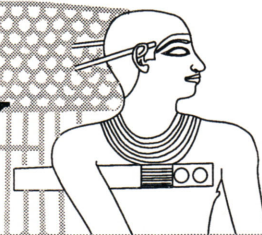


AERAGRAM

Newsletter of the Ancient Egypt Research Associates

Fall 1996

Vol. 1 No. 1



Introducing AERAGram *A Message from Mark Lehner*

A number of things inspire AERAGram. First is a desire to inform friends, family, supporters and the general public about our work at Giza. As the years go by and the work continues, we are constantly "capturing" more and more data. We could profitably take several years off from fieldwork to catch up on processing and publishing this information.

A Sense of Urgency

Working in the shadow of the pyramids for 20 years, however, has brought home a sense of urgency, as we have seen how even the greatest and most enduring stone monuments in the world are subject to drastic changes, and how ever more fragile is the archaeological record which surrounds them and contains the

evidence of the people and society that raised them. As told in the story of our 1995 field season (see page 8), our recovery of fish bone in a "loaves and fishes" food producing complex has brought home just how detailed, slow and painstaking our work must be in order to retrieve, without destroying, these particularly vital clues about the purpose of an ancient building, as well

(Continued on page 2)

Team members enjoy the view from the top of the Khufu Pyramid while collecting and preparing samples for the Radiocarbon Dating Project (see page 10).



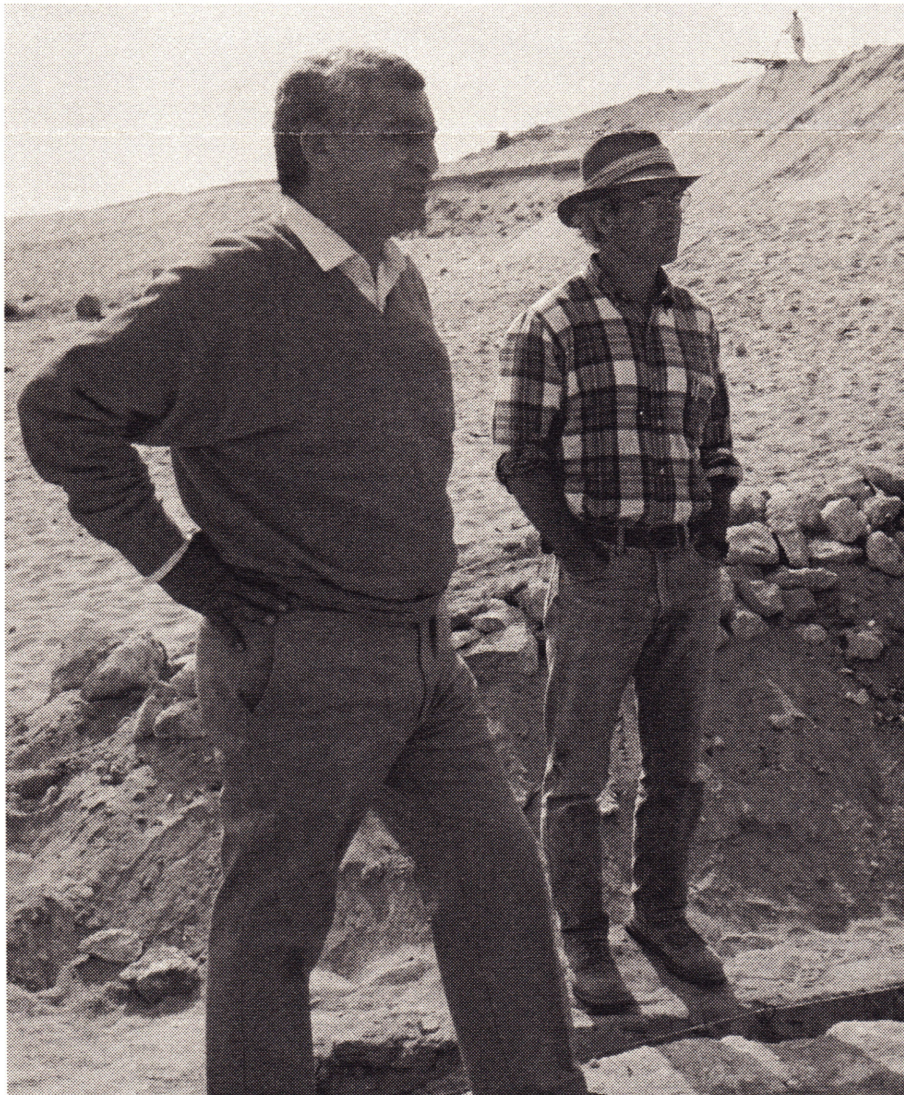
Introducing AERagram *A Message from Mark Lehner*

(Continued from page 1)

as other evidence about the most basic structures of everyday life during the time the pyramids were erected. Stripped of such information, these great monuments appear mysterious. Who built them and when seems to be "up for grabs." Yet, as we spent hours upon hours and days upon days trying to extract and map fish gills, fins, and cranial parts, front-loaders and road-

graders were gouging holes in the desert or pushing several meters of sand over the site. Modern Cairo continues to expand inexorably right to the edges of our excavation area, and, each day, the thundering hooves of, literally, hundreds of horses from the string of nearby riding stables pound the surface around our small 5 x 5 meter excavation squares.

Dr. Zahi Hawass and Dr. Mark Lehner look out over Area A. The worker's cemetery, excavated by an Egyptian team under Dr. Hawass, is just beyond the upper right hand corner of the photo where a workman is dumping fill from the excavation.



