



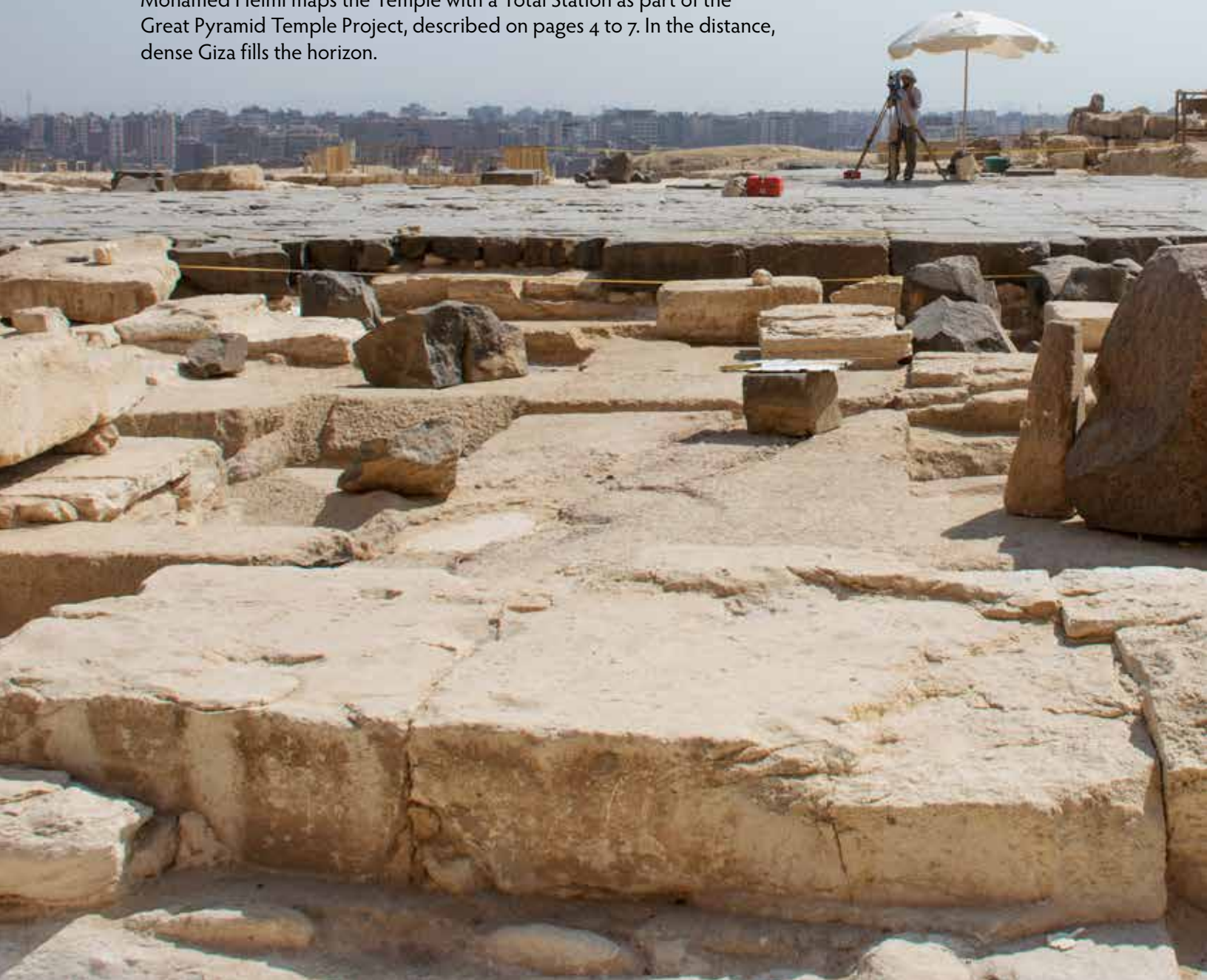
# AERA

Ancient Egypt Research Associates

## Annual Report 2020–2021

# Working through COVID, Making Discoveries

Looking east across the remains of the Great Pyramid Temple. Surveyor Mohamed Helmi maps the Temple with a Total Station as part of the Great Pyramid Temple Project, described on pages 4 to 7. In the distance, dense Giza fills the horizon.





## AERA: WHO WE ARE

For 31 years Ancient Egypt Research Associates (AERA) has brought together archaeologists and specialists from around the world to address questions regarding the origin, nature, and development of the Egyptian state—one of the earliest states of the ancient world.

We seek answers on the Giza Plateau, at our flagship site, “Lost City of the Pyramids” (also called Heit el-Ghurab, HeG), and the Kromer Dump site, where debris from HeG was deposited, as well as the Great Pyramid, Sphinx, and communities associated with the tombs of Pharaoh Menkaure and Queen Khentkawes. After more than three decades of field and laboratory work, we have constructed a nuanced interpretation of how the Egyptians supplied and transported raw goods and materials to build the pyramids and maintain the HeG settlement, a large urban center dating to the reigns of

Menkaure, Khafre, and probably Khufu, builders of the third, second, and first Giza pyramids, respectively.

