty years), firstly with Harry Smith and Lisa Giddy at the Saqqara Anoubieion, and then, from 1981, as part of the Egypt Exploration Society's Survey of Memphis. In that time we were able to survey all the visible remains at the site (apart from those in military areas), develop an understanding of its local topography and of far-reaching environmental change, and undertake a modestly sized but important excavation aimed at clarifying some of the earlier stages of human activity there.

From the beginning it has been clear how neglected Memphis is as an archaeological treasure. Some (misguided) guidebooks still maintain that Memphis has completely disappeared and that there is nothing left to see, betraying a staggering failure of imagination. In actual fact even the visible part of the city stretches for six square kilometers—the largest in Egypt, and covering five thousand years of human activity—and that is certainly only a small proportion of its full extent.

The MSCD Project has also opened up new avenues and opportunities for the many young Egyptian student inspectors who have attended and given their time and enthusiasm to the idea, and gained skills in the many and varied possibilities for public outreach and education. In material terms, the central part of the ancient city has been transformed from a jumble of sites, hardly ever visited or even suspected, to a connected complex of temples, tombs, and dwellings that visitors can now explore, thanks to the new walking circuit with excellent signage and supplementary information.

So it is a delight to watch as Memphis is transformed and regains its rightful place in the public's attention—and becomes, once again after all these years, not just a detour, but a destination!

MAHMOUD EL-SHAFEY

MSCD Teacher

Although hundreds of years have elapsed since the fall of Memphis and its burial under the sands of Mit Rahina, its charm, personality, and ability to inspire have not vanished or faded over time. This was clearly reflected in the MSCD Project, which has become a source of inspiration for the more than 70 Egyptian archaeologists trained by the project in our four field school sessions, the project staff members, and many others who were involved or knew about the project.

I am one of the very fortunate Egyptian archaeologists who participated in this inspiring project as a staff member. This project was one of the most important milestones in my career. It changed my plans for the future by developing my view of archaeology and its broader context in society. The project has opened my eyes to enhancing visitor experience at cultural properties and interpreting and presenting archaeology for non-specialists, through showing the importance of field- and literature-based comparative analysis of other projects both in Egypt and abroad. Furthermore, it showed the benefit of promoting archaeology by using social media and digital movies, a technique that was neither familiar or widespread in the field of professional archaeology in Egypt prior to this project. I learned how to develop a social media plan for a cultural heritage site, and now I see Egypt's crucial need for this approach.

Guest lecturers from different backgrounds helped me see our colleagues' different views of the challenges facing cultural heritage sites and their ideas for potential solutions. Moreover, I learned from each person involved in the project, whether they were staff members or even my trainees' colleagues.

In order to evaluate the importance of this project, it is enough to know that some of the Egyptian staff members, along with some of our trainees, were invited by the Ministry of Antiquities to participate in new activities related to enhancing visitor experience at heritage sites. In my view, this project will be seen as one of the most important steps in the process of developing Egyptian archaeologists and keeping them apace with the discipline of heritage site management. For Memphis, this project is a big leap on its journey to recovering its status as one of the world's most famous heritage sites.

Mahmoud el-Shafey. Top: leading a tour for students on site at Memphis (all photos by Amel Eweida); Middle: explaining a concept from a reading assignment to a field school student; Bottom: with students on site at Memphis.

Reham el-Sayed. Top: Reham with Mark Lehner at her MSCD graduation, prior to becoming an instructor herself (photo by Hanan Mahmoud); Middle and Bottom: with students on site at Memphis (photos by Amel Eweida).

REHAM MAHMOUD ZAKY EL-SAYED

MSCD Student and Supervisor

As I began my studies and career in archaeology, I thought that everyone knew the importance of archaeology and cultural heritage—by default! But this is because I forgot how little I knew about this field before I got into it. In my childhood, I did not know much about the archaeological sites in my hometown in the Delta and I could say the same for my family and friends. Since 2011, Egyptian cultural heritage has faced many serious challenges at both museums and sites. It is necessary to analyze the relationship between heritage and local community, the factors that control this relationship, and its vulnerabilities and potential opportunities.

I believe that is why I chose to participate in the first field school session of the MSCD project in September 2015. I felt it was a great challenge (and later, accomplishment, too!) to produce interpretative materials for these sites that were suitable for both the general public and specialists. In 2016, I was honored to be promoted to Supervisor for the third and fourth field schools to help my colleagues—inspectors and curators from all over Egypt—to produce these interpretative materials. I worked on the panels, brochure, guidebook, and the website. I still remember our days in Ptah Temple West Gate walking the site doing documentation, and our brainstorming discussions to form our development proposal.

In the fourth field school, our task was to produce a social media video about Memphis, targeting a certain category of audience and guess what…. our persona was local community! Heritage can be a very effective tool in developing the local community simply by opening closed sites for visitors.

This past July, a new department of Site Management was launched in the Ministry of Antiquities. Among its team are five MSCD participants, including myself. We aim to make different Egyptian sites accessible for visitors in the proper way. It is an opportunity to apply what I learned from the MSCD project, that our work is not only a chance to analyze the relationship between archaeology and local community, but also to remind specialists that archaeological sites are for everyone to learn from and enjoy too. Heritage was made by people and belongs to them.

SAYED SALAH ABD EL-HAKIM

MSCD and AERA Foreman

What we have done has been a huge change for the local town of Mit Rahina. What was once invisible is now visible to all that live around the monuments. At the very start of the Project the local people that would cross the roads and paths nearby had no idea that these monuments were there, and then day by day, as we cleared the vegetation, the sites were revealed to them. I would often hear from people who had lived in Mit Rahina for 30 years or less that they had absolutely no idea what was there, and they were so excited when they saw these sites, and always asked if the team could be there the whole time.

Every day tourist buses driving to the Open-Air Museum would slow down to have a look and take pictures when they passed us working. The local community observed this too, and would tell me the opening of the Walking Circuit would be of great economic benefit to them.

For me personally, Memphis represents Egypt's beauty and heritage, and I wish there was more archaeological research done there. There is such huge potential. What we see is just a tiny snippet of the archaeology there. As an archaeologist I see Memphis as one of the greatest archaeological areas in Egypt. What's outside the Open-Air Museum is so much better than what's inside it!

I've worked as an archaeologist in Egypt since 1989 and have been working for AERA since 2008, becoming the Project's *Reis* (Project Foreman) in 2009. My role is multi-faceted, working as an archaeologist, recruiting and managing the workmen that work on site, and various logistics. For the MSCD Project we hired local workmen to work on the sites of the circuit, cleaning the sites, laying paths, and installing panels. Of the local workmen we employed, many had not worked in a long time. All were very appreciative of the work and it's made a huge difference to them and their families.

Sayed Abd el-Hakim. Top: on site (all photos by Freya Sadarangani); Middle: stringing new cordage to delineate exhibit space at the Open-Air Museum; Bottom: back row, second from left, with local workmen on site at Memphis.

Freya Sadarangani. Top: documenting relief blocks on site (photo by Mark Lehner); Middle: accompanying Minister of Antiquities Dr. Khaled el-Anany on a site tour at Memphis (photo by Sayed Abd el-Hakim); Bottom: leading a meeting with MSCD staff prior to the start of work (photo by Dan Jones).

FREYA SADARANGANI

MSCD Co-Field Director

For me, as Co-Field Director, my role was diverse—from overall project planning to setting up the field seasons, managing of logistics and personnel, planning and hitting deadlines, acting as liaison with Ministry and USAID officials, producing content, procuring supplies, and ultimately making sure the deliverables promised in our USAID grant were met.

Everyone involved in the MSCD Project would probably agree that over the last two years we all experienced extreme highs alongside extreme lows. There were certainly times where the promised project deliverables seemed impossible, often requiring a day-by-day re-negotiation of how they could be achieved. For me, this experience has taught me to become more adaptable and flexible, learning to find alternate paths when problems arise.

I've been involved in AERA's field schools since 2005 and I rate my involvement in these as the best professional experience I've ever had. The camaraderie is second to none, and the enthusiasm, dedication, and passion of our Field School students is overwhelming and infectious. All four MSCD Field Schools fit this bill entirely, and seeing the MSCD graduates along with the Field School supervisors receive their certificates from the Minister of Antiquities was probably my all-time project high.

But this was closely followed by the physical manifestations of the project—the first panel we installed, seeing the website live, handling the printed copies of the brochure and guidebook. But as I think of it, there was so much more—the café owner's smile at seeing his café labeled on the new brochure, the bazaar owners' joy at seeing the new panels. All of it made for an experience that I will not soon forget.

videos (search “Ancient Egypt Research Associates” on YouTube), guidebook and brochure (memphisegypt.org/research/tour-guide-resource-material/), social media campaign (Facebook: Memphis, Egypt), and information resources for tour guides (memphisegypt.org/research/tour-guide-resource-material/).

An important component of the project was outreach to the local Tour Guide Syndicate, in order to spread the word about the Circuit and the resources available to those who will in turn pass along information to visitors at Memphis. Here again, our field school students and supervisors played a crucial role in the long-term success of the project and will continue to do so moving forward. Two members of the field school team, Supervisor Azmy Taha Mohamed Seif Salama and Graduate Fatma Ahmed Soliman Abd el-Naby, gave a well-attended lecture to the Giza branch of the syndicate and led a series of four half-day tours of the site for 57 tour guides. The tours began at the museum, and each attendee was provided with an information packet, brochure, and guidebook to share with their clients.

Other Improvements

In addition to the clean-up of the sites and installation of the Circuit, the MSCD Project provided other improvements to the visitor experience at Memphis. These included new signage in the museum and new cordage to delineate exhibit space, as well as a fresh coat of paint for the whole museum—both inside and out—some upgraded electrical circuitry, and a revamped ticket booth.

As part of the outreach component of the MSCD Project, we also helped the museum further refine their curriculum for school-age children. We produced a handout of coloring pages and activities related to pieces in the museum and ancient Egyptian/Memphite history. Additionally, we developed an unused and overgrown corner of the museum’s garden into a children’s area that will be used by the school outreach inspectors for activities with local school groups.

Above: Model of the Memphis Walking Trail made by Fatma Abd el-Naby to share with the Tour Guide Syndicate. Photo by Freya Sadarangani.

Below: Fatma Abd el-Naby and Azmy Taha Mohamed Seif Salama lecturing to the Tour Guide Syndicate, Giza branch. Photo by Freya Sadarangani.

Below: New children’s play and outreach area in the gardens of the Memphis Open-Air Museum. Photo by Dan Jones.

Below left: View of the head of the massive Ramesses II colossus around which the Museum was originally built, with freshly painted walls and new signage and cording provided by the MSCD Project. Photo by Freya Sadarangani.

September 23rd Celebration

We celebrated the successful completion of the Project with an event held on site, where guests and local media could walk the new Circuit and learn more about the program. Field School Supervisors and some graduates were on hand to pass out brochures and guidebooks to guests and answer any questions they might have. A series of supplementary posters with more information on the history of Memphis and the MSCD Project provided additional content for the event.

Mark Lehner welcomed the guests with an introduction to the Project and Circuit before leading a tour of some of the sites to those assembled, including Kamal el-Daly, the Governor of Giza; Dr. Sahr Nasr, Minister of Investment and International Cooperation; Dr. Moustafa Waziri, Chairman of the Ministry of Antiquities; and Thomas Goldberger, US Chargé d'Affaires. Later, Egyptian Minister of Antiquities Dr. Khaled el-Anany joined the tour and also gave a speech, along with Drs. Lehner and Nasr and Mr. Goldberger. The event concluded with refreshments.

We enjoyed the opportunity to share the fruits of these two years of our work with others. As Dr. Jeffreys noted (page 3), it is a pleasure to help draw attention to the great importance of this ancient capital and all it has to offer us. We hope the MSCD Project spurs on yet another renaissance in Memphis's long and fabled history.

Above: Graduates of the MSCD Field Schools prior to the start of the event. The students were stationed throughout the museum to answer any questions guests may have had, while some were interviewed by a local television crew. Photo by Amel Aweida.

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FROM THE AMERICAN PEOPLE

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Mark, at lower right on podium, giving the introduction to the project, prior to a tour of the circuit. Inset: Mark with supplementary poster behind him. Photos by Bassem Ezzat.

Kafr, Village of the Pyramid Sheikhs at Giza

by George L. Mutter and Bernard P. Fishman*

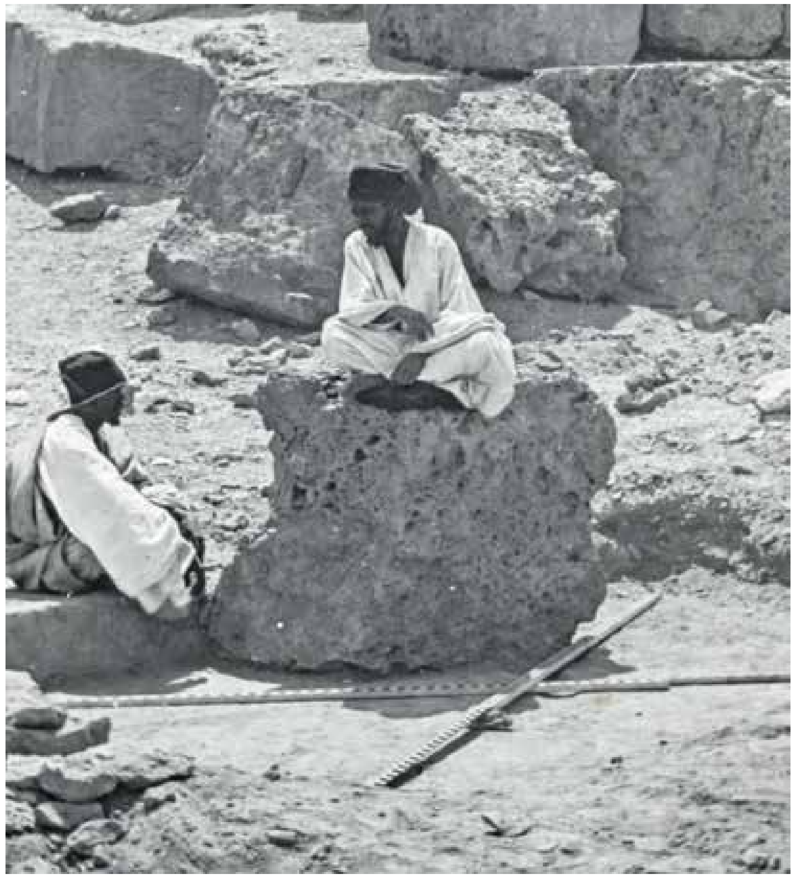
"In proceeding to the pyramids…near the village of Cafr el Batran I was met by two men, who stretched out a red ribbon before my donkey, to intimate that I must stop and give a backshish"

Colonel Howard Vyse, May 23, 1837[1]

The Giza village of Kafr figures prominently in 19th century historic accounts and photographs, but its location was lost during expansion and overbuilding of the modern city of Giza. We here use 150-year-old photographic images, and contemporary writings by archaeological explorers, to fix its location today.