Alternative Theorists

Meanwhile, in recent years, there has been a flurry of interest and attention concerning the Giza Pyramids and Sphinx from outside academic Egyptology and archaeology. Many of the ideas in recent books and films rehash and embellish old pyramidological perspectives that have been around as long as, and in some cases, longer than systematic, scholarly archaeology. They focus on lost civilizations (e.g., Atlantis); astronomical patterns; the numerical and metric relationships between the pyramids, the earth, and the heavens; and the allegation that the dynastic Egyptians did not have the ability to build stone monuments with blocks weighing

Modern Cairo continues to expand inexorably right to the edges of our excavation area...

hundreds of tons. They take certain aspects of ancient Egyptian mythology literally and see in this the origin of the Sphinx and Pyramids in a time far more ancient than that of the Old Kingdom Egyptians of the 4th Dynasty (2,500 BC), who have left behind so much evidence on the Giza Plateau. Since I began my own sojourn and quest in Egypt 23 years ago, inspired by such ideas, this whole genre still interests me even if only as a social, psychological and literary phenomenon. Over the course of time, I have become a skeptic, concerned by an apparent lack of critical thinking in our society, and sympathetic, for example, with the aims

of CSICOP (Committee of Scientists for Investigation of Claims of the Paranormal) which publishes *Skeptical Inquirer*.

Meanwhile rumor, innuendo, and misinformation about the Sphinx and Pyramids is now transmitted instantaneously over the Internet, much of it associated with a "New Age" perspective. Many theorists and their followers feel excluded from the "club" of academic scholarship and sometimes express resentment and suspicion about orthodox scholarship and archaeology. Major television networks, motivated by their bottom lines, will air primetime specials that endorse the idea of a Sphinx far older than the experts admit, based on only several weeks of fieldwork, and the existence of a lost civilization that all the scientists seem to have missed, but they will not follow a story derived from decades of fieldwork that thoroughly documents every hieroglyph in Old Kingdom tombs or carefully extracts the gills of a 4,500-year old catfish.

The alternative theorists stand ready with simple easy-to-follow narratives of sleuthing out a technologically advanced, yet somehow lost, ancient civilization. Perhaps, this is so attractive because, to some extent, we feel lost in our own civilization. Scientists, on the other hand, offer dry hypotheses and rational explanations. All too often, archaeologists and Egyptologists only publish, for reasons necessary to the conduct of their field, collations, catalogues, tabulations and indices of fish bone, potsherds and hieroglyphic terms.

AERAGRAM

AERAGram is published twice a year by the Ancient Egypt Research Associates, 38 Harrison Street, #3, Somerville, MA 02143.

AERAGram reports on AERA's ongoing research, as well as our findings and other developments on the Giza Plateau for friends and supporters of AERA and others interested in ancient Egypt.

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AERAGram's Goals

It is AERAGram's purpose to give information, openly and candidly, about our research and activities at Giza, and elsewhere, relating not only the facts we observe, but the story-line and the understandings that guide us. With AERAGram we hope to stay in better touch with the many friends and supporters who have, over the years, helped to make our work at Giza possible. David Koch and Bruce Ludwig, by means of their financial support, have carried the project on their shoulders. LIETZ-Sokkia has consistently loaned state-of-the-art surveying equipment. Jon Jerde has contributed enormously with funds, computer time, and the unstinting work of Tom Jagers, CAD Director at the Jerde Partnership. The Oriental Institute and the Harvard Semitic Museum have

given an institutional context that the project could not do without. John and Peggy Sanders at the Oriental Institute Computer Laboratory and Archaeological Graphic Services have created and advanced our Giza data base and computer model. And many of you have helped with additional contributions of funds, time, material, and effort—so many, in fact, that it is difficult to keep you all fully informed one-on-one. And, so, with the help of Wilma Wetterstrom and John Nolan, we hope to publish AERAGram twice a year. At this stage, I am not sure how AERAGram will evolve, but I hope that, in addition to keeping you informed of research both inside and outside of the field, we may offer some opinions and observations on matters great and small along the way.