Excavation, analysis, publication, and educational outreach stand as pillars of our mission in Egypt. Through multidisciplinary analysis, rigorous archaeological fieldwork, and laboratory science we open windows on the everyday lives of Egyptians who built and administered the Giza Pyramids and Sphinx during the 4th and 5th Dynasties (c. 2543–2306 BC) of the Old Kingdom. In 2005, with the sponsorship of the American Research Center in Egypt (ARCE), we began an archaeological training program for Inspectors in Egypt’s Ministry of Antiquities. After completing more than 20 field schools and graduating more than 300 inspectors, AERA continues to embed this important outreach program within our core research.

Founded in 1985, AERA is a 501(c)(3) tax-exempt, non-profit research organization located in Boston and Giza, registered in Egypt as a foreign NGO. AERA-Egypt maintains the AERA-Egypt Center in Giza—a year-round base for our team, with library, archives, and meeting facilities. Our scientific and educational missions are supported by philanthropic individuals, foundations, and USAID government funding, as well as USAID in collaboration with the American Research Center in Egypt (ARCE).

Photos in the 2020–2021 annual report were taken by Mark Lehner, Dan Jones, Sayed Salah Abd el-Hakim, and Ali Witsell. Maps by Rebekah Miracle, AERA GIS.

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# PRESIDENT'S MESSAGE

With COVID-19 starts and stops and the calendar year splitting AERA's natural annual cycle—our fiscal year (FY) that runs between July 1 and June 30—it can be hard to keep track of where we were and when.

I started FY 2020–2021 in July at Giza, where I had been happily stuck since February 29, 2020. As reported last year, we had to truncate our 2020 field season at the Menkaure Valley Temple (MVT) in mid-March because of the initial worldwide response to the first wave of the coronavirus. I did not return home to the Boston area until July 8.

During the rest of that summer, I wrote chapters for a book, *The Red Sea Scrolls*, co-authored with my friend and colleague Pierre Tallet. AERA team members prepared to launch the Great Pyramid Temple Project (GPTP), funded by a grant from the Antiquities Endowment Fund (AEF) of the American Research Center in Egypt (ARCE). I am honored to co-direct this project with Dr. Zahi Hawass. We aimed to thoroughly map and document the remains of Khufu's Pyramid Temple and to provide signage and a walkway for visitors.

COVID-19 notwithstanding (and this was pre-vaccine), Fran Dilks and I headed back to Egypt in mid-September 2020. From then until mid-December, Zahi and I carried out the GPTP with Dan Jones (Senior Archaeologist), Sayed Salah (Overseer of Workers), and Mohamed Helmi (Surveyor). To our great surprise, under a 1940s restoration of the temple's basalt pavement, we discovered fragments of relief carving from the temple walls, hitherto unknown. They came from scenes of the Heb Sed ceremony, which the ancient Egyptians believed renewed their sovereign's vigor and vitality. We were proud to present these scenes for the first time in our Spring/Fall 2020 issue of *AERAGRAM* (21-1 & 2), our newsletter.


I returned stateside just in time for the Winter Solstice 2020 holidays. Then COVID infections took another upswing. It seemed to be on the increase in Egypt, with the first infections among people I knew. I was now concerned enough to postpone fieldwork we would have normally done between January and April. We were slated to return to resume our tale of two temples: the valley temple of Menkaure (MVT) and upper Great Pyramid temple of Khufu.

Then—go figure!—I, myself, contracted COVID-19 in late March, one week after taking my first Pfizer shot. I had a hard time with COVID into early April. As I recovered, I did all the editing of my contributions and end-work for *The Red Sea Scrolls*.

Meanwhile, the COVID-19 restrictions, entrenchments, and postponements gave team members and me the desk-time to do a lot of writing and editing. So, while our publications list is slight for FY 2020–2021, the publications list for the next fiscal year (the one we are in now) will be full with several articles, and a book!

As with so many people and endeavors, we are a bit behind because of COVID, including with AERA's Annual Report 2020–2021. But we will have much to report for the FY 2020–2021, because, by the end of last July, our near future was full of fieldwork.

Our adventure of discovery is moving full steam ahead. Please stay with us.



Mark Lehner

# Great Pyramid Temple Project 2020

The American Research Center in Egypt (ARCE) awarded AERA an Antiquities Endowment Fund (AEF) grant for the first phase of the Great Pyramid Temple Project (GTPP), carried out in Fall 2020. The team, headed by Dr. Zahi Hawass and Dr. Mark Lehner, included Dan Jones, Senior Archaeologist; Sayed Salah Abd el-Hakim, Foreman; Mohamed Helmi, Surveyor; and Emad Shaaban Hendawi, Survey Assistant.

GTPP 2020 aimed to document and conserve what remained of Khufu's once-magnificent temple and present it to visitors in such a way as to make it comprehensible. During the 25 years preceding the GTPP 2020, visitors—along with camels, horses, and carriages—trafficked across the temple surface, unaware they were gradually obliterating Khufu's temple. With such ongoing threats to the temple, documenting and conserving what remained was urgent and crucial. It is important for the history of architecture as the second oldest, large stone (pyramid) temple in ancient Egypt and the first to include a basalt pavement and granite pillars.