Kafr was a village perfectly situated to intercept arriving visitors as they crossed the floodplains from the Nile to the Giza pyramids, a stream of Europeans that increased dramatically following the French invasion by Napoleon. From their elevated position in the village, the headmen or "sheikhs" would see anyone coming from miles away, meeting them en route to offer their services as guides. Thus the people of Kafr became de facto local custodians of the Giza pyramids, and were engaged as workmen by almost all European explorers and archaeologists working on the plateau before 1900. Alee Dobree (photo on the right) was a Kafr villager who served as a basket boy to Howard Vsye,[1] chief assistant to Charles Piazzi Smyth,[2] and beloved foreman to William Flinders Petrie.[3]

For these reasons, Kafr (also known as "Cafr," "Cafr el Batran," and the "Northern Pyramid Village") figures prominently in the recent history of the Giza pyramids. Interviews with villagers in 1865 by Piazzi Smyth recorded a tradition where, just after the invasion of Bonaparte, the local fellaheen allied themselves with a "great Sheikh of the Libyan desert."[4] This Bedouin leader was having trouble feeding his flocks along the sandy plains and decided to settle himself in one of the villages near the Pyramid. He approached the head of the village, married one of his daughters, and offered his livestock and men to cultivate the fields. In 1865, Charles Piazzi Smyth encountered two grandsons descended from this marriage:



Alee Dobree, a Kafr village "pyramid sheikh," sitting on a pyramid block in the northwest socket of the Khufu pyramid. Charles Piazzi Smyth, 1865. Original glass positive stereophotograph labeled in manuscript: "Socket Of Corner-stone Of Ancient Casing Of Great Pyramid, At Its N. West Corner. First Discovered By The French Savants Of 1799. C.P.S. 1865". Digitization and permission courtesy of Photoarchive3D Collection. Online at www.Photoarchive3D.org. [NegNr-018106, ObjNr-008518].

Abdul Samed, the village sheikh of Kafr, and pyramid sheikh Alee Dobree who "is alone, of all the village population, allowed by the Government to retain his gun."[4] Kafr retained a village sheikh, in addition to several "pyramid sheikhs," who met tourists and supervised excavation crews on the nearby Giza plateau. Smyth observed,

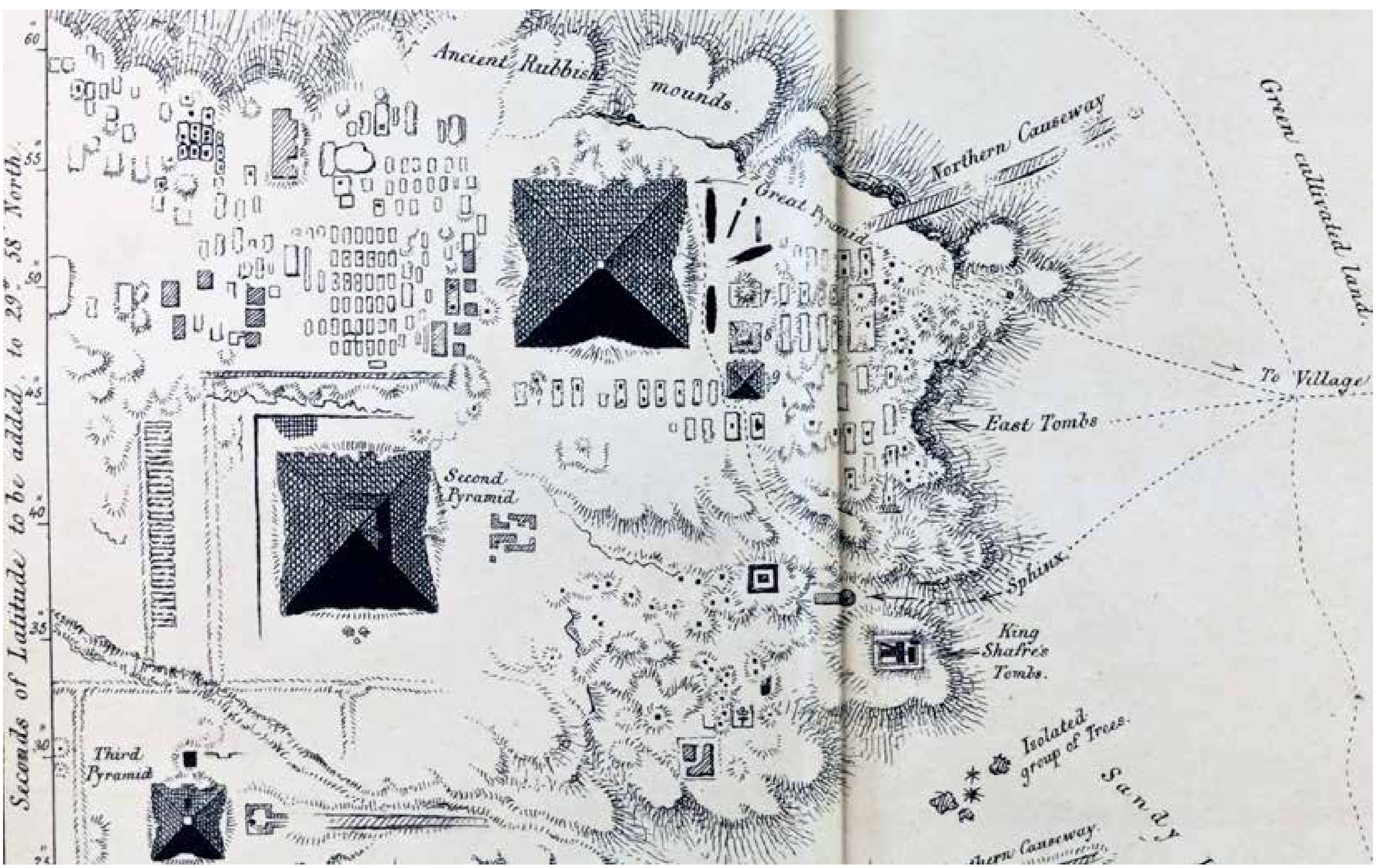
> …party after party of travelers, either coming to or going away from the Pyramids; and continuing so to do, from early morn to eve… Our position… in the East Tombs was singularly convenient for overlooking all these social phenomena, and yet without being positively disturbed by them. For, right in front, or eastward, lay the nearest Pyramid village."[5] (see photo and map facing page).

Europeans coming to Giza for more than a daytrip became temporary residents, heavily dependent on the local infrastructure based at Kafr. Prior to the opening of the Mena House

*The authors are founders of Photoarchive3D (www.photoarchive3d.org), a high resolution digital archive of over 30,000 historic stereophotographs, including many from Egypt. In addition to a passion for history and preservation of the photographic record, both have day jobs. G. Mutter is Professor of Pathology at Harvard Medical School, and a practicing gynecologic pathologist. B. Fishman is a trained Egyptologist with field experience at Luxor, and museum administrator, who now is Executive Director of the Maine State Museum. They can be reached by email at: gmutter@gynepath.org, bernard.fishman@maine.gov.

Above: *Photo A*. Giza pyramid village, Nile, and distant Moqattam Hills looking east from the Giza Plateau escarpment as photographed by Charles Piazzi Smyth from his eastern tomb encampment. His caption reads, "The northern of the two pyramid villages from east tombs. Instantaneous. Cattle grazing near village. C.P.S. 1865." Half of a stereo-photograph positive on glass. Charles Piazzi Smyth, Edinburgh, 1865. Digitization and permission courtesy of Photoarchive3D Collection. [NegNr-018063, ObjNr-008511].

Below: The Giza Plateau and eastern footpaths to the floodplain village, 1865. Charles Piazzi Smyth added the footpath configuration and location to the 1837 map by Vyse.[6]



Hotel in 1886, hardy visitors could bring their own provisions and manage a few uncomfortably hot nights in tents. For longer stays, rock cut tombs had several advantages, including a cool interior, security, and floors that could be brushed clean. Those tombs accessed by vertical shafts were impractical, but walk-through doorways were characteristic of those sunk horizontally into the 130-foot-high, precipitous vertical cliffs on the east side of the plateau. Beautiful views of the Nile Valley, gentle breezes, and a constant parade of new arrivals made these "East Tombs" especially attractive (Photo A, page 11). Thus, the vertically tiered tombs along that section of easternmost cliff from the Khufu causeway, south to the Sphinx (map, page 11), became favorites during the extended stays of Vyse (1837), Piazzi Smyth (1865), and Petrie (1880–1882). Limited provisions could be acquired locally through the pyramid sheikhs of Kafr, who made a great show of clearing the tombs of snakes and sand before relinquishing occupancy.

A Village Lost

Several factors contributed to the disappearance of Kafr, long notable for its situation controlling access to the Giza Plateau, and elevation capable of withstanding most Nile inundations. It never was accurately surveyed. Vyse complained in 1837 that the location of the villages was incorrectly recorded by the Napoleonic expedition in the *Description de L'Egypte*,[7] and most

Photo B. View of the Village looking west from the Nile at Giza. Large format albumen print by Wilhelm Hammerschmidt, Cairo, c. 1858-1860. [NegNr-018696; ObjNr-008768] Digitization and permission courtesy of Photoarchive3D Collection.

detailed maps of structures on the Giza Plateau do not extend very far beyond the Eastern tombs. It is difficult to know which of the conflicting historical maps are in fact accurate.

Another blow came with a decline in local influence of the pyramid sheikhs themselves. In preparation for Empress Eugenie's 1869 visit to commemorate opening the Suez Canal, an elevated pyramid road was built across the floodplain to the northern aspect of the Giza plateau, site of the future Mena House hotel. This circumvented the traditional visitor path alongside the village, and the pyramid sheikhs no longer found themselves uniquely positioned to intercept tourists.

Lastly, urban development then erased Kafr's physical presence and dispersed the population. The 1902 Baedeker map of Giza shows no permanent structures immediately at the foot of the eastern escarpment of the Giza plateau.[8] At that time, the "Arabian village, Kafr" is designated, but it lies east of the cliff-like plateau, off the map frame. Cessation of the annual inundation, with construction of successively higher Aswan dams in 1902 and finally 1964, had the effect of transforming surrounding arable floodplain into potential building sites. By 1928 a new village designated "Kafr el-Samman" (later known

Photo C. Another view of the Village looking west from the Nile at Giza. Half of a stereo pair by Wilhelm Hammerschmidt, Cairo, c. 1858–1860. [NegNr-003532; ObjNr-001744] Digitization and permission courtesy of Photoarchive3D Collection.

as Nazlet es-Samman) appears immediately abutting the Giza Plateau,[9] and by 1977 the entire ex-floodplain was populated, as shown in the MHR 1977 map (pages 14–15).[10] Thus, the village of Kafr was lost, no longer recognizable by name or geographic location amongst the warren of confluent buildings extending from the eastern cliffs of the Giza Plateau to the Nile.

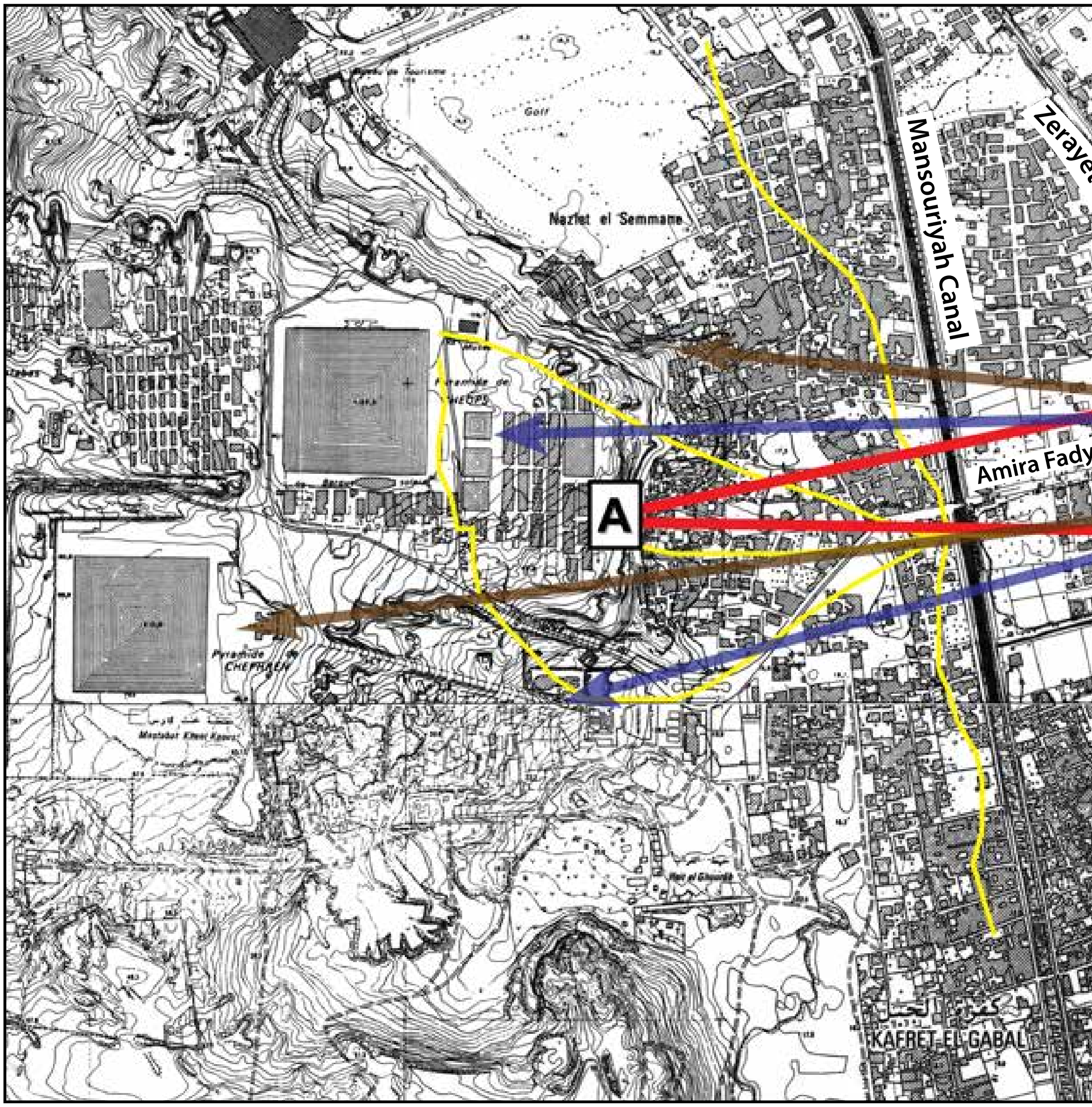
Mapping of Kafr from the 19th Century Photographic Record

Kafr, the northernmost of several pyramid villages (there was a southern counterpart of lesser prominence), is documented in 1865 photographs of Charles Piazzi Smyth (page 11) and 1858–1860 photos of Wilhelm Hammerschmidt (photo on facing page and above) as due east of the Khufu pyramid within the floodplain upon an elevated rise crowded with mudbrick buildings and tufted clusters of palms. Its elevation is due to an unknown combination of natural geologic features and accumulated debris of long-term occupation (a tell). The 19th century photographic views, unobstructed by modern buildings, objectively illustrate the village and its natural topography against prominent monuments and geological features which are conserved to the present day.