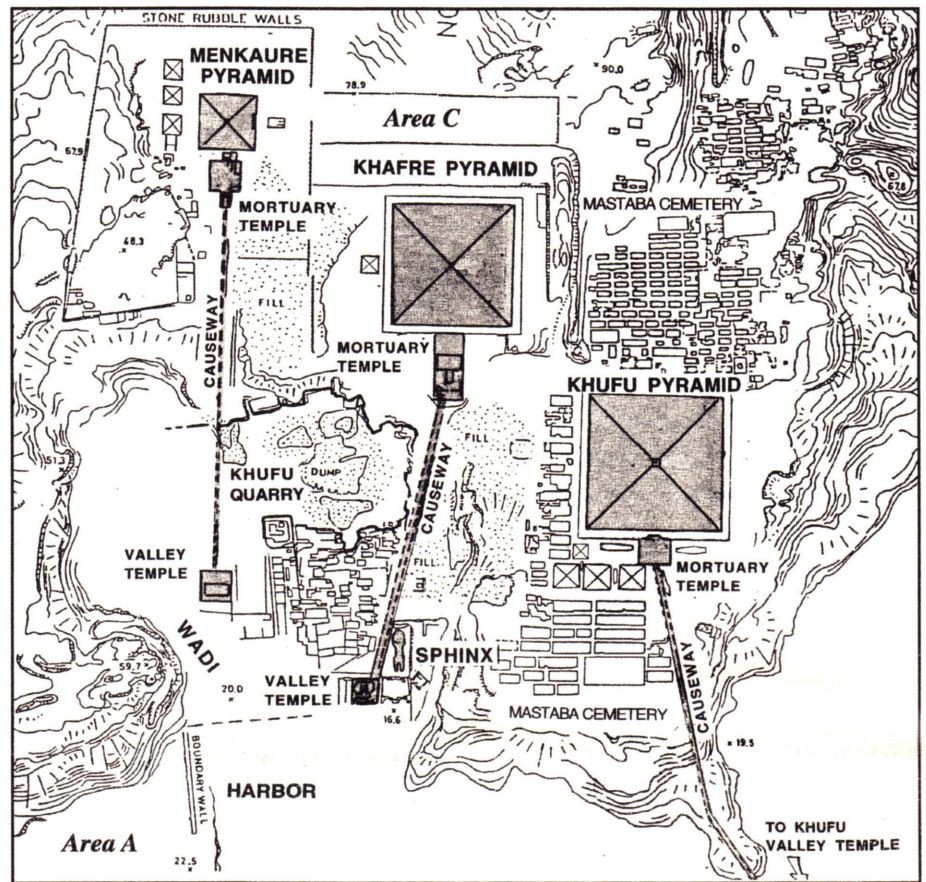


Introducing AERA

AERA, Ancient Egypt Research Associates, was incorporated in 1985 for the purpose of funding and facilitating the research of the Giza Plateau Project, which grew out of the Sphinx Project sponsored by the American Research Center in Egypt. Carried out between 1979 and 1983, under project director James Allen, Director of the American Research Center in Egypt at that time, and field director Mark Lehner, the purpose of the Sphinx Project was to document and study the great Sphinx.

The Sphinx Project

Carved from the living bedrock of the Giza Plateau, the Sphinx preserves a cross-section of the layers of limestone that the ancient Egyptians used to construct the pyramids, temples, and tombs at Giza. Our study revealed that the two large temples immediately to the east of the Sphinx—the Khafre Valley Temple and the Sphinx Temple—were created from stone blocks, weighing up to hundreds of tons, which had been quarried out of the Sphinx sanctuary, leaving a core from which the huge lion body was later sculpted. The Sphinx Project also revealed that the Sphinx and these temples were carefully positioned with respect to the Khafre Pyramid. This kind of attention to orientation is evident for much of the rest of the Giza Necropolis. As the Egyptians enlarged the necropolis over the course of three generations during the 4th Dynasty, they brought into alignment the pyramids, temples, and enclosure walls. The builders of the Sphinx and the pyramids adapted their vision of the royal and ancestral burial ground to the geological and topographical opportunities and constraints of the Giza Plateau. In this way, building the Giza Pyramids was a huge



A map of the Giza Plateau showing Area A and Area C and the major monuments.

architectural landscape project.

Survey and Mapping

The resulting terrain, therefore, can tell much of the story about how the pyramid builders were organized and how they lived. By surveying and spatial analysis, we can locate the ancient quarries which produced the bulk of the stone in the pyramids' cores, the massive dumps of the material used for building pyramid ramps, the harbors where the pyramid casing stones from Tura as well as granite from Aswan were delivered, and the areas of settlement where workers and overseers were housed and fed. Systematic excavation of these settlement areas could give us information about climate

and labor organization, as well as the economy that fueled pyramid building. It would also allow us to assess the effect that building the gigantic pyramids had on the evolution of the Egyptian state and culture.

Building the pyramids was a huge architectural landscape project.

And, so, these new avenues of research, raised by the Sphinx Project, led to the inception of the Giza Plateau Mapping Project (GPMP) in 1984. With help from David Goodman of CALTRANS (California Transportation

Authority), the GPMP established a survey control network over the entire Giza Plateau. Several seasons of surveying not only advanced our understanding of the geomorphology of the Giza Plateau, but helped determine areas, still open to excavation, which may prove to contain Old Kingdom settlement or remains of the infrastructure left by pyramid construction.

Excavation

In 1988 the project undertook its first excavation season, under the auspices of Yale University and the American Research Center in Egypt, with the financial support of David Koch and Bruce Ludwig. This work continues today as the Koch-Ludwig Giza Plateau Project. Since 1990 the excavations have been conducted under the auspices of the Oriental Institute of the University of Chicago and since 1994, the cosponsorship of the Harvard Semitic Museum.

In collaboration with Dr. Zahi Hawass, we excavated the so-called "Workman's Barracks" west of the Khafre Pyramid (our "Area C") in 1989, uncovering evidence that these buildings were not barracks at all, but storage magazines and workshops. Afterwards, we began to concentrate our attention on the southeast corner of the Giza Plateau, specifically the area south of the colossal stone wall 300 meters south of the Sphinx, a tract of low desert which we called "Area A." Here we have uncovered what appear to be the remains of 4th Dynasty royal institutions, comprising storage buildings, camp sites and bakeries. In addition, over the last several years, our Egyptian colleagues, under the direction of Zahi Hawass, have excavated a vast, working-class cemetery in the escarpment just above Area A. Meanwhile, the installation of a sewage system in recent years has uncovered evidence of a large,

ancient settlement underneath the modern town along the foot of the Giza Plateau.

AERA's Work and Mission

Until 1994 AERA played a minor role in this research at the Giza Plateau. AERA administered part of the funds supporting the exhibit, "The Sphinx and Pyramids: 100 Years of American Archaeology at Giza," which can be seen at the Harvard Semitic Museum through June 1997 as described in the article below.

AERA's mission, defined in its charter, is to explore the origins of civilization in the archaeological record and from this work contribute insight and understanding to our present awareness of cultural evolution. With this mission in mind, AERA's attention has naturally focused on the Giza Plateau, the center of Old Kingdom pyramid building—one of the earliest turning points in the cultural evolution of ancient Egypt, the world's first nation-state.



Pyramid and Sphinx Show at Harvard Semitic Museum

An exhibition on the pyramids and the Great Sphinx is currently on display at Harvard University's Semitic Museum. The show—"The Pyramids and the Great Sphinx: 100 Years of American Archaeology at Giza"—brings current research on the Giza Plateau together with the work of the great early 20th century Egyptologist, George Reisner. The exhibition is funded by David Koch, Bruce Ludwig, Shelby White, and Leon Levy; Mark Lehner and Rick Riccio of the Harvard Peabody Museum designed and constructed the exhibit, with the help of museum staff, while Lehner was a visiting scholar at Harvard University.