For the GTPP we meticulously mapped and thoroughly documented every remaining archaeological feature within and around the temple. We assigned a "feature number" to each physical feature that reflects processes and events. We located each feature on a map, photographed each one, and took notes. By documenting all features—including those dating before, during, and after temple construction—we treated all the archaeological remains equally, which is crucial to understanding the sequence of events at the site of the temple as a whole.

All our recorded data was collated into GIS by AERA's GIS specialist, Rebekah Miracle. Our 2020 work highlighted how much the scholarly world and the wider public has yet to discover about the temple. Despite irreversible damage, it retains invaluable original information never before recorded.

With our detailed, comprehensive dataset, we have been able to work out the history of the temple—its initial layout, building, and destruction—as well as assess how the temple may have looked in its heyday.

The builders first hammered out a level surface in the hard limestone bedrock,

another first in ancient Egypt. Next, they cut sockets into the bedrock for the 50 pillars that once held massive granite columns supporting the temple roof. Made of hard granite, the pillars arrived on site with varying lengths. Rather than shape them to a uniform length, the builders worked the softer limestone to custom depths for each one instead. As a result, the pillars would all have stood to the same height. In order to install the massive pillars—most 3.5 feet square (2 cubits in ancient Egyptian units)—the masons cut a slope in one of the socket walls so that the pillars could be

Mark Lehner off-set maps on the southern side of the Great Pyramid Temple. He first began mapping the temple in 1995. In 2020 the GTPP completed the map. Features not drawn in 1995 were recorded either by hand-drawing to scale 1:100 or by surveying using a Total Station. View to the north.



Workers remove a displaced block using ropes, like ancient Egyptians may have done. View to the north.



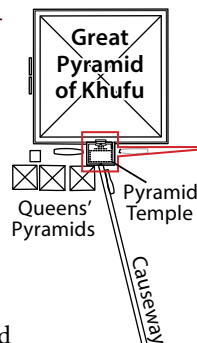




Mark Lehner brushes sand from the relief on a wall fragment of the Great Pyramid Temple. It was found in sandy debris that filled one of the pillar sockets. Dan Jones (left) and Ashraf Mohi el-Din, Director of Giza, watch. Inset: Wall fragment, with part of Heb Sed scene.



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

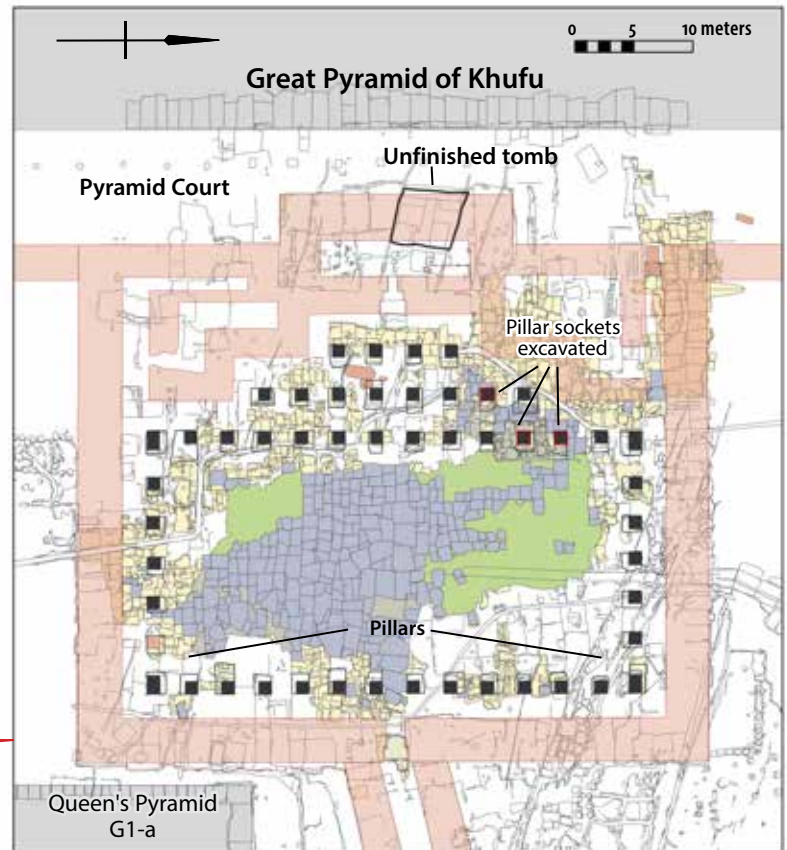


rolled in, set on their sides, and then pulled upright with ropes.

As with the pillars, the builders did not attempt to shape the very hard slabs of basalt that formed the pavement. They prepared a bed of limestone pieces and gypsum mortar cut to conform to the basalt slabs that arrived from the Fayum in varying shapes and with angular bottoms reflecting the natural planes along which they were cut. The builders trimmed the upper edges of the slabs to make complex, intricate fits, like a jigsaw puzzle.

As part of our documentation, we removed small parts of a modern “restoration” of the pavement from three of the temple’s pillar sockets. In the fill that “restorers” left unexcavated, we found fragments of fine painted reliefs, probably from the walls around the temple cloister. They show snatches of a Heb Sed festival, a rejuvenation ceremony for the king’s 30th year of reign. Since Khufu did not survive that long, the festival was apparently for a Heb Sed in his Afterlife.