An 1865 stereophotograph by Charles Piazzi Smyth taken from his eastern tomb home (Photo A, page 11) looking eastwards towards Kafr, is accompanied by a map of footpaths from the plateau towards the village (map, page 11). The footpaths are approximate modifications after Vyse, but their general configuration is informative (yellow lines, map page 14), as the photo shows features intervening between the plateau and Nile, including the village, footpaths, and line of cultivation. Viewing the original stereoscopic Photo A (page 11) in conjunction with the map overlay (map, pages 14–15), it is evident that the line of cultivation corresponds to the course of the Mansouriyah Canal, which is located halfway between the photographer's Position A (on map, page 14) and the village. This places the western boundary of the village at or near the more distant Zerayet Zaghloul Canal, also visible in Photo A. The direct west–east path from the eastern tombs to Kafr approximately follows Amirah Fadyah (Al Amira Fadia) Street.

Lines of sight within two circa 1858–1860 westward-facing photographs (Photos B and C, facing page and above) that include both Kafr and plateau monuments were used by the au-

Village position extrapolated from Photographs A-C onto 1977 topographical map. Positions B and C are photographers' vantage points for Photos B and C (pages 12–13), respectively, determined from landmarks exclusive of Kafr village itself. Blue and brown lines are vectors delimiting northern and southern boundaries of the village from viewing positions B and C, as projected from distant landmarks on the Giza plateau. The approximate vantage point of the vintage Photo A (page 11) is known from Smyth's records to be from the eastern tombs, facing east towards the village with left and rightmost image boundaries shown by red lines. The 1865 footpaths are overlaid in yellow, based upon scaled alignment of Piazzi Smyth's map (page 11). The background is the 1977 Ministry of Housing and Reconstruction (MHR) 1:5,000 topographical map of Giza, Folio F-17.[10] The green polygon indicates the domain of the 1865 village of Kafr.



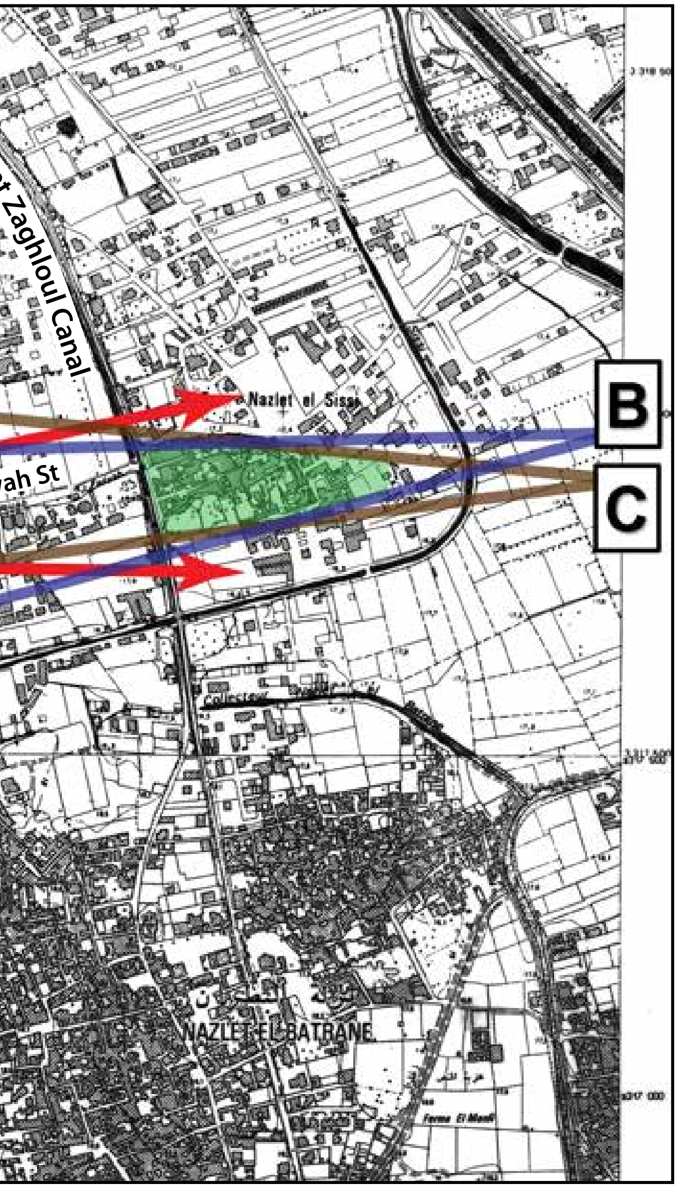
thors to delimit the northern and southern boundaries of the village. The location of the photographer was first triangulated by reference to multiple pyramid angles (Points B and C on map on the right) on the plateau. Then, the relative position of the north and south boundaries of the village mound were projected by line of sight from the photographer's position to identifiable landmarks in the background (blue and brown arrows on map above). Combined, these vectors define a perimeter encompassing the putative domain of Kafr village (green overlay on the two maps). The highest elevation contour lines within the delimited region measure 20.9 meters above sea level, at a vertical height some 3 meters greater than that of the surrounding flatland with elevation of only 17.1–17.6 meters above sea level (brown overlay on map on facing page). Knowing the village was elevated to this approximate extent above the floodplain, we assign the historic village of Kafr to latitude 29°58'43.87" N, longitude 31°9'1.51" E, which is in the Giza neighborhood presently known as Nazlet el Sissi.

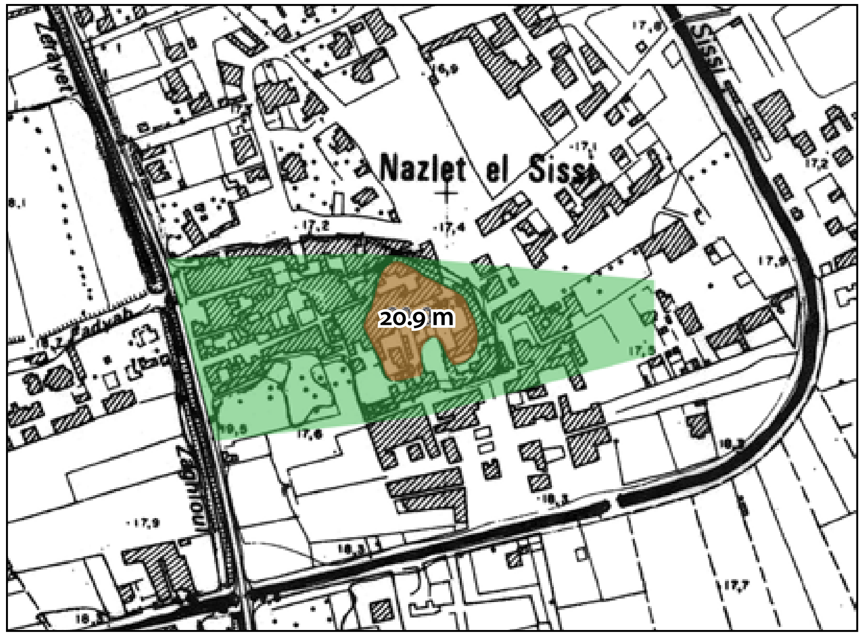
Conclusions

Kafr is important, as a point of contact, and collaboration, between European explorers and native Egyptians. The contributions of the "pyramid sheikhs" to our understanding of the Giza Plateau have been explicitly acknowledged by Smyth and Petrie, who respectively note that Alee Dobree was "a man of sterling moral worth; endued too, with quite enough general knowledge to become a very good helper in mechanical researches about the Great Pyramid,"[11] and "was a greater help in measuring than many a European would have been."[12] The sheikhs carried forward local skills, and knowledge, between expeditions. When the engineer Inglis, working with Charles Piazzi Smyth to uncover all four corner sockets of the Khufu pyramid, had trouble locating that in the northwest, one of the Kafr sheikhs stated that members of the Napoleonic expedition had marked the spot with a pyramid block. This is the story of the photo on page 10, fittingly documented.

Our work demonstrates the unique value of early photography in documenting monuments and structures that have become lost or unrecognizable. Internal reference to preserved landmarks, such as those which figure so prominently at Giza, allowed precise localization of Kafr.

Settlement at that specific site in the 19th century was no accident, having been particularly advantageous because of its





Above: The 19th century village of Kafr is in the Nazlet el Sissi neighborhood. The 19th century photographic record defines an outer perimeter (light green) for the current location of the village, lying east of the Zerayet Zaghloul canal. The highest local elevation at 20.9 meters elevation above sea level (brown) is approximately 3 meters higher than immediate surroundings.

protected elevation within cultivated fields of the floodplain. We can only speculate on what came first: a natural elevation that attracted settlement, or a manmade accumulation of underlying debris.

An interesting AERA archaeological discovery of the last decade is that what we now know as Kafr, or Nazlet el Sissi, was probably flanked on the west by a contiguous Old Kingdom harbor and canal that served the monuments of the Giza Plateau.[13] Further textual evidence comes from a cache of 4th Dynasty papyri published in 2017 from the site of Wadi el-Jarf on the Red Sea, where an official, "Inspector Merer," involved in transporting Tura limestone by ship for construction of the pyramid of Khufu references the *She Khufu*, or "Basin of Khufu."[14, 15] This raises the possibility that the village of Kafr might incorporate, or be built upon, the *Ro-She Khufu* or "entrance to the pool of Khufu," mentioned by Merer as part of the ancient harbor complex at Giza. This is unproven, but we know where to look if that idea is to be tested.

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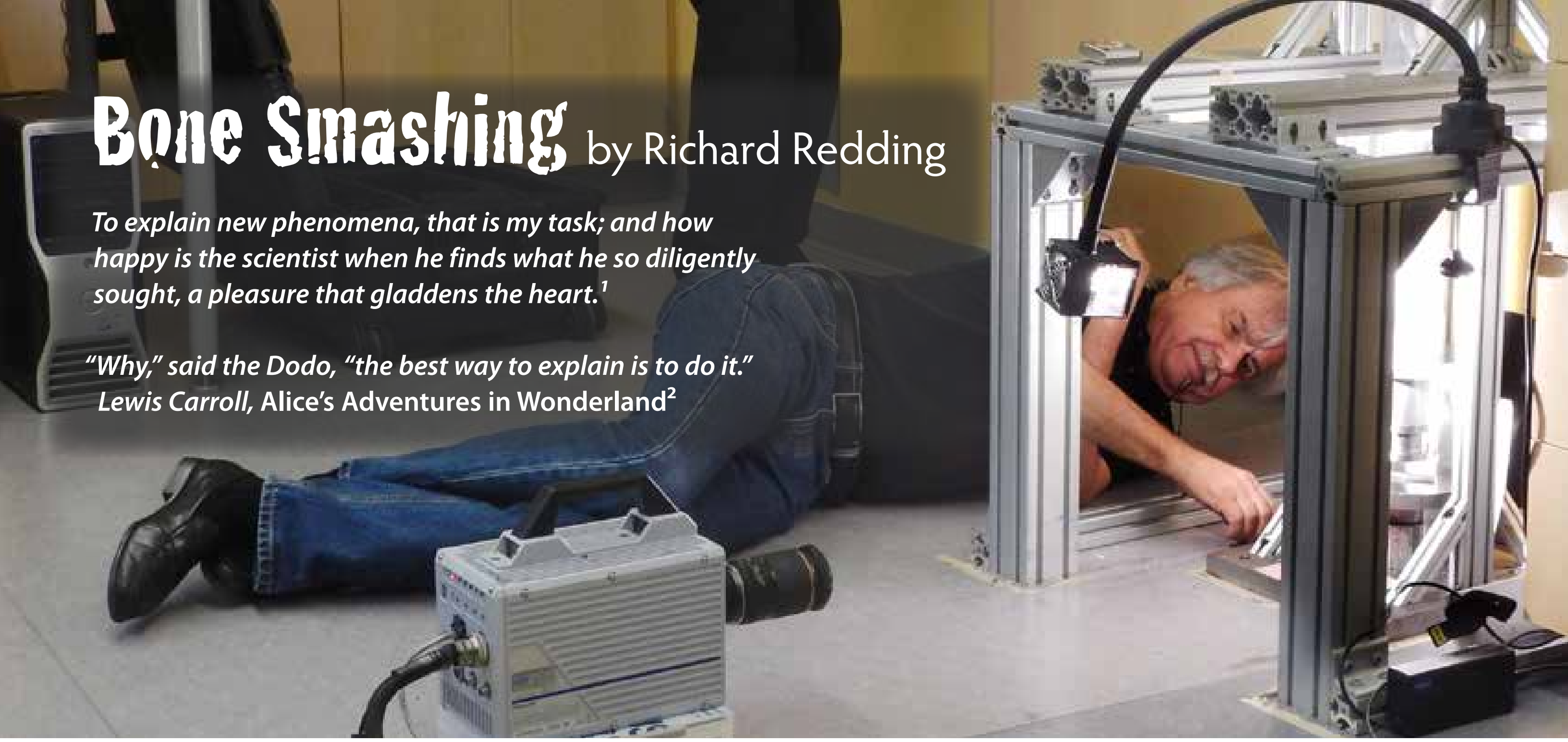
Bone Smashing by Richard Redding