The complementary nature of Lehner's and Reisner's work, makes them ideal companions in an exhibit. Reisner, a Harvard professor, spent

much of his life working at Giza, sponsored by Harvard University and the Boston Museum of Fine Arts, and was chiefly interested in excavating and interpreting the great tombs and temples at Giza. Lehner, on the other hand, takes a more contextual approach by looking not only for evidence of the infrastructure and great masses of people that were necessary to build the pyramids, but also at how pyramid building fit into the larger context of Egyptian cultural development. While helping to create a single integrated kingdom, pyramid building also had a great impact on the development of literacy and record keeping as well as spurring on internal colonization, which moved people into the hitherto sparsely-populated regions of Middle and Lower Egypt.



The Pyramids and the Great Sphinx
100 Years of American Archaeology at Giza
April 1995 - June 1997

Semitic Museum
 6 Divinity Avenue
 Cambridge, Massachusetts
 Monday - Friday 9:00 - 4:30
 Sunday 1:00 - 4:00
 Information: 617-495-4631

Pyramid Age Bakery Reconstructed

Experimental archaeology offers clues to ancient baking technology

Inspired by a major discovery during the 1990-91 field season, Mark Lehner and a National Geographic team built a replica of a Pyramid Age bakery during the fall of 1993. With the assistance of Ed Wood, an expert on yeasts and sourdoughs, they tried their hand at baking bread following ancient Egyptian techniques.

The highlight of the 1990-91 field season was the discovery of two rooms, connected to a larger complex, which turned out to be the remains of baking facilities. Here bread had been baked in large, cumbersome, conical, ceramic molds, weighing up to 12 kilograms each, called *bedja*—a style unique to Pharaonic Egypt. These two small rooms were far more significant than their modest contents, seen in the map to the right, suggested. The data they yielded, after painstaking excavation, helped flesh out some of the details of the baking process that was previously known only through reliefs from Old Kingdom tombs. However, to answer the many unresolved questions, Lehner and his team were compelled to turn to experimental archaeology, whereby ancient sites and processes are reconstructed to gain insight into how they really functioned. The National Geographic Society helped in this endeavor by sponsoring a project that rebuilt a bakery room, modeled after the ancient bakeries discovered in Area A, to test various theories about the baking process.

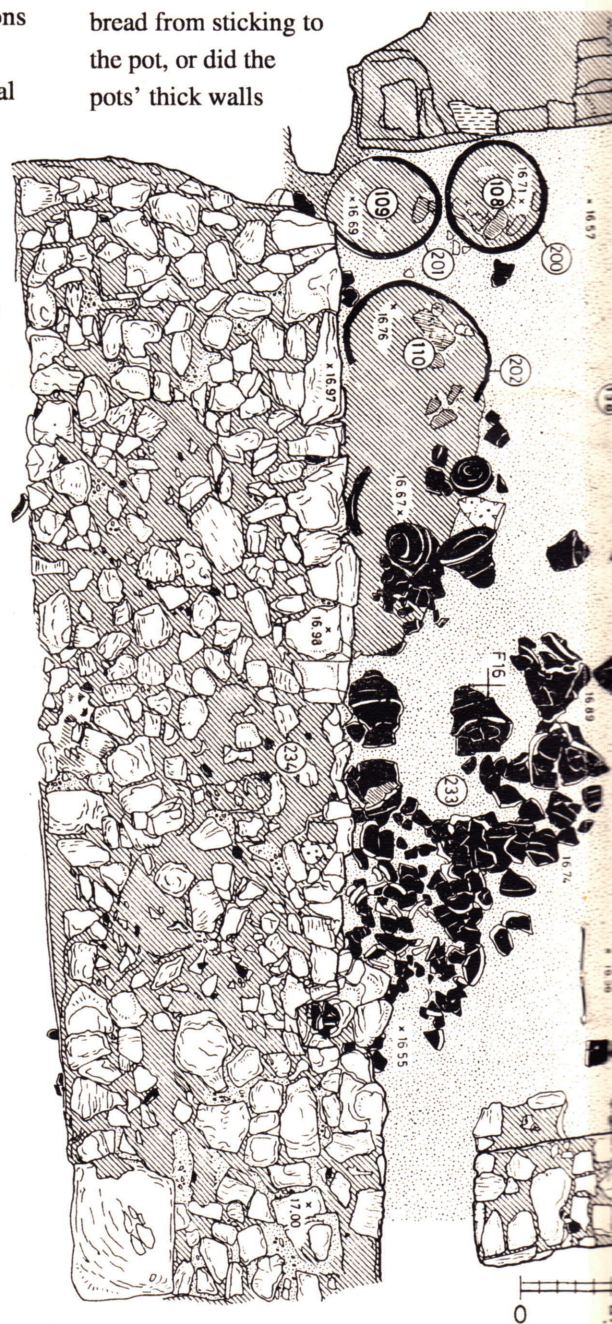
When the two baking rooms were first uncovered in Area A 7 at Giza in 1990-91, they seemed to be enigmatic rectangular structures, 5.25 x 2.5 meters, with low stone walls. As layers

of black ash were carefully troweled away, features and artifacts, including whole and broken *bedja*, used to bake bread during the Old Kingdom, started to emerge. In the end, it became apparent that the rooms closely corresponded to the bread baking depictions in reliefs from Old Kingdom tombs such as that of the 5th dynasty official Ty at Saqqara.