As part of the GPTP, we prepared the temple site for visitors. See pages 6 to 7.



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



Right center: A pillar socket cut with one sloping side, which provided a means to install the pillar. Workers moved the pillar to the socket on wooden rollers and with levers and ropes rested it on its side and slid it down into the socket. Then, with wooden levers and ropes lashed round the top of the pillar, they pulled it upright.

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





## Building for Visitors

After documenting the Great Pyramid Temple, we began preparing it for visitors. To make it comprehensible and reduce traffic over the remains, we designed a wooden walkway to follow the outer wall line of the temple. On November 1, 2020, Mohammed Hassan, Kamel Hassan, and their carpenters from the company Noor el-Rahman began installing the walkway, which took six weeks to complete.

Before it could be installed, we had to reposition a scatter of displaced limestone and basalt blocks that overlaid the location of the temple wall and a red granite block that formed part of a threshold in the northwest corner of the temple. We also had to remove a section of fencing of 25 posts and their connecting chains on the west side of the temple to make way for the walkway. We re-installed 15 of the posts and chains just to the south of the temple in order to keep horses and camels off the temple.

For the walkway, the carpenters constructed a wooden frame directly on top of the limestone bedrock and archaeological remains, but no new holes were cut to secure the frame. In some places they protected the ancient remains with plastic and polystyrene before overlaying the walkway. The steps involved in building the walkway are shown in the photos on the facing page.

The walkway does not have a fence around it to stop people from entering the temple. We observed during its installation that visitors migrated to the level surface of the walkway.

To compliment the walkway and improve visitor experience we produced three information panels to be installed around the temple in 2022. One explains the layout of Khufu's pyramid complex, the second discusses the pyramid temple itself, and the third, the sanctuary and the unfinished tomb shaft.







1

1. The carpenters constructed a wooden frame of Swedish pine, 2.06 meters wide and 0.15 meters high, directly onto the limestone bedrock and the archaeological remains, without making any holes. To support the frame and the planks that would go over it, crossbeams were fixed with metal brackets to the inside of the frame at 0.50-meter intervals.

2. The team put sand inside the frame to provide stability and support for the walkway surface.

3. The men surfaced the walkway frame with planks of pitch pine wood, selected for its strength. They secured the planks to the crossbeams using glue and nails and attached both ends with screws.

4. The carpenters finished the walkway surface by filling gaps and blemishes with four coats of sealer, a high-build material that fills in the pores in the wood and gives a smooth, hard seal coat as a foundation for varnish, which they applied last.

Facing page: Measuring 2.06 meters wide by 215 meters long, the walkway was built over the outer wall line of the temple, marking the perimeter of the structure, and included a ramp up to the main entrance from the east, to reference the causeway. The walkway does not have a fence around it to stop people from entering the temple because we observed during its installation that visitors migrated to the level walkway. In the foreground, a metal fence encircles an unfinished tomb shaft, dug during Roman or Saite times. View to the east-northeast.

Below: View to the southeast showing the repositioned fence just south of the temple and the new walkway. Note camels kept out of the temple.



2

Brace  
closes gap  
between  
the base  
of frame  
and uneven  
surface



3



4



# Objects Publication Project



In 2019, the American Research Center in Egypt (ARCE) awarded AERA an Antiquities Endowment Fund (AEF) grant to document, conserve, and publish a typology of the enormous collection of objects that AERA has amassed since the first excavation season in 1988–1989.

Begun in Fall 2019 under the overall management of AERA Director of Archaeological Science Claire Malleson, the project is nearing completion, with work this past year focused on preparing the *Ancient Egypt Research Associates' Object Typology*, a digital book available for free download on our website in 2022.

The AERA collection includes more than 7,000 objects—hammers, scrapers, grinding stones, weaving tools, spindle whorls, small tables, gaming pieces and more—that were recovered from the Heit el-Ghurab, Menkaure Valley Temple, Kromer Dump, and Khentkawes Town sites. The overwhelming majority are tools, which although mundane, reveal much about everyday activities of the people who built the pyramids and maintained mortuary cults. Hence, they are invaluable for the study of ancient Egyptian economy, technology, and daily life.

Our records for the objects include drawings, handwritten documents, photographs, and an Access database. AERA Objects Manager Emmy Malak and Dan Jones, AERA Cairo Office Archives Manager, started in 2019 with an inventory, then collated and reviewed all the records, and checked for accuracy and consistency. Records that were not in digital form were digitized.

During a Spring 2020 field school, four Ministry of Tourism and Antiquities (MoTA) inspectors worked on the project. AERA Field School alumnus Yaser Mamoud trained them in illustration, while MoTA photographer Amel Eweida worked with them as she took photos of representative examples of each category. New draw-

## QUERN STONES (METATES)

Quern stones are metate grinding stones that could be placed on the ground, on a quern emplacement or on the knees, with the working surface facing upwards. The main differences between quern stones and grinder manos are the size and the working surface. The querns have a flat to convex lower surface while grinders have a flat to concave upper working surface (Giddy 1999: 201). The majority of the quern stones excavated were found in HeG, with a few examples from MVT and KKT. Quern stones are mostly made of quartzite, with some examples of limestone, grano-diorite, basalt, diorite, and a couple of limestone examples.