To explain new phenomena, that is my task; and how happy is the scientist when he finds what he so diligently sought, a pleasure that gladdens the heart.[1]

"Why," said the Dodo, "the best way to explain is to do it."
Lewis Carroll, Alice's Adventures in Wonderland[2]



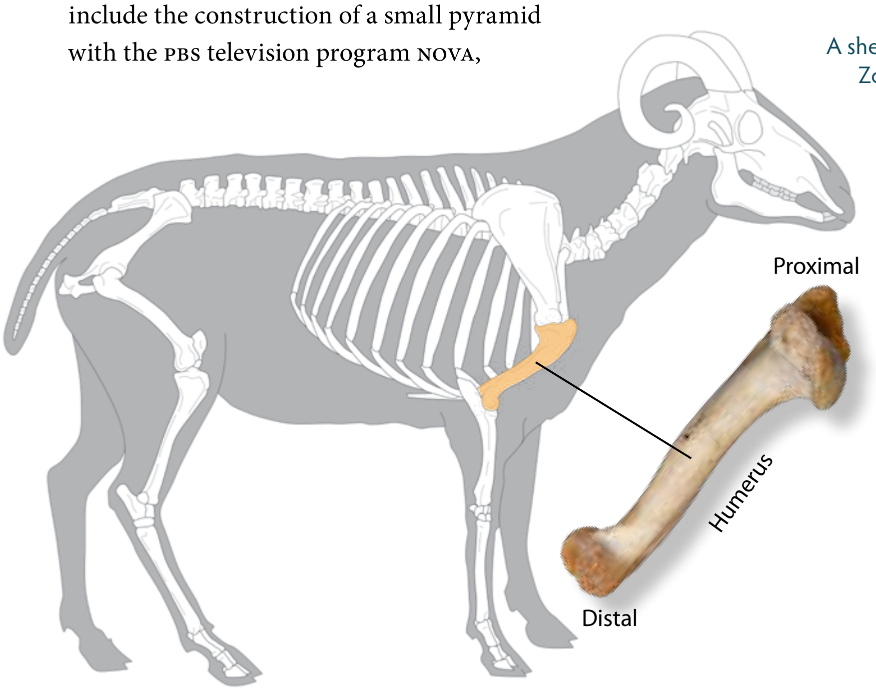
Richard Redding positions a sample in the drop tower in the Breaker Space Lab at University of Michigan. Photo by Claire Malleson.

I tell students that the most important question in archaeology is why. Explanation is the goal of science and, of course, archaeology. One of the many tools in the archaeologist's toolbox is experimental archaeology. Archaeology is not a field that you would associate with the word experiment. But in experimental archaeology we actively try to recreate through experiment the processes that yielded the rich culture history we find. By recreating buildings, tools, pottery, and the features we find, and by trying to perform the tasks that the ancients did, we can test ideas about the past and how work was done.

AERA has a long history of using experimental archaeology to help us understand what we find at Giza. Two examples of large scale archaeological experiments conducted by AERA include the construction of a small pyramid with the PBS television program NOVA, shown in the episode "This Old Pyramid" (1992), and the construction and use of an Old Kingdom bakery in 1993, sponsored by National Geographic.[3]

Broken Bones

I have started a new experiment to address one of the problems I am encountering with the fragmented animal bones from Giza. Bones are almost always broken either purposefully, to remove the fat and marrow from the cavity inside limb bones, or accidently, after they are disposed of and trod upon by humans and animals. So we end up with broken shaft



A sheep skeleton with the humerus highlighted. Courtesy of ArcheoZoo.org. © 1996 ArcheoZoo.org / Michel Coutureau (Inrap), Vianney Forest (Inrap). After R. Barone, *Anatomie comparée des mammifères domestiques, Tome I Ostéologie - atlas.* Paris: Vigot, plate 8, page 23, 1976.

Left: Photo of a sheep humerus. Below: Photo of archaeological sheep humerus fragments. All photos by Richard Redding unless otherwise noted.

The drop tower with a high-speed camera in the Breaker Space Lab at University of Michigan.

fragments and broken ends in our sample. These are the different "elements" of a bone that we try to identify.

If you assume that whole animals are being brought to a settlement for consumption, then the bones found there should be in the same proportions that they occur in a sheep, goat, or steer. For example, there should be one top (proximal) end of the humerus (upper leg bone) for each bottom (distal) end.

But this is not the case at Giza and at many archaeological sites around the world. Using the humerus as an example, the number of distal humerii far exceeds the sample of proximal humerii in our samples. This kind of bias is true for many bones in our sample of domestic animals. Why?

A bias in the representation of different parts of the various bones in the body is a problem that archaeozoologists—archaeologists who study animal bone—have found throughout the Old World and from the Paleolithic through Medieval periods.

For almost four decades the conventional wisdom among archaeozoologists has been that biases in the representation of body parts is largely due to differential destruction. For example, the proximal humerus has a low ratio of very hard surface bone to soft, spongy bone while the distal humerus has a very high ratio. The argument goes that bones with a low ratio are easier to fragment and will disappear more quickly from the archaeological record. Archaeozoologists have used bone density, determined by several different techniques, to estimate the survivability of different bones and different areas of a bone.[4]

Smashing Bones

I have been concerned that the use of estimates of bone density as a proxy for bone survivability neglects the internal structure of bone that is designed to resist forces. So, I decided to test bone resistance to fracture and destruction directly, by smashing bone!

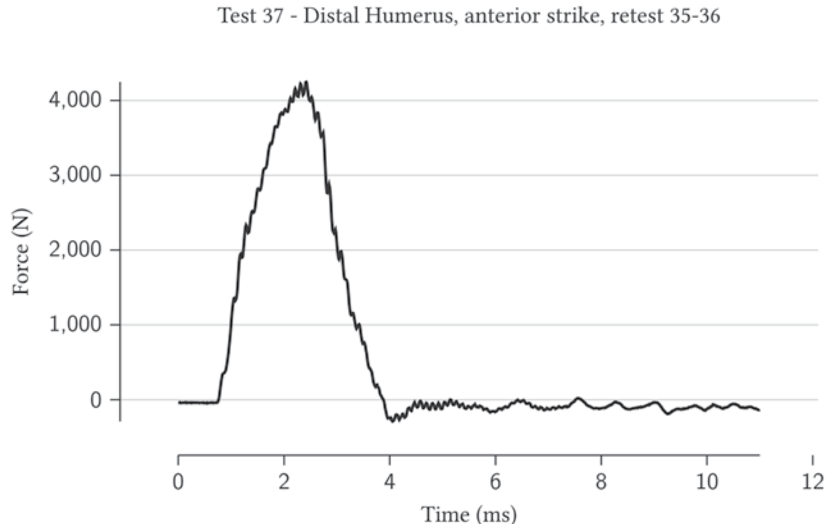
Left: A distal humerus sitting on the lower plate that has an embedded piezoelectric sensor.
Below: A fractured distal humerus from a test.
Bottom: A humerus that has been hit mid-shaft in a replication of breaking a bone to remove the marrow.

Along with an engineering colleague, Andy Poli, I have been using a drop tower (top left, page 17) in the aptly named "Breaker Space Lab" at the University of Michigan to break bones and record the amount of force (in Newtons) that is required to produce the breaks.

The weight in the drop tower falls onto a test specimen, a bone in our case, sitting on a plate (bottom left, page 17). Under the plate is a piezoelectric sensor that detects forces generated on the bone and transmits them to a transducer and then to a computer. The output for each test is a graph, with force (N) and time (s) (on the right).

We first broke each bone in the middle—the shaft connecting the ends. This replicates the activity of human butchers who break limb bones to remove the marrow and fat found in the cavity. Then we broke the distal and proximal ends (photos, page 17).

I have now tested all the limb bones of four sheep. I have found that the best measure of a bone's ability to resist breakage is the "Impulse." Impulse is force divided by time and is the area under the curve on the right. When I statistically test the impulse for each element of a bone (e.g., a shaft, distal end, or proximal end) against the published densities for the elements, I find no correlation. This means that bone density is not a good measure of a bone element's ability to resist breakage.



A graph showing force (Newtons) and time required to fracture a distal humerus.

Boiling Bones

I have also worked on a related problem. At Giza the bones of sheep, goats, and cattle were broken to expose the marrow cavity and then boiled in a stew.[5] Boiling animal parts to make stew is a practice found in many areas of the world. Boiling bone should weaken the structure and make it more susceptible to fragmentation. I have boiled bones from two of the four sheep I have tested. I am still doing the analysis of these tests, but I hope to not only be able to find whether boiled or unboiled bone is more resistant to fracturing, but through examination under a microscope be able to differentiate between boiled and unboiled bones.


Boiling the distal and proximal ends of the limb bones of a sheep to test in the drop tower.

Why the Bias?

This brings us back to the original question of the bias in representation of different bones elements at Giza and other sites. If it is not density mediated then what is the cause? At this point in our work Andy and I think it is the result of differential effects on the bone due to boiling. But we have much more work to do and ideas to test. We want to compare the fragments produced in the lab with the fragments at Giza. Do consistent patterns appear that need to be explained? It is through experimental archaeology that we will understand the biases in faunal samples at Giza and address the general problem of biasing. As the Dodo said, "the best way to explain is to do it."

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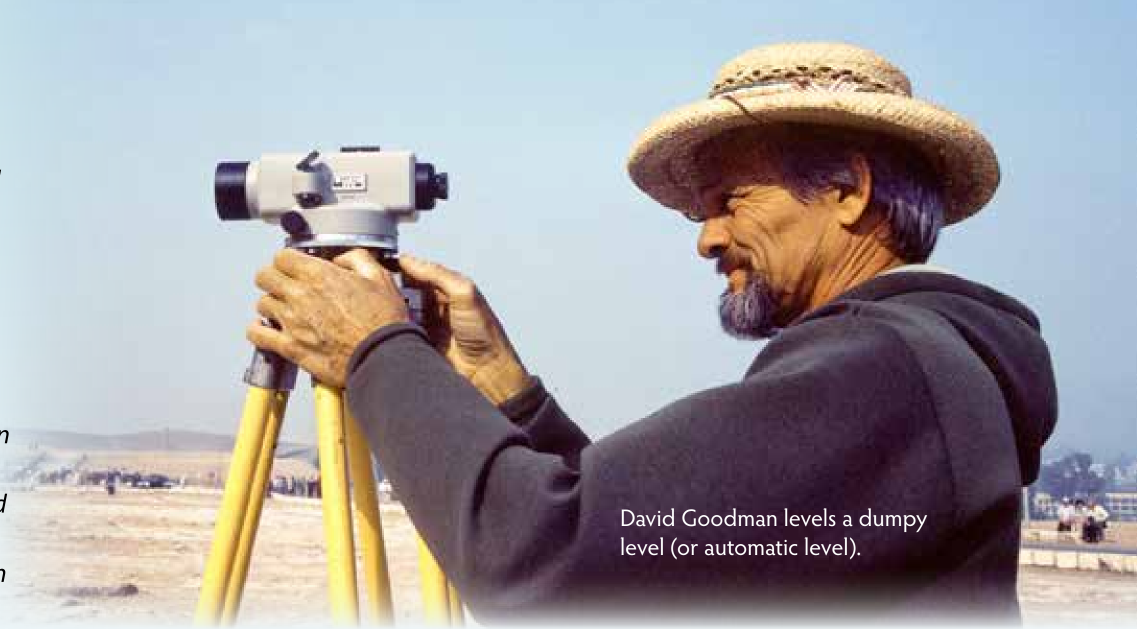
David Goodman: Back to the Point of Beginning by Mark Lehner

Last December I learned that David Goodman had passed away on October 30.

David and I started the GPMP in 1984. The GPMP established the basis for all our survey, mapping, and excavation work at Giza. For me, David was a companion, great friend, and mentor. It was a joy to know and work with David. I will miss him.

Allow me to pay tribute to David by telling a bit of our time together, when it was just the two of us galumphing across the Giza Plateau in an old Land Rover, whose breaks kept giving out, and when lunch was a can of tuna, an orange, and a thermos.



David Goodman levels a dumpy level (or automatic level).

I was surprised when David Goodman told me, right away, on the telephone, that he would come all the way to Egypt and help me establish my newly conceived Giza Plateau Mapping Project (GPMP). It was 1984. David, a "Licensed Professional Surveyor and Registered Civil Engineer" at CALTRANS (California Department of Transportation) had been working with Kent Weeks's Theban Mapping Project (TMP) since 1978, setting survey control and mapping tombs in the Valley of the Kings and across Luxor's West Bank. I remember the TMP as state of the art, setting new standards for Egyptian archaeology. David brought Electronic Distance Measurers (EDMs), then as big as and weighing as much as a truck battery. Members of a whole TMP team had to lug the EDMs up and down the Theban mountain. My GPMP was, so far, only me.

I just was coming off the ARCE (American Research Center in Egypt) Sphinx Project (1979–1983), where my survey experience started on an old brass transit with a Vernier scale. But soon, Ulrich Kapp, professional surveyor for the German Archaeological Institute, brought a proper theodolite and photogrammetry equipment to produce elevation drawings of the front and sides of the Sphinx (see article starting on page 25). Together we surveyed a rectangle around the Sphinx and marked grid points. Later, surveyor Attila Vass and I used a Kern theodolite with a mounted EDM to expand the Sphinx grid. I knew the basics of how to use theodolites and EDMs, to triangulate points with angle measurements from grid points, and to sight and extend lines.