In the northwest corner of each ancient bakery three large vats had been set into the ground, presumably, for mixing the dough. On the other side, in the southeast corner of both rooms, had stood open fireplaces, one of which still held an upside-down *bedja*. Old Kingdom tomb reliefs show *bedja* stacked with their interiors down, over an open fire in order to preheat them before bread baking. Along the eastern walls of both bakeries, two rows of depressions had been dug into the floor, like large egg cartons, presumably to serve as receptacles for the preheated *bedja*. Reliefs show workmen pouring batter into upright *bedja* whose rounded bottoms had been set into some sort of base. These same representations show that another *bedja* was placed upside-down over the filled bottom bread mold, as a cover. Then, hot ashes were probably piled around the two pots to complete the baking process, as suggested by the soil found in the “egg carton” area, which was black with minute particles of charcoal.

While the bakery rooms at Giza shed light on some details of

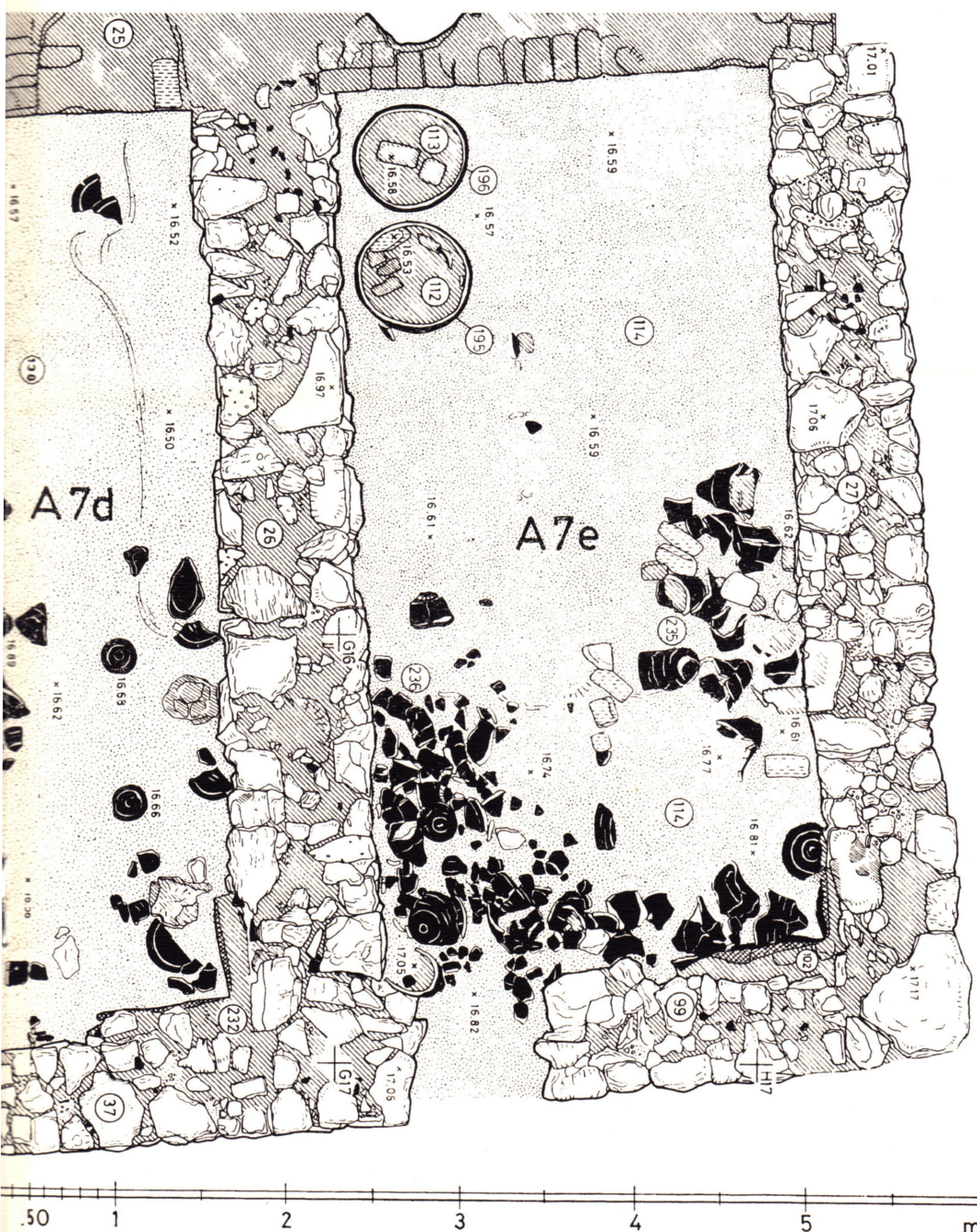
this unusual method of baking bread shown in these tomb reliefs, many questions remained. For instance, why were the pots stacked heated prior to baking? Was this merely to temper them in order to prevent the bread from sticking to the pot, or did the pots' thick walls



retain enough heat from the fire to serve as miniature ovens? Was ash indeed raked around the preheated pots after they were placed in the "egg cartons?" Was this really necessary to bake the bread? And, what kind of bread was

ultimately produced from the emmer wheat and barley flours available to the ancient Egyptians? These grains contain very little gluten, the protein which gives modern breads their light, airy texture.

A map of the two bakery rooms discovered during the 1990-91 field season. On the left hand side of the rooms are the large vats used for mixing dough. The black, irregular shapes are broken and whole ceramic molds called bedja.



With these questions in mind, Mark Lehner and the National Geographic team reconstructed a bakery in the fields beneath the bluffs of Saqqara, faithfully reproducing the Giza bakery. Mark and Ed Wood, a retired pathologist, attempted to bake breads using emmer and barley flour, in pots made more or less to *bedja* specifications, and leavened with local, wild yeasts from Giza, captured by Ed, who has devoted much of his life to the study of wild yeasts and the sourdoughs made from them.