Quern stones can be either expediently or strategically designed. The main shapes of quern and quern fragments recovered are: flat/concave (over 30 examples), boat (19), and saddle (12). A flat/concave shape has a roughly rectangular outline when viewed from above with a flat base/undersurface. It has a rectangular outline in its cross-section, with the ends sometimes turning upwards. Querns of similar shapes were found in Ayn Asil (Jeuthe 2012: 234–35, 239, fig. 96). Top and bottom surfaces are almost parallel. Its working surface is flat, but sometimes becomes slightly concave in profile due to extensive use. Examples of flat/concave-shaped querns are Objects 1811 (Fig. III.2.a) and 2188 (Fig. III.2.b).

A boat-shaped quern is slightly similar to the saddle-shaped ones; hence it is difficult at times to



Left: Emmy Malak (standing) and Yaser Mahmoud discuss details of a tool he is drawing. Trainees Rasha Mohamed (left) and Alaa Talaat work on drawings.

Below left: The entry for quern stones.  
Below: A page illustrating stone drill bits of various shapes.

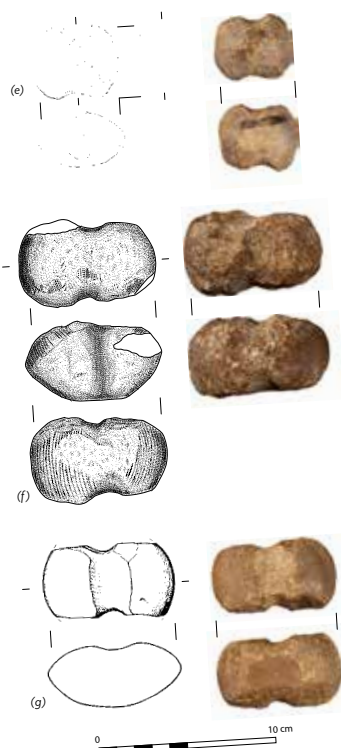


# ANCIENT EGYPT RESEARCH ASSOCIATES' OBJECT TYPOLOGY, v. 1.2022

by Emmy Malak, Claire Malleson, and Ali Witsell



Left: The cover of the digital publication of AERA's object typology.



ings were prepared as needed, with Piet Collet helping to complete the work in 2021.

Emmy Malak and Ana Tavares developed typologies for the objects over several field seasons prior to the AERA Objects Project. For the publication, Emmy wrote text, selected photos and drawings, and made minor changes in the typology groupings.

The typology is intended to be ever-evolving, tweaked regularly to incorporate new finds. Because of this, we have no current plans for a print copy. Ali Witsell, Managing Editor for AERA and Sealings Specialist, worked closely with Emmy during Fall 2020 and Spring 2021 to begin shaping the look of this first edition. She prepared the drawings and photos for the publication, developed the book design, and began laying out the pages, a process that continued on into the fall of 2021.

The publication, totaling about 150 pages, will be a valuable, accessible resource for scholars and students working on objects in Egypt. The high-quality photos and drawings will be useful both for identification and comparison.

**Fig. II.1.e.** A quartzite figure-eight drill bit from HeG. Tool is almost oval in shape in longitudinal section, with one side almost flat in profile and opposite side convex/dome in profile. Convex/dome surface has fine concentric lines from use. Object 1510, drawing 1000-421 by J. Karlsson, photos 116240-41 by A. Eweida; **Fig. II.1.f.** A quartzite figure-eight drill bit from HeG, oval outline in section along length. Traces of concentric lines from use, visible on one surface. Object 2699, drawing 1000-863 drawn by R. M. Abd El-Salam, digitally linked by PCollet, photos 116240-41 by A. Eweida; **Fig. II.1.g.** A quartzite figure-eight drill bit from HeG, with two notches on each side of the tool where the shaft would have been. Object 2865, drawing 1000-653 by W. Schenk, photos 116240-41 by A. Eweida

# SHARING OUR WORK

## Publications

MARK LEHNER

"Giza Plateau Mapping Project," in *The Oriental Institute Annual Report 2019/20*, ed. by Christopher Woods, Chicago: University of Chicago, 2020, pages 63–82.

YUKINORI KAWAE

"Pyramids in Egypt," in *World Pyramids Wonderland*, ed. by Yukinori Kawae and Etsuo Sato, Tokyo: Graphic-sha Publishing, 2021, pages 16–83 (in Japanese).

CLAIRE MALLESON

"Agriculture and Environment in the Wadi Tumilat, Egypt, 2nd–1st Millennium BC," *Journal of Archaeological Science: Reports*, (2021) 102942 (online publication).

## Lectures and Presentations

MARK LEHNER

"The People who Built the Pyramids - How we Know," for International Archaeology Day, sponsored by The Metropolitan Museum of Art, Department of Egyptian Art; The Archaeological Institute of America; The Archaeological Institute of America, New York Society; The American Research Center in Egypt; and The American Research Center in Egypt, New York Chapter; September 28, 2020, online.