So, after David flew all the way from California to meet me at the ARCE office in Cairo, I explained how we could "shoot" our Sphinx grid lines to the west, up and over the Giza Plateau, to map all the pyramids, tombs, and temples. David listened until I had finished outlining my plan of action. "Well," he said, in his gravelly voice, "that's just ass-backward."

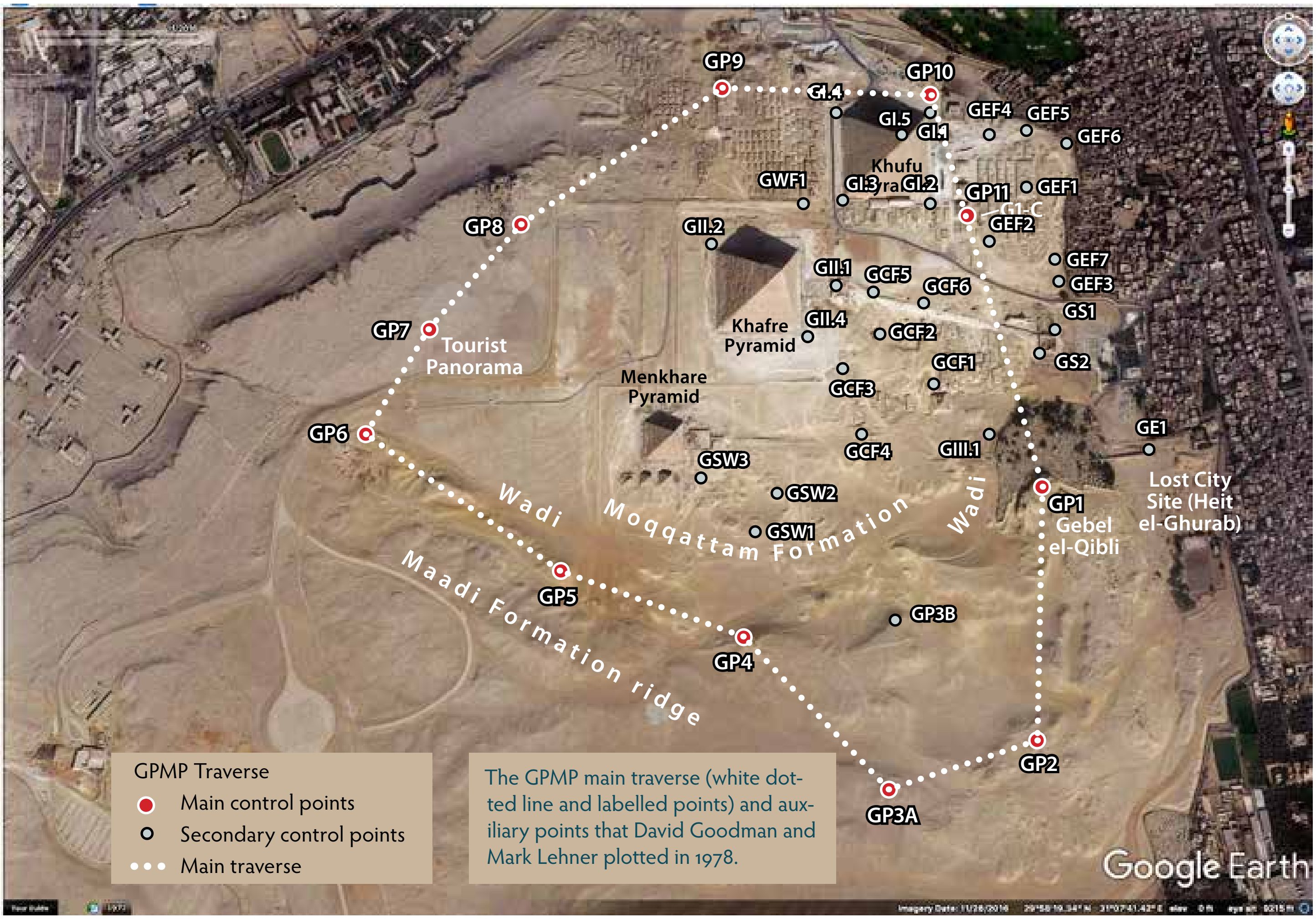
The right way: select a polygon of points, visible from one another, establish their precise locations with respect to each other and then decide on a grid and define coordinate values, anchored to the primary traverse points. We chose the calculated center of the Great Pyramid, its four corners being among our control points.

Point of Beginning

When we hit the plateau, it was just David and me and Inspector Amal Samuel in an old gray and green Land Rover, with brakes that kept giving out. We carried no survey instruments, only a canvas bag containing an electronic power pack drill with a masonry bit; two cans of paste, white and black, which mixed together produced the epoxy such as highway workers use to glue down yellow markers on asphalt roads; a spoon and trowel to mix and apply the paste; a club hammer (a small sledge hammer); a steel punch; a punch and dye letter and number set; my yellow survey notebook and camera.

In another bag, David brought surveyor markers. These "monuments," as David called them, were round aluminum disks with a toothed stem on the underside, ending in a round magnet.

Our procedure: select a survey point, drill a hole for the toothed stem, mix the white and black paste into a pad of epoxy around the hole, and set in the disc. The corrugated stem would



The GPMP main traverse (white dotted line and labelled points) and auxiliary points that David Goodman and Mark Lehner plotted in 1978.

help hold the disc; the magnet on the end would help locate it later, if buried, with a magnetometer. David had each marker pre-punched with "Giza Plateau Mapping Project GPMP." As we set each point, we would punch in the name of the point and the date.

"What's the highest place where you can see most everything else?" David asked. "We'll start there."

I knew exactly where to start—the top of the Gebel el-Qibli (the Southern Mount), a knoll that rises 150 feet, about 1,312 feet south of the Sphinx. From the knoll, you look over the mouth of a wadi (arroyo), which the pyramid builders quarried wide. The wadi separates the Moqattam Formation outcrop at Giza—the Pyramid Plateau proper—from the younger Maadi Formation. From here the entire Giza pyramids tableau presents itself on a slope of 6° down into the wadi below your feet.

The Gebel el-Qibli rises at the eastern end of the ridge above the Lost City site. Pyramid builders quarried its face into a semicircle like a ship's bridge, curling around from east to north to west. Often have I imagined that Khufu's captains stood just here to command the steering, routing, and navigation of his ship of state as his forces built the Great Pyramid.

The Gebel el-Qibli became our survey point GP1—Giza Plateau 1. For our main traverse, a polygon of points circumventing the Giza Necropolis, we set ten more points on high places to the south and west, along the Maadi Formation ridge, crossing over to the Moqattam Formation at the tourist Panorama, then west, north, and east of the Great Pyramid to GP11, atop the southernmost of Khufu's queens' pyramids. From GP11, we could link back to GP1, our point of beginning.

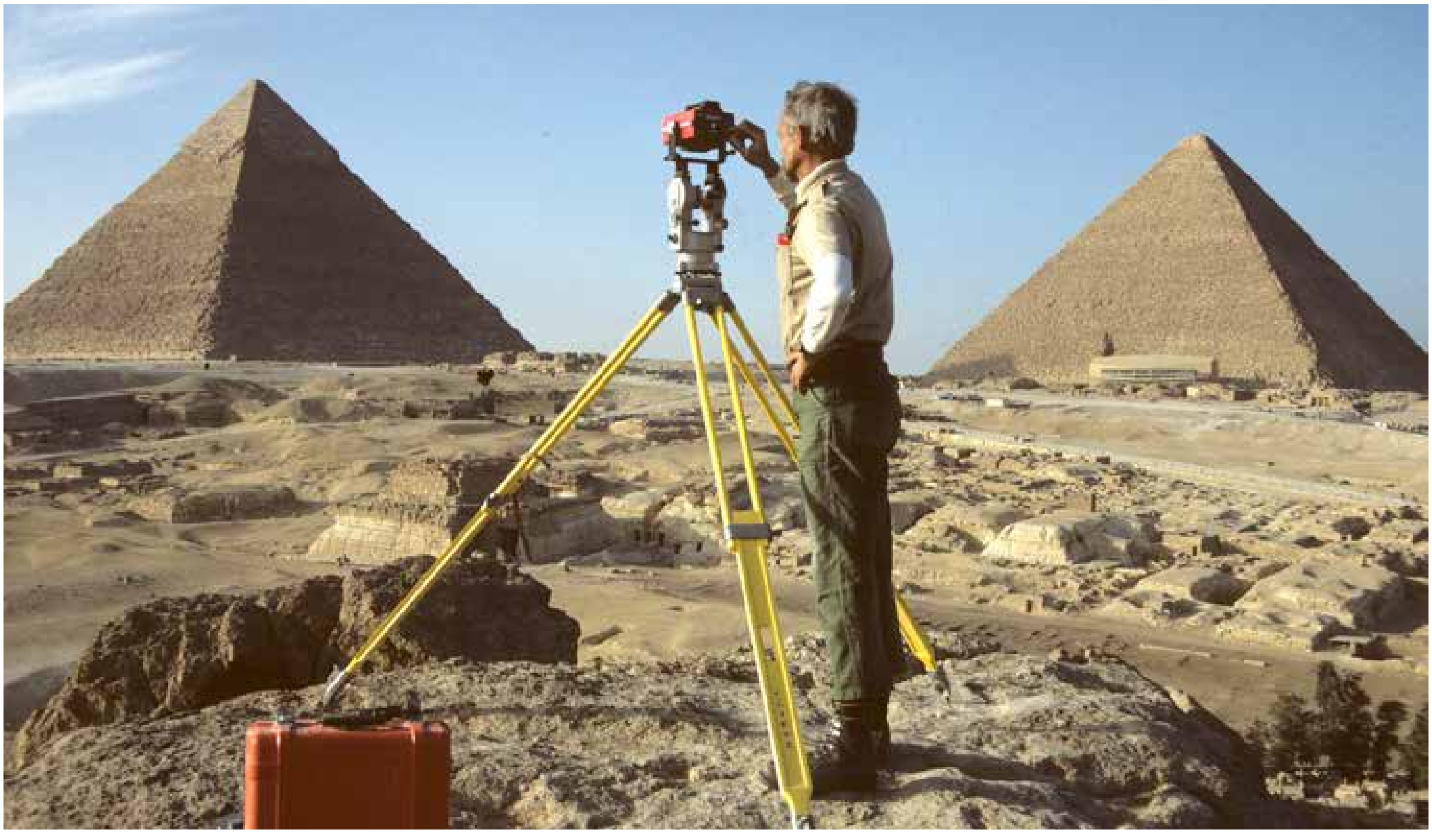
To a Gnat's Eyelash

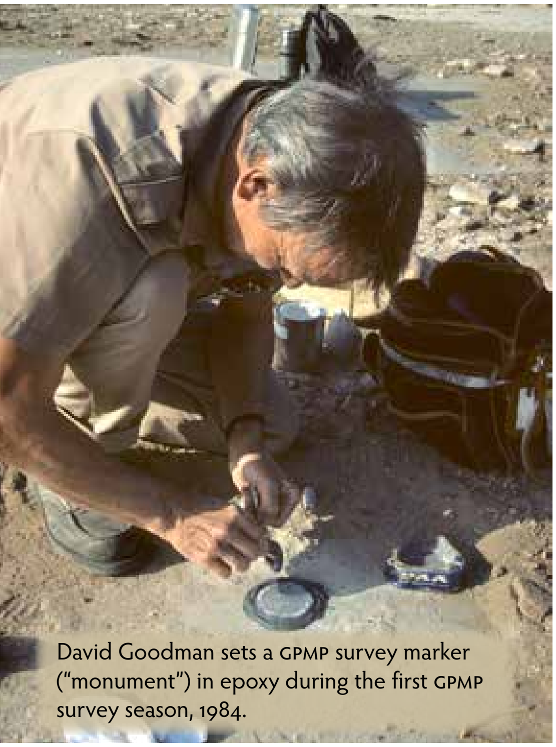
David would say that for our primary control points (and, for David, for any survey point) we needed to survey "to a gnat's eyelash." Following standard "second order" survey procedure, we needed to "occupy" each of the primary traverse points with the theodolite and EDM on a tripod, leveled and centered on that point. We would aim the crosshairs of the theodolite telescope on reflectors set up on tripods over as many of the other primary points as possible, as many as we could see, and for each point, take a distance measurement and an angle measurement with reference to a "back sight," a reflector set over another traverse point behind us. Fixed on the back sight, we set the theodolite scale to near zero.

This procedure meant a lot of walking and driving across the plateau. We came to appreciate the site's broad sweep. In our muscle memory, we ingrained a sense of its bumps and ridges, its sand-filled swales and soft spots (where the Land Rover got stuck so often)—the "geomorphology" of the Giza Plateau. Usually, David would "take the gun," that is, stay at the theodolite. Sometimes he took measurements to points as soon as I had set up the reflector over them. But mostly he would wait until I had set reflectors on several points. Then I would drive back to

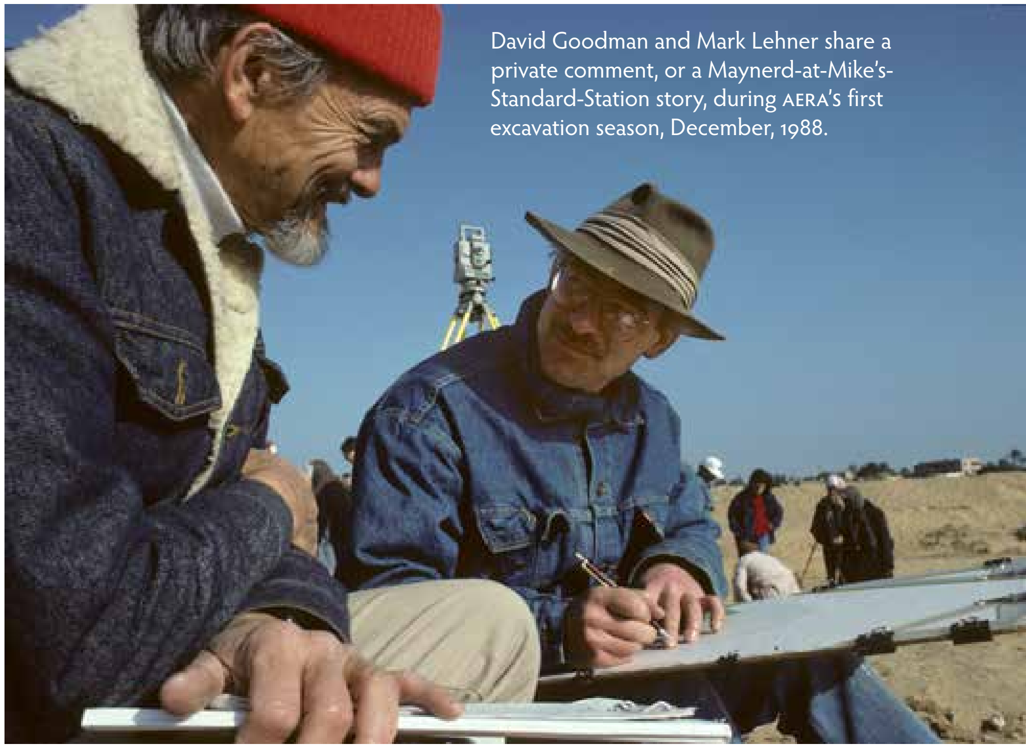
Above: David Goodman packs equipment for bumpy transport in the old green Land Rover with a canvas-covered back, as M. Abd el-Gadar assists and Mark Lehner waits in the driver's seat. All photos by Mark Lehner unless otherwise stated.