These experiments yielded many surprising insights, that would not have come about through arm-chair theorizing. For example, Mark and his colleagues discovered, as they mixed the dough and placed it in the pots, that the low walls of the ancient bakery rooms were not merely the eroded foundations of what had been taller structures. These walls were intended to be low and flat, providing essential working surfaces. They also found that higher walls would have trapped and held all the smoke and ash generated during baking, making the small space intolerable.

The results of these experiments are not only important for understanding the bakeries at Giza, but also have broader implications. Baking bread in *bedja* was a wide-spread practice, persisting for almost 500 years, as demonstrated by bread mold sherds found at campsites along the way to Palestine, as well as at sites from the Delta all the way down to Elephantine, in all kinds of contexts.

National Geographic article

A report on the bakery experiments appeared in *National Geographic's* January 1995 issue along with an article on Old Kingdom Egypt.

The 1995 Field Season

A massive fish processing center discovered amidst enigmatic long, low plastered benches

The Koch-Ludwig Giza Plateau Project (formerly known as the Giza Plateau Mapping Project) resumed excavations in Area A 7 from January through March 1995. The goal of these latest excavations was to explore beyond the bakery rooms, and understand the larger complex of which they were a part. The bakeries (described on pages 6-7) were attached to the southern wall of an expansive building, with external mud brick walls 1.5 meters thick. Lehner has proposed two possible explanations for the function of this vast building and the activities which took place therein. First, the bakeries may have been part of a major household, called a *per* (or "house") in Ancient Egypt. Such households typically had a variety of specialized work spaces attached to them in modular fashion. At Illahun, for example, as Barry Kemp has pointed out, there is a core house which is surrounded by granaries, bakeries, butcheries, and weaving shops. Similar workshops are represented in the charming models from the 11th dynasty tomb of Mekanre. Following this suggestion, the building in Area A 7 may have been a large, central institution to which the bakeries and a variety of other industries were attached.

An alternative hypothesis is that the structure was a large, specialized production center, a state institution dedicated only to baking bread and brewing beer. In Old Kingdom tomb scenes, baking and brewing are closely connected. For example, in a relief from Ty's tomb, these two activities are carried out inside the same *Per shena*

("house of *shena*"), which appears to be a commissary.

During this last season, three 5 x 5 meter sections of this structure in Area A 7 were excavated in order to determine which of these two hypotheses best fit our building. If it had been a large "commissary," which only baked bread and brewed beer, then, logically, only the remains of these industries should be unearthed. On the other hand, if the structure were a large household to which a variety of modular workshops were attached, traces of these other activities, such as weaving and butchering, should turn up.

In 1991, the extreme southeastern corner of this large building was excavated, revealing a series of 6-inch high, plastered benches, running from south to north, disappearing into the baulk at the edge of the square. On top of these curious platforms was a set of complete bowls and cylindrical bases. The ceramic in these bowls and bases was much finer than that in the *bedja* turning up in the bakeries. Since we had only exposed a small portion of this structure, it was too soon to make a guess about its purpose, but we fully expected that more benches, bowls and bases awaited us, along with other, more conclusive clues to the function of this building.

Initially, the three squares we opened in 1995 lived up to our expectations. After a week of removing layers of sand and compact soil, the tell-tale plastered benches began to appear, except that these benches were bare. Not only were there no vessels similar to the bases and bowls we had discovered

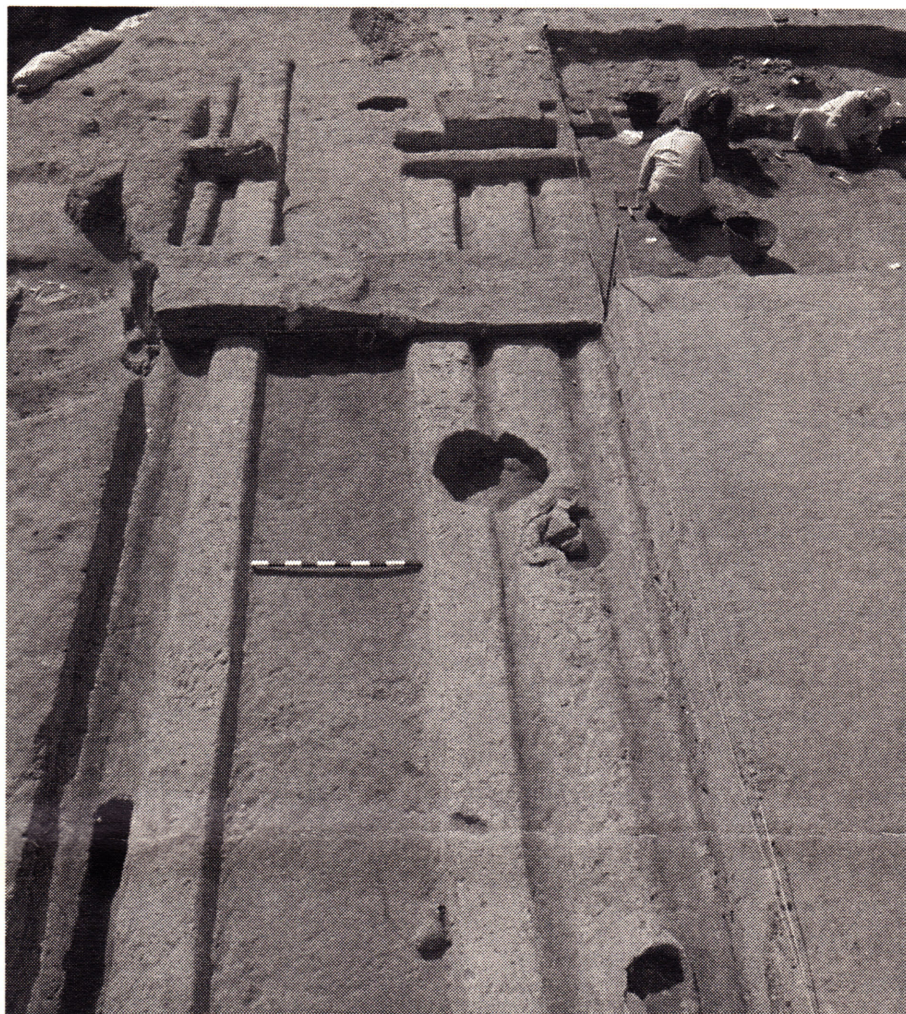
four years before, but we were encountering fewer sherds of pottery than elsewhere on the site. Flint blades, which popped up occasionally, seemed comparatively numerous. In addition to this disappointment, the pace of the work had slowed down considerably as we began to peel back multiple floor layers, requiring much attention, and, at