"From the Prairie to the Pyramids, Via Edgar Cayce and Virginia Beach," Ancient Mysteries Event: Beneath Stars and Sand, Association for Research and Enlightenment, Virginia Beach, October 10, 2020, online.

"Sphinx and the Nummulites," 2nd Grade Dragons, Dilworth Elementary School, February 17, 2021, online.

YUKINORI KAWAE

"A Study on the Chevron of the Great Pyramid Invented in the Age of King Khufu," 63rd Congress of the Society for Near Eastern Studies in Japan, November 30, 2021, online.

"Reconstruction of Ancient Visual Information in the Pyramids Based on 3D Survey," Nagoya University Initiative Webinar, December 13, 2021, online.

CLAIRE MALLESON

"Loaves and Fishes," Egypt Exploration Society, January 26 and 28, 2021, online.

RICHARD REDDING

"Staffing an Archaeological Project: HR Considerations," University of Michigan, Ross School of Business, February 9, 2021.

"The Animal Subsistence System of the Old Kingdom of Egypt; The Infrastructure of Pyramid Construction," Society of American Archaeology Annual Meeting, April 16, 2021, online.

"What is *Kawara* and Why Was It Important in Human Subsistence in Ancient Egypt?" University of Michigan, Kelsey Museum, May 4, 2021.

WILMA WETTERSTROM

Karin Sowada and Wilma Wetterstrom, "The Archaeology and Re-Use of Combed Jars from Old Kingdom Giza," Egypt and the Mediterranean World From the Late Fourth Through the Third Millennium BC Zoom Conference, May 20, 2021, online.

ANNA WODZIŃSKA

"Presence of the Imported Combed Ware at Heit el-Ghurab: Use and Importance," Egypt and the Mediterranean World From the Late Fourth Through the Third Millennium BC Zoom Conference, May 20, 2021, online.

MANAMI YAHATA

"AERA 2020 Excavation Report," August 29, 2020.

"Walk around the Giza Plateau - Ancient Egypt Craftsmen and Tools," September 26, 2020.

"Ancient Egyptian's Life," October 24, 2020.

"Animals in Ancient Egypt 1," November 21, 2020.

"Animals in Ancient Egypt 2," December 26, 2020.

"Queen Khentkawes Town 1," January 16, 2021.

"Queen Khentkawes Town 2," February 19, 2021.

"Royal Workshops at Giza," March 19, 2021.

All of above presented by the Asahi Culture Center, Osaka, Japan, online. All included material about AERA's work and findings, although some also ranged more widely than Giza.



## In the Popular Press

The Heit el-Ghurab (HeG) site was featured in *Shogaku 8 Nensei* (小学8年生) Shogakukan Inc. (小学館), a well-known Japanese educational magazine for junior high school students. Manami Yahata—AERA archivist, plaster and roofing specialist, and archaeologist—was interviewed extensively for the article, which appeared in the April/May 2021 issue. We were very pleased

to see AERA's work and HeG introduced to Japanese children and their parents. Manami reported, "The editors ... told me that the article was very popular for both boys and girls. I have received some comments from the students, and I can see many people (not only the students, but also their parents) really enjoyed it."



On the left-hand page Manami explains how archaeologists work in the field, illustrated with photos of her measuring a feature, excavating at the Heit el-Ghurab (HeG) site, and carrying out research in the Giza field lab. In the speech bubble she says, "This is the *mastarin* (Arabic for trowel), the tool

we use when we excavate." On the right-hand page, Manami introduces House Unit 1, which she excavated. Below the photo the text describes HeG and explains that the pyramid builders lived here.

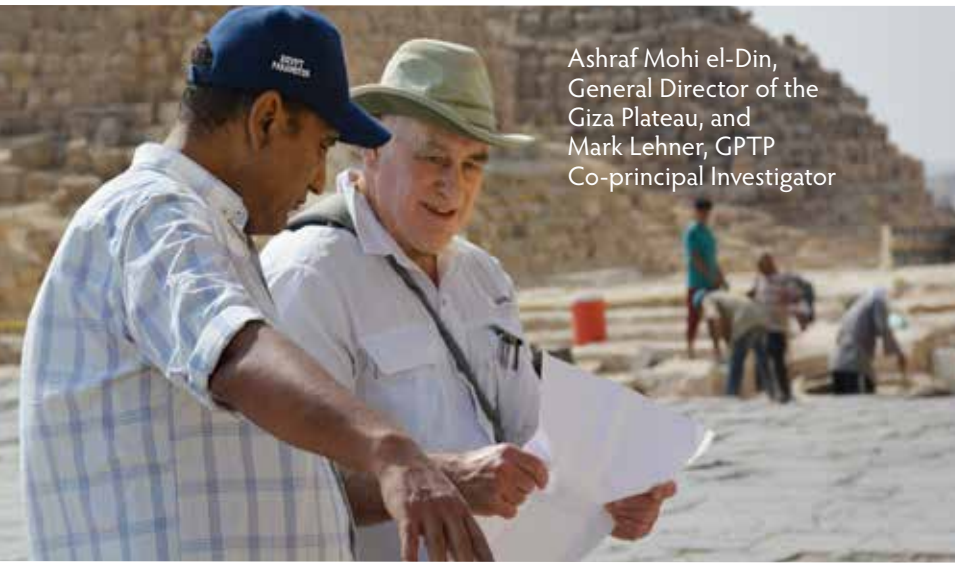
## Documentaries

National Geographic Explorer Yukinori Kawae, an AERA team member, was featured in a short Vimeo video (<https://vimeo.com/462208104>) that first appeared in Fall 2020. Working during the pandemic "with all borders closed ...," the producers had an especially challenging task. "We had to direct shooting sessions 5K miles across. We had to shoot Ancient Egypt without having our protagonist on the set." Combining film footage and animation, they succeeded in producing an engaging and informative video.