Below: David Goodman adjusts the Lietz-Sokkia theodolite and Red 2A Electronic Distance Measurer (EDM) at the GPMP Point of Beginning (POB), GP1 on the Gebel el-Qibli. Pyramid of Khufu (right) and Khafre (left) in the background.





David Goodman sets a GPMP survey marker ("monument") in epoxy during the first GPMP survey season, 1984.



David Goodman and Mark Lehner share a private comment, or a Maynerd-at-Mike's-Standard-Station story, during AERA's first excavation season, December, 1988.

David Goodman, "at the gun," signals that he has taken the angle measurement with the theodolite, and the distance measurement, with the Red 2A EDM, so the target reflector and tripod can be removed from survey point GP11, atop queen's pyramid GI-C, during the 1984 season.

the occupied station where, at David's side, I filled out the standard traverse forms he brought from CALTRANS. David had his bugaboos about punctuation and the penmanship of print (vs. cursive) writing. (At first he did not like my 7s, which I learned to cross, as did David and as do our European colleagues).

David would fix the telescope to each point where I had set reflectors in turn, say from south to west, and take an angle and distance measurement, with the telescope in normal position. Then he would flip the telescope 180° (so upside down) and take the same measurements back through the points, from west to south, and then check to the back sight. By flipping the telescope 180° and re-measuring, we could average out any error due to the rotation of the telescope on its axis. He called out the readings–"naughty, naughty" for zero, zero–and, sitting beside him, I would fill the field on the form in pencil—no Excel spreadsheets yet. (David eschewed erasures. Crossing out your mistakes, he said, is more accurate and objective). Next David would turn the theodolite's one-second scale about a quarter, say from near zero to near 15 seconds of arc, and do the whole set of angle and distance measurements again. He did a complete set of measurements, direct and reversed telescope, for each quarter of the one-second scale. This was to average out any error due to inaccuracies in the scale.

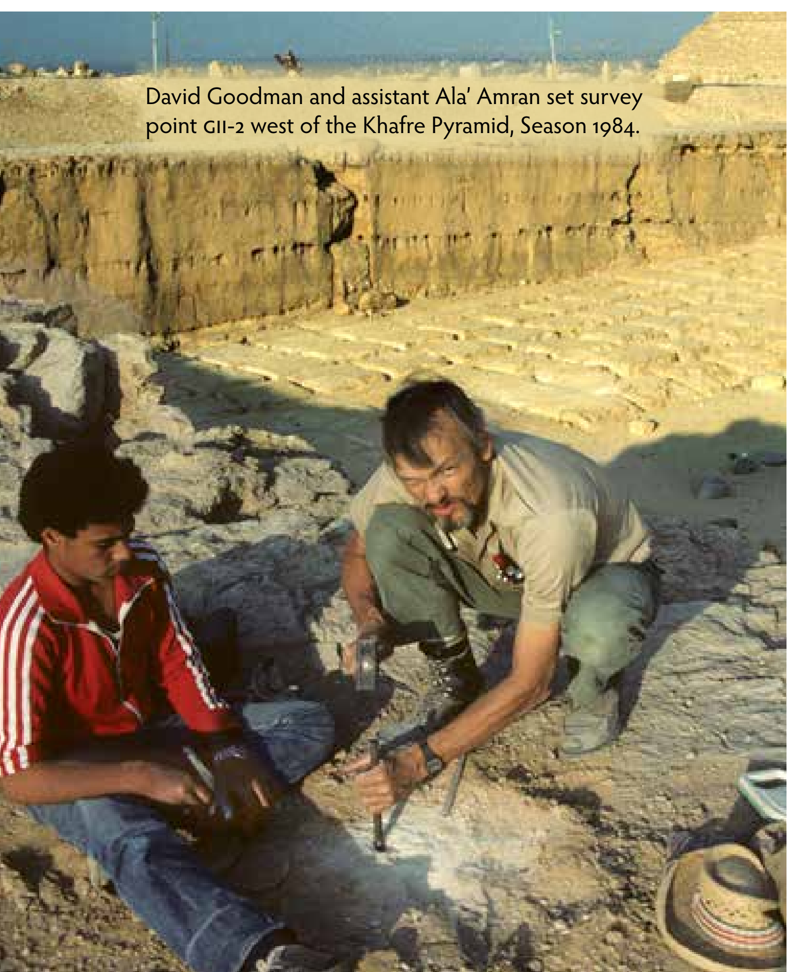
And thus, we tried to survey to a gnat's eyelash.

One day our procedure left David stranded atop queen's pyramid GI-C, where we had set our survey point GP11. He climbed the pyramid with the theodolite, EDM, tripods, survey forms, calculator, and notebook. I drove around the plateau setting reflectors on tripods on as many points as David could sight from GP11, and as many tripods, tribrachs,[1] and reflectors as we had. By now we had set additional points, auxiliary to the main traverse, around the quarries, in the mastaba fields, at the Sphinx, on the Wall of the Crow. I set up some half dozen reflectors far to the south and southeast, and then drove the Land Rover back to David via the gated area east of the Sphinx. But the gate was closed. Authorities had ordered all pedestrians and visitors out of the site. Uniformed policemen were deploying up the plateau and all around the Sphinx and Great Pyramid. All this for the visit of a VIP, no less, we heard later, than the President of Egypt.

But there stood David at the theodolite, tiny and alone upon the pinnacle of pyramid GI-C. I cajoled my way through, on foot, and walked up the plateau to the base of the queen's pyramid. I shouted up to David that he had to break it down, and stop work. He was only midway through this set of measurements, and less than pleased. We got David and the gear down the pyramid, walked down the hill and out the gate, and drove the back way to the southern points to collect the reflectors and tripods. It was one of the rare times I saw David angry. Nothing should get in the way of survey! As we drove down Pyramid Road, done for the day, an entourage of official black vehicles passed, sirens blaring, on the way to the Pyramids.

Locking into Latitude and Longitude: Mad Hatter

In fact, David was never really angry—only frustrated for a moment, and unlike me, never irascible. Only one other time did I see a break in his calm and cool demeanor that befits gnat's eyelash survey.


David Goodman and assistant Ala' Amran set survey point GII-2 west of the Khafre Pyramid, Season 1984.

We wanted to tie our GPMP survey control traverse to an official, first order Survey of Egypt marker, a copper plug set in the southwest corner of the truncated top of the Great Pyramid. We found a published value of its latitude and longitude. By tying in, we could translate GPMP grid coordinates to Earth coordinates. David wanted to take an angle and distance measurement to this point on the peak of the Great Pyramid from two of our primary traverse points, widely spaced, one, GP8 on the west and the other, GP1 atop the Gebel el-Qibli.

I drove David, with tripod, theodolite, and EDM across the crusty, bumpy plateau surface far west of the mastaba (bench-like) tombs laid out in streets and avenues west of the Pyramid to where we had set our survey point GP8. Then I drove myself and our assistants, Ala' and Essam Amran, to the southwest base of the Great Pyramid, which we scaled in about half an hour with another tripod, tribrach, and reflector. I set up the reflector on a tripod and leveled it over the copper plug by alternately turning the three knobs on a tribrach so as to center the bubble level. I centered the reflector over the point on the ground with the "optical plumb," a tiny eyepiece with a center-circle and prisms that magnify the ground. I turned and tilted the reflector to the west, aiming its sights like a gun toward David, so he could center the cross hairs in the theodolite telescope on the reflector, and shoot the infrared beam that measures distance. Then I climbed back down and drove the Land Rover back to GP8, where David had taken his readings and broken down and packed the equipment so we could move to the next point, GP1.

We drove the Land Rover on our, now usual, big loop: west on the asphalt road to the Panorama highpoint where tourists take in all three pyramids together, then east and south along the Maadi Formation ridge, turning north to come up onto the Gebel el-Qibli from behind. Leaving David and the equipment to set up on GP1, I drove the loop all the way back to the southwest corner of the Great Pyramid, and climbed back up.

It was a gorgeous day, perfect for those panoramic views that can only be seen from the top of the Great Pyramid. I shot a whole roll of Kodachrome. I took photos of the Sphinx down to the southeast, Mena House Hotel and the expanse of the Delta to the north, the Khafre Pyramid to the southwest, a virtual city of tombs splayed out to the west. Switching wide angle and telephoto lenses, I reshot the whole sequence, walking back and forth across this 35.7-foot- (10.9-meter-) wide top of the world, passing the reflector on its tripod, while Essam and Ala' sat patiently on its edge.

And then it struck me. I hadn't turned the reflector! David must have been set up on GP1 with his telescope aimed at the

1. Tribrachs are the sockets or attachment plates, with optical plumbs and turning knobs and bubble levels for leveling, into which surveyors lock theodolites or reflectors. "A tribrach allows the survey instrument to be repeatedly placed in the same position with sub-millimeter precision, by just loosening and re-tightening a locking handle or lever" (https://en.wikipedia.org/wiki/Tribrach_(instrument)).

David Goodman surveying during season 1988, now with a Total Station (theodolite and electronic distance measurer combined), while teaching use of the Total Station to Inspectors Nemat Hamed Mohamed (left) and Maher Moussa (right).

reflector for nearly an hour. With trepidation I turned my camera with its telephoto lens to David. There he was, waving his broad brimmed straw hat, trying to get my attention, one eye to the theodolite telescope, seeing me pass again and again the reflector, without turning it from GP7 to GP1, and aiming it so he could take his shot. At that moment, David threw his hat to the ground, and stomped up and down. I aimed the reflector to him. He looked back in the telescope, and took his shot.

When David signaled that he had taken the shot, I broke down the reflector and tripod. Esssam, Ala', and I carried the gear down the Pyramid to the Land Rover. By the time we drove the loop around the plateau and arrived back at the Gebel el-Qibli, David had broken down his gear and calmed down.

From a Kentucky Holler to the Great Pyramid of Giza

David was a true professional. He mostly dressed in smart, clean khakis. He would keep his mechanical pencils, pen, and steel stylus (with a carbide steel tip for scribing reference crosses in stone) all aligned in his breast pocket, clipped to one of those plastic protective sleeves. When we treated ourselves to an early morning, pre-plateau, high-carb and high-cholesterol breakfast at the Giza Mövenpick Hotel, the waiters would, every time, give the check to David, and not to the younger man in dirty blue denim, his presumed assistant.

David prided himself on being a good old boy from a Kentucky holler (the valley or "hollow" between two mountains, where you can holler to your neighbor). He was polite and charming as a prince in mixed company, but creatively crude when not. I told David about my adolescence in Minot, North Dakota, when for a time, cohorts gave me the nickname Maynerd, and somehow my mention of a Standard gas station near my family's house morphed into imagined scenarios of Maynerd and the boys at Mike's Standard Station. Many an afternoon, as we sat in the old Land Rover, eating tuna from cans and oranges for dessert, David told Mike's Standard Station stories that I cannot repeat here.

When in that 1984 season we surveyed the base of the Great Pyramid, I took short measurements ("fallings" or "offsets"), barely centimeters long, from a line that David sighted from corner to corner, through the crosshairs of the theodolite telescope, so that we could plot how "wavy" the ancient builder's line was where it remained preserved.[2] One day on the east side we measured a long run of the Pyramid's platform, straight and clean in the polished white Turah limestone. Measure after measure was practically the same. The platform was proving straight as straight could be. David left "the gun" and walked down line. "Damn," he said, "They did one hell of a job." "Do you think it took advanced technology?" I asked. "Sh..t no," David said. "Give me string, a straight edge, good masons, and I could do you that job." CALTRANS, and the GPMP, were well served.

For nearly twenty years, David came to survey with us at Giza, seeing us expand our mapping to include seven hectares of 4th Dynasty settlement in the Lost City site, south of the Wall of the Crow. When AERA field seasons grew to include large teams, David was a mature, calming adult in the room, and a steady hand. It wasn't always easy for him. Already in that inaugural 1984 season, David would open his hands and clench his fists, stretching his fingers to relieve arthritis pain. But he enjoyed the people, especially the Egyptian people, the site, and seeing his GPMP survey control put to good use.

A point of beginning (POB) is a surveyor's mark at the beginning location of wide-scale surveying of land. I see POB as metaphor for the wide-scale landscape of our lives: we all return whence we came. In our coming season, I will climb the Gebel el-Qibli to that point of beginning, GP1, and sit in silence remembering David.

2. For Glen Dash's reprisal of the Goodman-Lehner 1984 survey see "New Angles on the Great Pyramid," *AERAGRAM* 13.2, pages 10–19, Fall 2012. Available for free download at aeraweb.org.

Sphinx Archive Project: It's a Wrap

Mark Lehner and M. Abd el-Gadar do baseline offset mapping on the southern wall of the Sphinx Temple in 1981. Photo by Salah Nasar.