After a week of removing some...layers of compact soil, the tell-tale plastered benches began to surface.

first, yielding little new data.

Then, one of our workmen discovered what he thought to be ears of wheat embedded in one of the floors. This curious material proved to be very delicate, and had to be painstakingly treated with a consolidant before it could be removed in a block with the surrounding soil. Examined later by Wilma Wetterstrom, our expert on ancient plant remains, this wispy material actually turned out to be fish gills. Afterwards, the ancient floor levels at the site were examined minutely, revealing other traces of fins, gills and cranial parts. Where we had expected to find a brewery, we actually uncovered a massive center for processing fish, supplementing the loaves from the bakeries. This leads us to wonder what other surprises await us when we resume our field excavations at Giza.





The 1997 Field Season

The Koch-Ludwig Giza Plateau Project will return to Giza in early 1997 to resume work in Area A 7 where the bakery and fish processing center, described in the article to the left, were previously discovered. Working from January through March, the project team hopes to learn more about the functions of this large complex, most of which still lies buried beneath the desert sands.



In Area A 7 the low plastered benches run from north to south through a large area of the food processing center. The horizontal "bridge" across the benches is the excavators' baulk. The large circular hole straddling the benches is an intrusive pit. The two smaller holes are column bases.

Ancient Wall Discovered in the Valley Floor at Giza

Early in 1994, Dr. Zahi Hawass, Director of the Giza Pyramids, announced the discovery of a large stone wall which may have been part of the ancient harbor works at Giza. A contractor putting up apartment buildings in a vacant lot in the village of Nazlet el-Zaman just at the foot of the Giza Plateau uncovered the wall which lay about 2 meters below the modern surface. Because the lot was surrounded by a high brick wall, antiquities inspectors did not learn of the discovery until after contractors had uncovered and partially destroyed the ancient wall

by removing a large section and pouring in a cement foundation. The ancient wall is about 4 meters wide and is constructed of large blocks of limestone and basalt. Although its height has not yet been determined because its base is below the water table, it spans the 70 meter wide lot and continues well beyond. In fact, several years ago, wall traces were seen more than 200 meters further south in trenches dug for the AMBRIC sewage project, part of the same structure.

Dr. Hawass believes that the wall, lying about 500 meters east of the

Khufu Valley Temple (the location of which was only discovered recently, also by the trenching done for the AMBRIC sewage project), might have bounded the harbor that came to the front of the that temple 4,500 years ago. The wall also may have formed a part of an enclosure for the pyramid town of Khufu, housing priest and administrators, that grew up along the base of the Giza Plateau as the pyramids were being constructed over a period of three generations.