Yuki was designated a National Geographic Explorer several years ago. The Explorers program recognizes "exceptional individuals in their fields" and provides them with funding and support "to illuminate and protect our world through their work ..." (<https://www.nationalgeographic.org/society/our-explorers/>).



## SCENES FROM 2020-2021



Ashraf Mohi el-Din,  
General Director of the  
Giza Plateau, and  
Mark Lehner, GTP  
Co-principal Investigator



Mohamed Helmi,  
GTP Surveyor



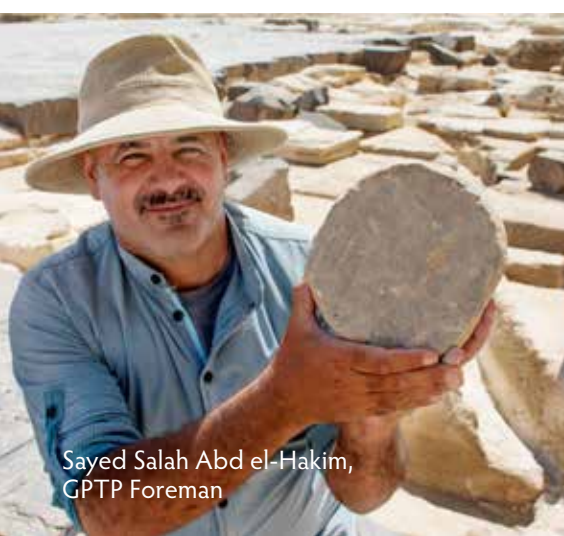
Dan Jones, GTP Archaeologist



Zahi Hawass, GTP  
Co-principal Investigator



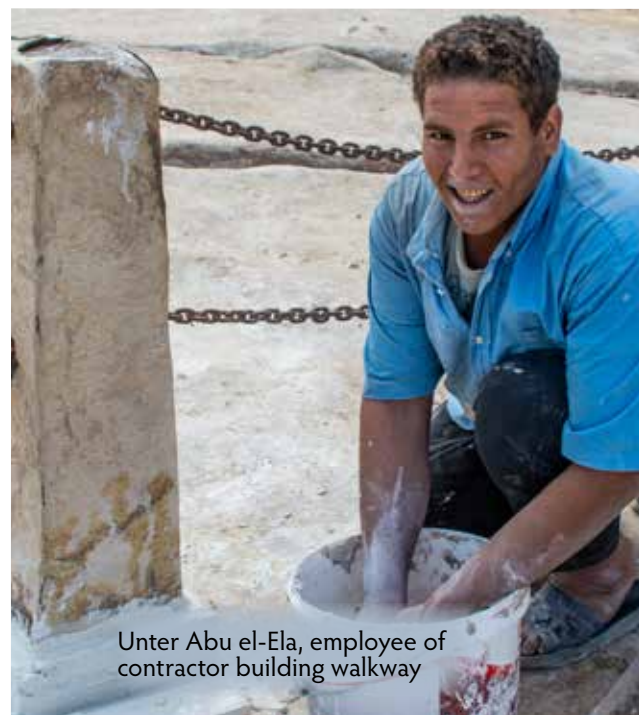
Emad Shaaban Hendawi, GTP Survey Assistant