For more than 30 years, a vast, unique trove of photos, drawings, field notes, and documents holding all the information collected and produced during the 1979–1983 Sphinx project was stored away, accessible to only a few. But no longer. With an Antiquities Endowment Fund grant from the American Research Center in Egypt (ARCE) awarded in May 2016, Mark Lehner and AERA team members Megan Flowers, Rebekah Miracle, and Stephen Dilks digitized the collection—364 maps and drawings, 3,857 slides, 1,740 black and white photographs, and reports, journals, and survey data—and made it freely available to the public online through the website Open Context (https://opencontext.org/projects/141e814a-ba2d-4560-879f-80f1afb019e9), managed by Open Context Program Director Eric Kansa. In addition, the team conserved the collection, assuring that the original hard copies will be preserved.

When James Allen and Mark Lehner proposed the Sphinx project, no scale drawings of this unique monument had ever been produced; nor had much of the site's geology or the three adjacent temples been mapped extensively. The ARCE 1979–1983 Sphinx Project aimed to rectify this with an ambitious program: produce a detailed master plan of the Sphinx as well as top plans, elevations (sides and front), sections, and profiles, including drawings of the masonry repairs; map the greater Sphinx site, including the temples and the larger quarry forming the Sphinx "amphitheater;" and also map the structural geology of the site.

Lehner and Allen believed they could unravel the history of the Sphinx through detailed study of the monument's structure and geology, detailed survey and mapping of the stratified masonry, and analysis of tool marks and mortar bonding the different phases.

With their ambitious goals, Lehner, as Field Director; Allen, as Principal Investigator and Director of the project; and eight additional team members—geologists, surveyors, and an Egyptologist—began the arduous and rewarding task of mapping the great feline and its surroundings as it had never before been mapped.

Capturing the Beast

The general elevations of the front and sides of such an enormous sculpture could not easily or quickly be mapped by hand. The most expeditious method was photogrammetry—using photos to prepare maps. Dr. Rainer Stadelmann, then Director of the German Archaeological Institute in Cairo, contributed the use of the institute's photogrammetric system and the services of surveyor Ulrich Kapp. Kapp took stereo-pair photographs of the Sphinx front and sides from grid points on the floor to carefully surveyed targets on the Sphinx. Using a plotting system, he produced front, north, and south elevations of the Sphinx, which show the contours of the exposed parent-rock of the statue and all stonework attached to the core. He plotted all of these drawings at a scale of 1:50.

Producing the 1:50 master top plan of the whole Sphinx statue was a challenge. Since Kapp could not get his large photogrammetry camera up above the Sphinx for aerial views, Lehner had to do the master plan by hand—draw all the details of a monument three-quarters of a football field long and more than 66 feet (20 meters) tall, with a complex history of masonry additions. He used offset planning, the mapping technique commonly used by archaeologists. This involves stretching a metric tape measure between two fixed control points that have

Ulrich Kapp plotting the Sphinx elevation drawings in the German Institute in Cairo. September–October 1979. All photos by Mark Lehner unless otherwise stated.

been surveyed in position. Then a folding rule or measuring tape is used to take a measurement from the stretched tape measure to any point on a feature, say, the corner of a stone. If the feature to be mapped lies in a lower plane, a plumb bob is used to make sure that the point being measured is perfectly in line with the point on the folding rule or measuring tape. The point is then marked, to scale, on the drawing. To map complex surfaces, especially irregular ones, an archaeologist might take hundreds or thousands of measurements. Lehner located the end points of his datum lines by triangulation from the grid points on the Sphinx floor. Some of the drawings had to be done while maneuvering carefully along a ledge.

Documenting Repairs

Carved out of bedrock, the Sphinx suffered erosion and damage that people tried to repair through its Pharaonic years. Documenting the history of these repairs was one of the priorities of the Sphinx project. To that end, Lehner drew a series of detailed profiles and elevations at scale 1:20 of various parts of the masonry around the sphinx. These profiles show that the bedrock core of the Sphinx was severely eroded differentially before restorers added the most ancient and extensive casing. The drawings capture places where boulder-sized chunks of the Sphinx were about to separate along natural fissures before the first set of casing held them in place.

A second and third phase of patching and repairs were also uncovered. The latter two could be placed in time, probably during the 26th Dynasty and Roman periods, respectively, but the dating of the first set of repairs was not obvious. Lehner solved the riddle when he excavated and carefully mapped the small 18th Dynasty royal chapel at the base of the Sphinx between the forepaws. He found that the limestone blocks framing the Thutmose IV "Dream Stela" in the chapel are uniform with the restoration of the Sphinx's chest and paws. So the earliest restoration masonry was close in time to the stela.

Mapping the Surroundings

Next, the Sphinx project prepared maps of the Sphinx and Khafre Valley Temples, and a schematic of the Amenhotep II Temple, along with the geology of the area. Lehner mapped the Sphinx Temple and the adjacent Khafre Valley Temple at 1:100, stone by stone. He and two geologists produced geological maps, geological survey data, and geological profiles with ID tags for the geological strata comprising the Sphinx. Together the geology and temple mapping revealed a picture of how

Ulrich Kapp and assistants M. Abd el-Gadar and Salah Nasar taking stereo-pair photographs of the Sphinx front with the photogrammetric camera.

The granite "Dream Stela" of the 18th Dynasty pharaoh Thutmose IV at the base of the Sphinx's chest.

builders and quarrymen made the Sphinx and the two temples as part of a massive quarry-construction landscaping project.

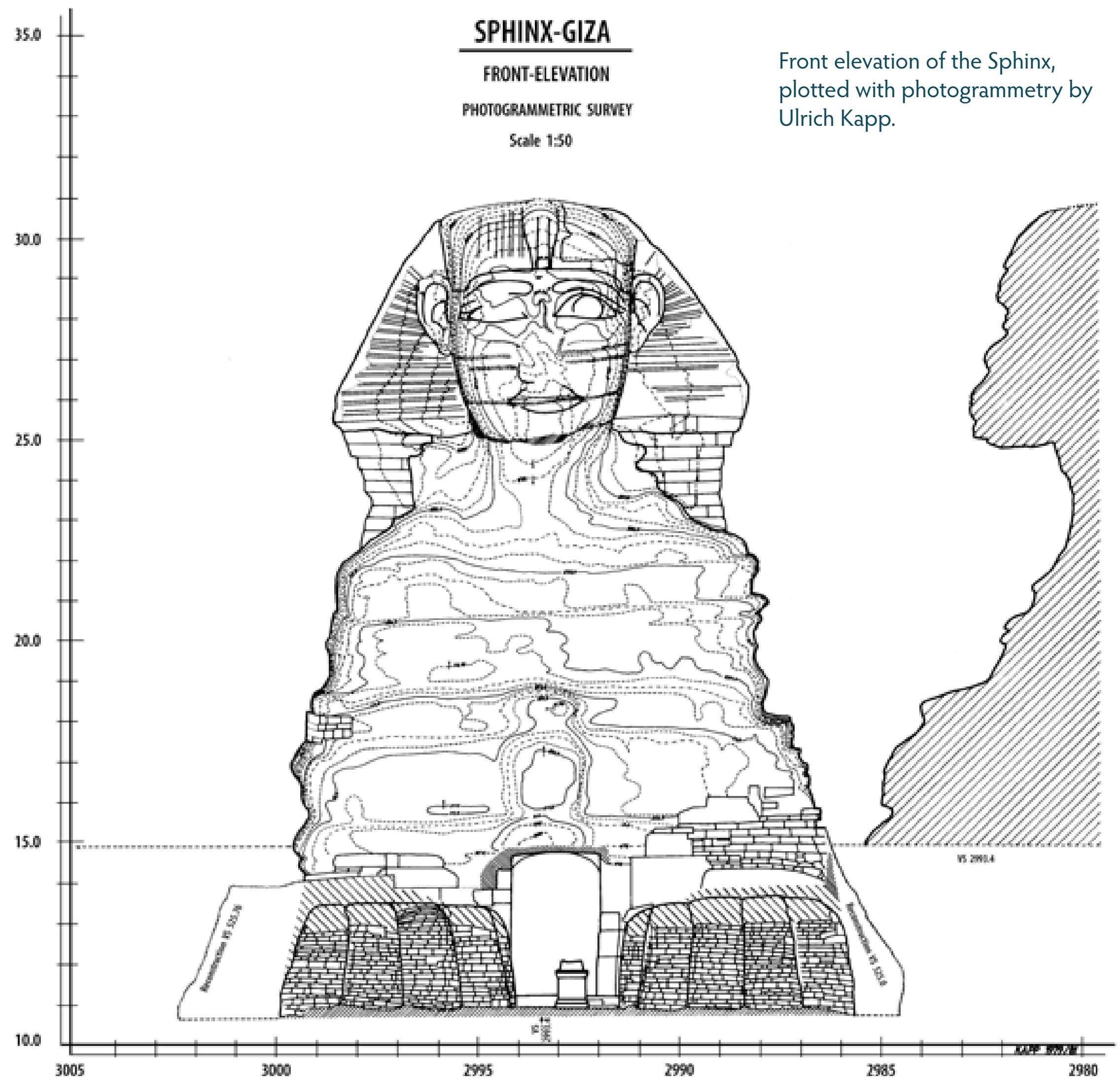
Lehner brought together all the evidence for the creation of the Sphinx in the Old Kingdom and for its restoration and revitalization in the New Kingdom in his 1991 PhD dissertation at Yale University, "The Archaeology of an Image: the Great Sphinx of Giza." But the dissertation was never published, and the archive remained mostly in hard copy, left to languish in storage, until the AEF grant was awarded.

From Hard Copy to Digital File

To prepare the Sphinx material as a digital archive for use online was not a simple matter of transferring files to appropriate folders and uploading them to the internet. Predating personal computers and digital photography, all of the material was hard-copy and had to be scanned. Archivist Megan Flowers and Lehner assembled and sorted all the Sphinx-related materials. Technical Assistant Stephen Dilks prepared high-resolution scans of all small items (black and white photographs, smaller field drawings, notebooks, forms, etc). All large format maps and drawings—some up to 6 feet long—were sent to a reprographics company for high resolution scanning. The process of scanning was time-consuming and took several months.

Flowers assigned standard format file names to each scanned item and its physical counterpart. She assembled all high-resolution digital files on a hard drive and sent it to Open Context for uploading through their various repositories. Dilks sorted and filed all physical items by their newly assigned file names and transferred them to archival envelopes, folders, and boxes, assuring their conservation.

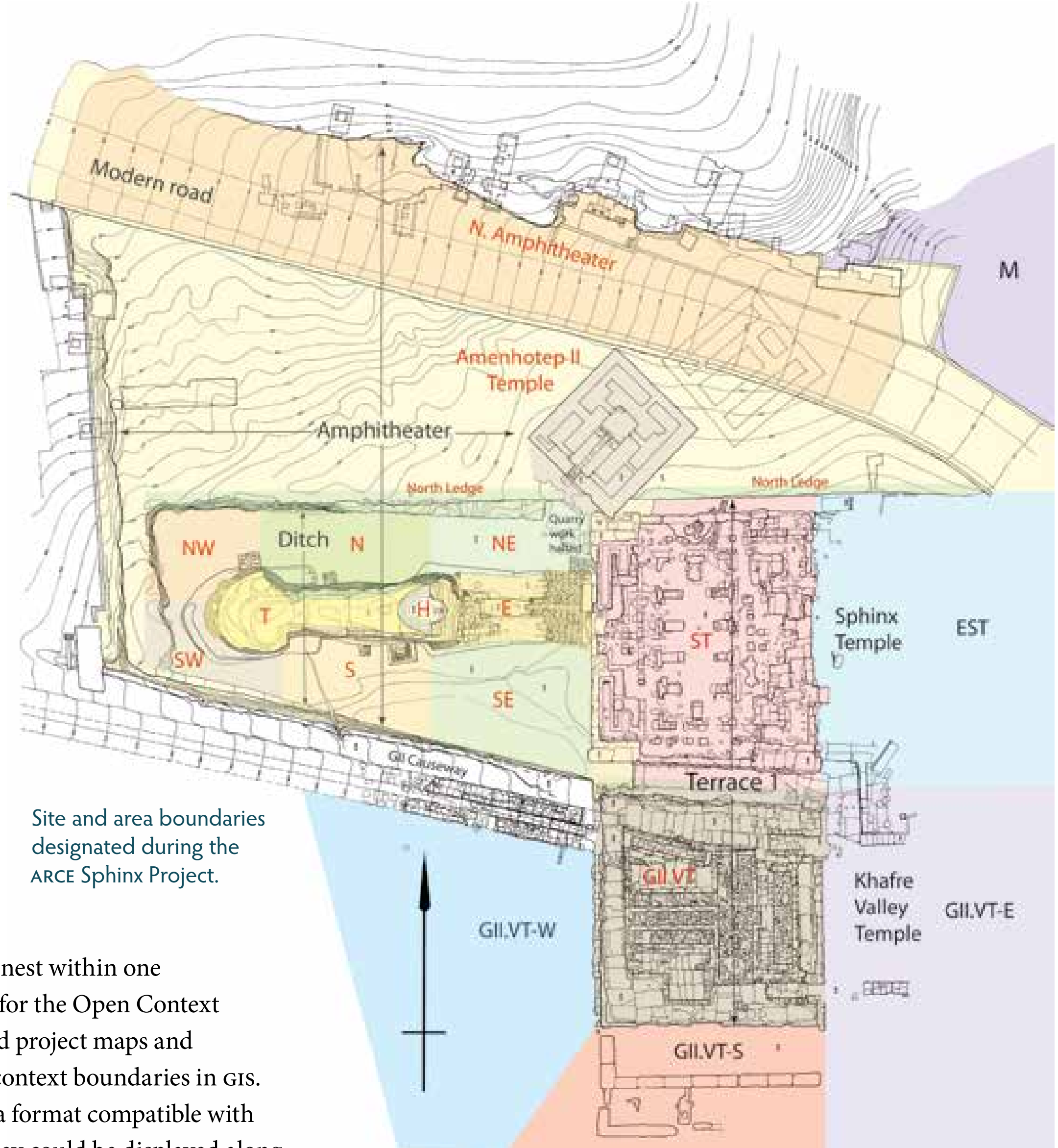
All of these tasks were straight-forward compared with the challenge of standardizing the files. The team had to translate into a more formal system what Lehner had construed as catego-



Front elevation of the Sphinx, plotted with photogrammetry by Ulrich Kapp.

ries and entities, his groupings according to similarities and differences and relationships within a hierarchy. Lehner's system, while functional enough to keep records in some kind of order during and after the fieldwork, needed to be freed of overlaps and ambiguities in order to be published online. Lehner had designated broad areas—such as Sphinx Temple, East of the Sphinx Temple, Sphinx Amphitheater—but he did not define formal boundaries for any of them. In addition, his areas overlapped or encompassed smaller areas.