Sayed Salah Abd el-Hakim,  
GTP Foreman

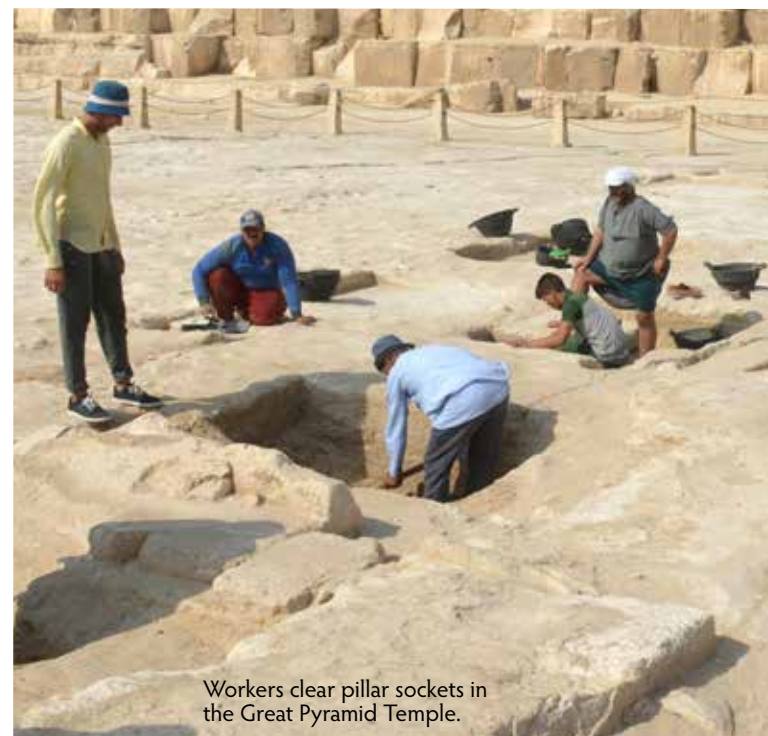


Mohamed "Midou" Said,  
Giza IT Manager

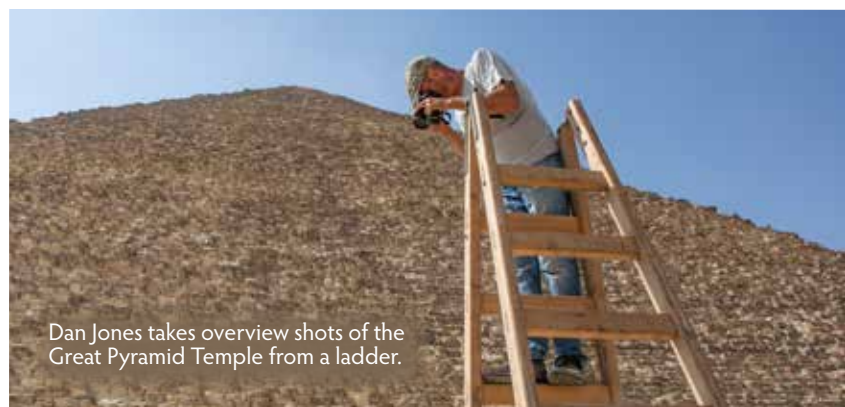


Unter Abu el-Ela, employee of  
contractor building walkway





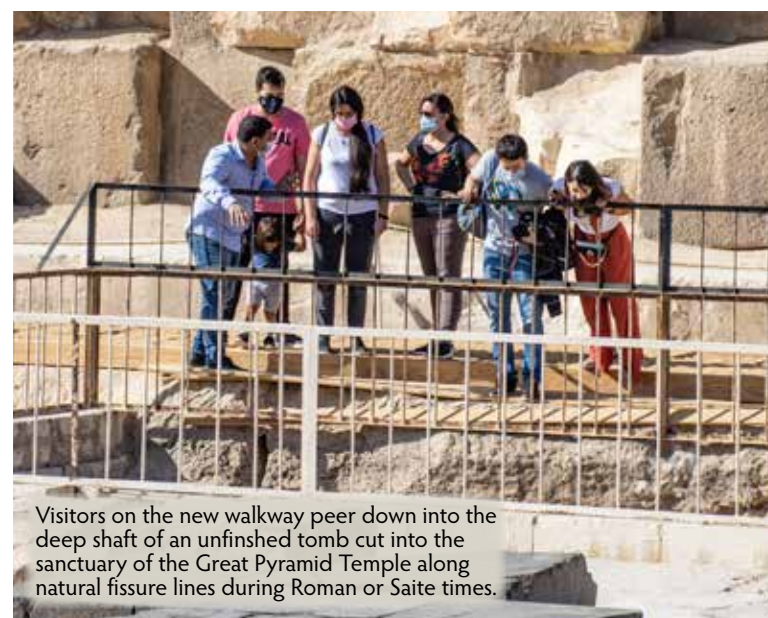
Workers clear pillar sockets in the Great Pyramid Temple.



Dan Jones takes overview shots of the Great Pyramid Temple from a ladder.



Visitors stroll on the new walkway as they view the Great Pyramid and Temple.



Visitors on the new walkway peer down into the deep shaft of an unfinished tomb cut into the sanctuary of the Great Pyramid Temple along natural fissure lines during Roman or Saite times.



A man is lowered in a bucket down into the shaft of the unfinished Roman or Saite tomb. He and another man filled the bucket with trash that had accumulated at the bottom and then had the load hoisted up to be hauled away. They repeated this many times until the shaft was free of debris.



A camel and his handler on the basalt pavement of the Great Pyramid Temple, before the GPTP team put up fencing to keep animals out of the temple.



# THANKS TO OUR DONORS

The generous contributions of our benefactors and members have made our work possible. Every tax-deductible donation supports AERA's archaeological excavations, publication of our findings, and educational programs aimed at advancing knowledge about our common human heritage. We are extremely grateful to the following foundations, businesses, and individuals who support our work. Donations through December 2021 are included.

## **LEADERS CIRCLE:**

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Ann Lurie  
Lee & Ramona Bass  
Douglas Rawles & Reed Smith LLP<sup>1</sup>  
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Brunel Society of North America  
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Leanna Gaskins  
Bob & Barbara Hensinger  
Kevin & Jeanne Kregel  
Norrone Leary  
Daniel Lehner  
Robert Lowdermilk  
Dr. Michael K. MacDonald

1. AERA thanks Douglas Rawles of Reed Smith LLP for providing advice and counsel on a myriad of legal matters.





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