So Flowers, GIS Director Rebekah Miracle, and Lehner worked together to map out a spatial hierarchy for the Sphinx Project. They defined the limits of 89 contexts, sites, areas, sub-areas, removals, and features and specified how these spatial entities nest within one another—a critical feature needed for the Open Context website. Miracle then georeferenced project maps and digitized the now strictly-defined context boundaries in GIS. Next she converted the GIS files to a format compatible with websites and open access so that they could be displayed alongside photographs, drawings, and other records to give a physical location to the project data.



Site and area boundaries designated during the ARCE Sphinx Project.

Exploring the Sphinx Archive at Open Context

Egyptologists, archaeologists, historians, scholars of art history, educators—anyone interested in Giza— can now access, interact with, and use this dataset in research and teaching. From the home page they can select either Data Record or Media. The former offers a pull down menu with types of records, such as area, feature, and trench. Each record type in turn presents its own pull down menu with choices. If the user chooses area, and then selects from its pull down menu, say, Sphinx Head, they have access to all linked media of the Sphinx's head: photographs and field drawings. Should the user choose Media on the archive home page, they will access all drawings and photographs, sorted by area or by file names, such as d-e-036, "drawing – area, east – number 36." All media are searchable by keyword, from "trench" to "tail." Other filtering options include resource type (e.g., color photo, drawings, forms), keyword (e.g., chapel), image type (e.g., working drawing, inked drawing).

These are just some of the options to navigate this Sphinx archive. Once drawings are selected, they can be zoomed to examine detail close up, even closer than is possible with the originals. Open context uses Internet Archive,[1] an IIIF (International Image Interoperability Framework) image server. IIIF allows the huge files for many of the scanned drawings and plans in the ARCE Sphinx Project Archive to be sent to users' browsers in manageable smaller parts. This enables dynamic zooming into large images without overwhelming the memory in a user's computer. Users can browse the Sphinx and temple maps close up, honing in on details captured in the large-scale drawings. But Open Context is still working on challenges presented by the largest Sphinx Archive maps.

Lehner's dissertation is also available on Open Context's Sphinx Archive website. It includes not only material generated during the ARCE Sphinx Project, but also material from Emile Baraize's excavations of the Sphinx between 1925 and 1936. Prof. Jean Yoyotte, Director of the Centre Vladimir Golenischeff of the École Pratique des Hautes études (EPHE), Paris, furnished

Banner of the home page for the Open Context ARCE Sphinx Project 1979-1983 Archive:
https://opencontext.org/projects/141e814a-ba2d-4560-879f-80f1afb019e9

the ARCE Sphinx Project project with field notes, plans and 226 photographs from those excavations compiled by Pierre Lacau (Archive Lacau).[2] Working with these materials, Lehner, in Chapter 2 of his dissertation, recounts the course of the Baraize excavation from one season to the next, with major finds, while making reference to the 226 Archive Lacau photographs, many of them dated.

We offer these records of the Sphinx, ranging from finished inked drawings to messy field notes and sketches, free and open access. For more than 35 years, these records have remained largely unpublished and otherwise inaccessible to the public. Restoration work during the 1980s–1990s, and subsequent efforts at consolidation, have hidden much of what the ARCE Sphinx Project recorded of the Sphinx. This archive will remain the only dataset to document the history of masonry work on the Sphinx prior to the interventions of the 1980s and 1990s.

By digitizing and publishing these records of the Great Sphinx of Giza with Open Context we hope to contribute, in some small way, to knowledge about a salient marker of Egypt's cultural evolution, about Egypt's contribution to world art history and to the human career.

While the project is finished, the uploads to Open Context go on. In the coming months we will continue populating the Sphinx Archive web pages with photos, drawings, and other materials.

1. The Internet Archive is a nonprofit library of free books, movies, software, music, websites, and more.
2. We thank Drs. Christiane Zivie-Coche and Laurent Coulon, former and current Directors of the Centre Golenischeff, for renewing permissions for the ARCE Sphinx Project to use these important records, to include Archive Lacau photographs of the Baraize excavation for publication of Lehner's dissertation, and to publish these photographs online and open acess, as part of the ARCE Sphinx Project 1979-1983 Archive.

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From Khufu to Kromer: A Jubilee Agenda Thirty Years in the Making

by Ali Witsell

Since our founding in 1988, AERA has sought to answer questions related to the origin and development of the ancient Egyptian state and the nature of the society responsible for building the pyramids of Giza. This has led us to uncover the architectural footprint of a sprawling, seven-hectare ancient settlement that housed the personnel necessary for the construction of the pyramids, a site known locally as Heit el-Ghurab (HeG). Thanks to 30 years of extensive excavation, geomorphological survey, and drill core sampling, we have constructed a nuanced interpretation of how the Egyptians supplied the raw goods and building materials necessary for the pyramids and the continual upkeep of the HeG settlement, a large urban center dating to the reigns of just two kings, Khafre and Menkaure, builders of the second and third pyramids.

But after 30 years of excavation and puzzle-solving, one major Old Kingdom figure remains absent. We are still looking for the elephant on the plateau: Khufu and the town that built the Great Pyramid at Giza.

Wadi el-Jarf and *Ankh Khufu*

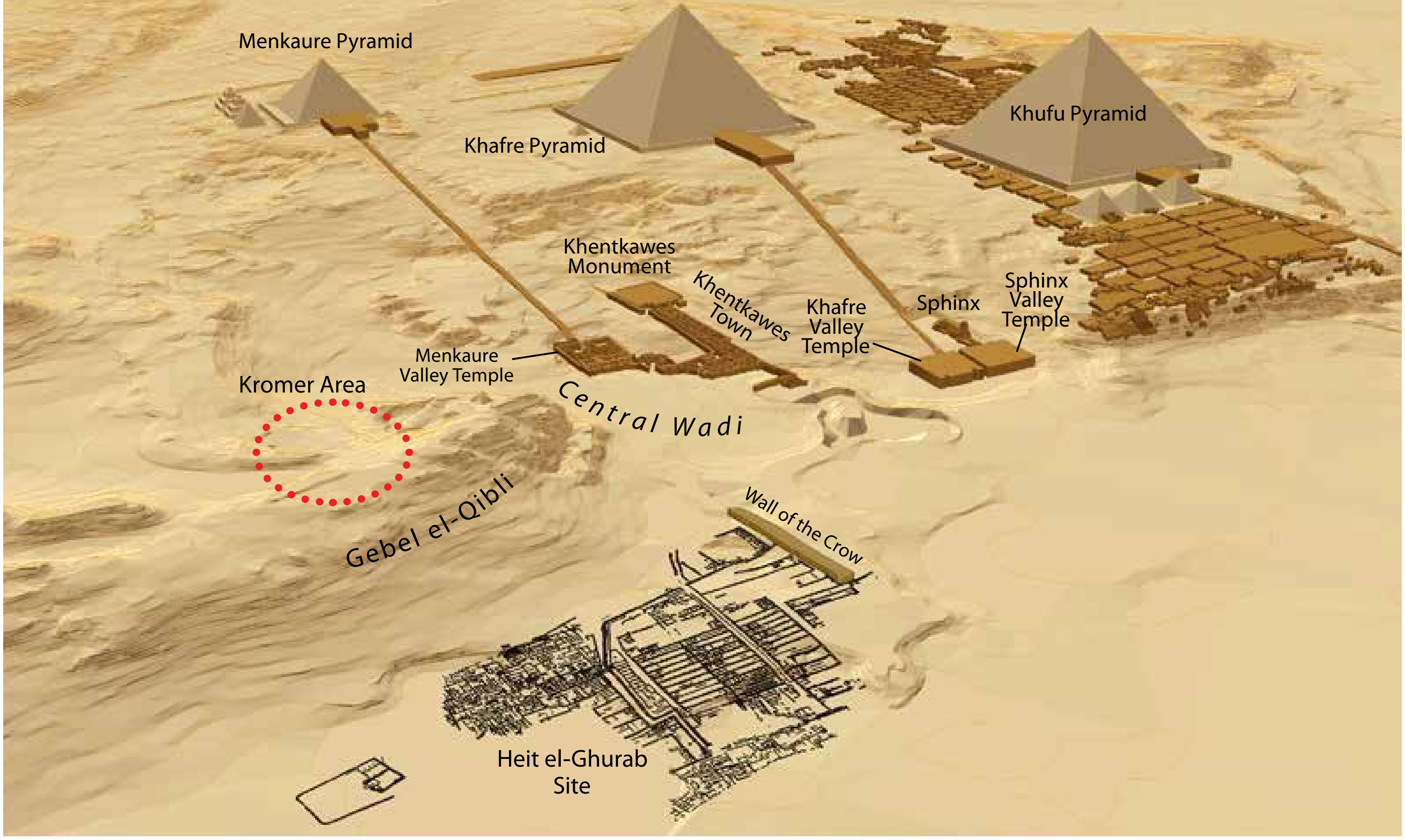
In our search for Khufu, we are keeping an eye on recent discoveries dating to his reign from the Red Sea port of Wadi el-Jarf. Here, amongst fragments of administrative papyri, Pierre Tallet found a logbook of Merer, the overseer of a team traveling round-trip to Giza by boat to deliver limestone for Khufu's pyramid. Merer makes note of passing by a place called *Ankh Khufu* at Giza, which very well could be the lower level of HeG.

And so this coming spring we will begin an exciting new research agenda at the HeG site, focused on determining the nature of the remains under the Khafre- and Menkaure-era footprint and whether they may date to the time of Khufu. While we have dipped into this older level in the past and encountered hints of something substantial there, we have not had the chance to thoroughly sample or study its material culture and architecture. We will analyze our backlog of this older material while excavating new areas targeting the early phase in the coming years. But first, we would be well-served to find a sample of Khufu-era material culture at Giza for our specialists to use as a comparative collection moving forward.

Karl Kromer and the Gebel el-Qibli

Enter Austrian archaeologist Karl Kromer, who discovered and excavated massive mounds of Old Kingdom settlement debris in the 1970s on top of the Gebel el-Qibli, the rocky ridge running along the western edge of the HeG site. This large dump contained stone and mudbrick rubble from large-scale structural remodeling—in addition to abundant ceramics, animal bone, and clay sealings (small pieces of clay impressed with designs from cylinder and stamp seals, often bearing the names of the pharaoh in whose reign they were carved). We hypothesize it represents a clean-out from a major rebuild of the HeG settlement, perhaps during the reign of Khafre. Kromer found sealings datable to Khufu and Khafre by the presence of their royal serekhs, but none of Menkaure. The HeG site has produced sealings of Khafre and Menkaure, but none of Khufu.

We are revisting this work for three main reasons. First, Kromer's publication failed to provide a thorough accounting and presentation of many of his trench sections (the vertical cross-sections or profiles illustrating the stratigraphy of a trench). Scholars have debated the nature and source of this material, but a proper study of his sections will hopefully settle the argument about how and why it was deposited. Second, Kromer registered over 1,500 objects and found that the deposit measured over six meters deep in some places. The process of relocating and cutting back Kromer's old sections in order to expose the fresh surface necessary for our photogrammetric recording will likely produce a corpus of early 4^{th} Dynasty material culture—dating to Khufu and Khafre, if Kromer's pattern holds. Third, we have reason to believe that Kromer found sealings



that were impressed by some of the same seals in use on the HeG site. If we find duplicate sealings, we may come closer to knowing when the 4th Dynasty debris in Kromer's excavation was deposited.

A Different Sort of Site

The Kromer deposit is a dataset ripe for a garbology study in ancient waste management. The study of middens and ancient rubbish has long been a source of information on environmental conditions, seasonality, diet and household economy, and social practices. If the Kromer area represents a demolition or clean-out of HeG, it may contain material different than that from the later level of HeG. This area sits at a much higher elevation on the plateau than the HeG site, and we will not encounter the same problems with high water table and water-logged deposits that we regularly encounter there. Fragile organic material such as wood, seeds, textiles, and perhaps even papyri, stand a better chance of survival in such dry conditions.

As we begin fieldwork in our 30th jubilee year, we are excited to see just how different the Kromer material may be. This analysis will yield valuable results, and represents the first step in our new agenda celebrating and bringing together 30 years of work at Giza. We still have so much to learn.

Above: 3D projection showing the location of the Kromer area in relation to the Heit el-Ghurab site.

Below and right: A sampling of some of the types of material culture on the surface in the Kromer area, including lithics (below), clay sealings (below right), and ceramics and faunal remains (right). Photos by Ali Witsell.

Facing page: Overview of Kromer's Crater. View to the south. Photo by Aude Gräzer Ohara.

The MSCD Project by the Numbers

1	USAID grant
2	years of work completed
4	six-week Field School sessions completed
6	sustainable management plans created
6	ancient buildings digitally reconstructed in the GIS
8	sites incorporated in the walking circuit
14	benches installed for visitors
46	local craftsmen and businesses employed
57	tour guides given tours
67	social media posts written by students
74	new information panels installed
77	MoA inspectors trained
91	previously excavated sites cataloged in a Historic Environmental Record with locations georeferenced in the GIS
133	local workmen employed
200	childrens' worksheets distributed
1,413	meters of path laid in the circuit
2,806	archaeological features recorded by previous excavators digitized in the GIS
3,030	new archaeological features recorded and digitized in the GIS
5,000	dual-language brochures and guidebooks printed
22,325	points surveyed and integrated into the GIS

The sun sets at Memphis. Photo by Amel Eweida.

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