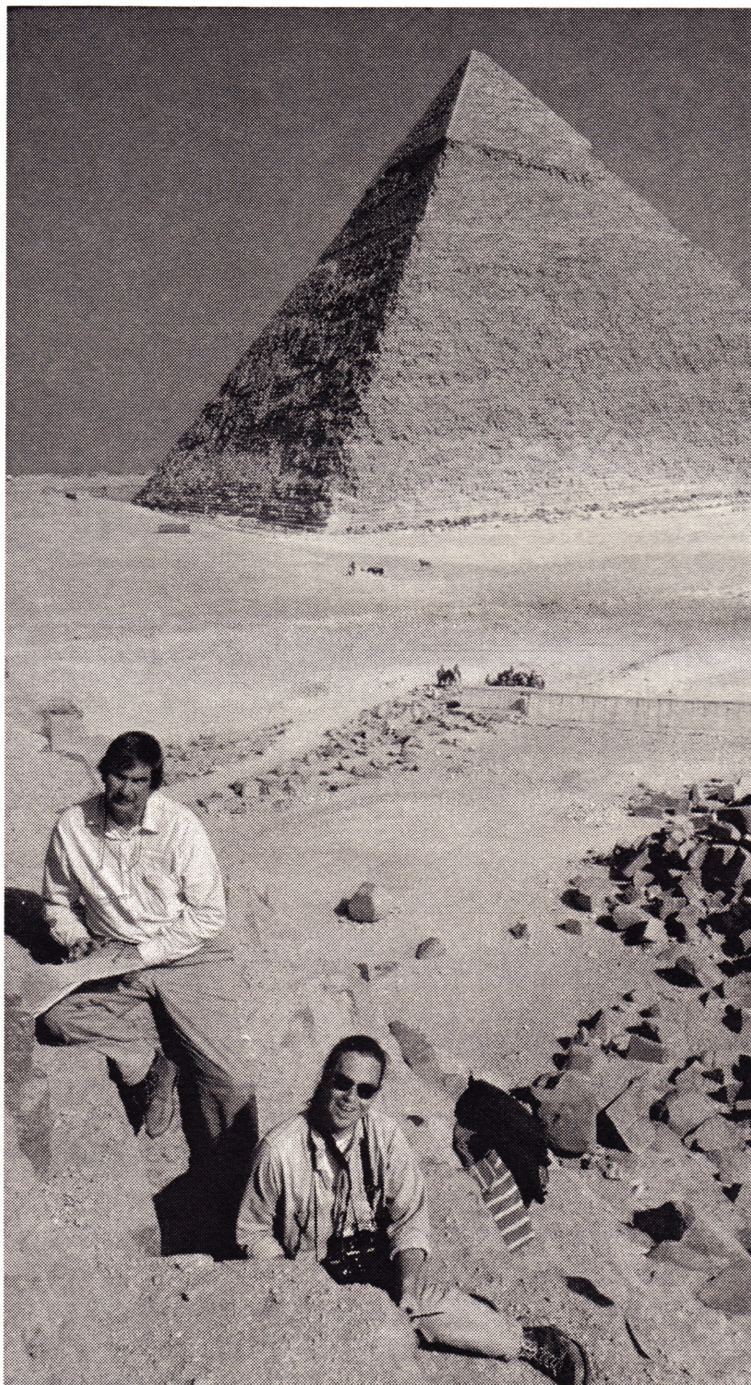
The Pyramids Radiocarbon Dating Project

Traditional historical dates and radiocarbon dates give different ages for the pyramids. Which are correct?

This project was inspired by the results of the 1984-1985 Pyramids Radiocarbon Dating Project, and by David Koch's keen personal interest. The project is a collaborative effort of Drs. Shawki Nakhla and Zahi Hawass of the Supreme Council of Antiquities; Herbert Haas, Desert Research Institute; Robert Wenke, University of Washington; Georg Bonani and Willi Wölfli, Institut für Mittelenergiephysik, Eidgenössische Technische Hochschule (ETH); and Mark Lehner, the Oriental Institute of the University of Chicago and the Harvard Semitic Museum. Funding for the 1995-96 program has been provided by the David Koch Foundation.

The massive Old and Middle Kingdom pyramids were habitation sites during the time they were being built. Hundreds of workers must have spent the better part of each day over the course of years on the rising building project. The stone blocks, bricks, and mortar comprising the cores of the pyramids hold evidence of the builders' presence: fragments of stone tools; green copper flecks from chisels, pottery sherds and small specks of charcoal, perhaps left over from the wood fuel for heating the gypsum in order to prepare the mortar. The cores of the giant Giza pyramids were built with great quantities of gypsum mortar slopped between the stones which the builders set with far less precision than the fine masonry of the outer casing. Although the cores of earlier pyramids appear to have been built with less prepared gypsum and more *tafla* (calcareous desert clay) mortar, bits of wood and reed can still be found embedded in the masonry. Middle Kingdom pyramids, following Senwosret I, were built with mud bricks tempered with large quantities of reed.

Radiocarbon dating can only be done on organic material. The development of radiocarbon dating by Accelerator Mass Spectrometry (AMS) allows very small samples of organic material to be dated. We thought that samples freshly collected from the fabric of the pyramids would provide an interesting data set to evaluate the chronology of the Old



Perched on the side of Menkaure's Pyramid, Robert Wenke and John Nolan collect samples of organic material for radiocarbon dating, while Khafre's Pyramid looms behind them.

Kingdom, prior to the first historical, astronomical 'footholds' in Egyptian chronology, and to evaluate and compare the results of traditional historical chronologies for the Third Millennium BC and those derived by radiocarbon dating. The fact that the samples could be extracted from secure contexts within the fabric of the pyramids, was coupled with an assumption (itself subject to testing) that the material was deposited during the reigns of the kings for whom the pyramids were built. At the same time, field work made it clear that "secure context" in the fabric of colossal pyramids is not something we can take for granted! There is a living ecology in the ruins of pyramids, which includes vermin, snakes, foxes and insects!

In 1984, we dated 64 samples of organic material (charcoal, reed from mudbrick, some wood) extracted from the fabric of the pyramids and their associated structures. The dating was done with an Accelerator Mass Spectrometer (AMS) facility at ETH Zurich. Larger samples were dated at the Institute for the Study of Earth and Man, Southern Methodist University, by benzene scintillation (the latter facility has since moved to the Desert Research Institute in Nevada). The results were published in *Chronologies in the Near East* (O. Aurenche, J. Evin, and F. Hours, eds.), BAR International Series 379 (1987), 585-606. The dates, after dendrochronological calibration, averaged 374 years too early for the *Cambridge Ancient History* dates of the kings with whom the pyramids are identified.

These results raise a number of questions. Here it can only be stated briefly that the sample collecting procedures, following guidelines of the geochronologists, as well as sample pretreatment in the laboratories, made it improbable that our methods were uniformly biasing the samples toward older dates. The dates were calibrated according to Robinson's (1986)

The dates ...averaged 374 years too early...

program for deriving average (centroid) calibrated age estimates by statistically weighted increments from multiple intersections with the tree-ring calibration curve (calibration has changed over the last ten years). Substantive issues include the "old wood problem." Are we dating charcoal that derives from wood fuel that had been long used for other purposes? For example, wood beams in the 12th Dynasty hauling tracks excavated near the Lisht Pyramids came from the hulls of boats that could have been built long after the felling of the tree that provided the wood. It is possible that the pyramid builders used the same wood for several purposes over a long period of time before it became fuel for preparing gypsum mortar. In the 1984-85 study we also had dates from material that we perceived was short-lived reed (without paleobotanical identification). While not as early as those derived from charcoal, the dates were still significantly earlier

than the expected ranges.

During the 1995 season, more than 300 samples were collected, and their provenances documented, mostly by Robert Wenke and John Nolan. Wilma Wetterstrom set up a provisional laboratory in our field house near the Giza Plateau for paleobotanical identification of selected samples. Concentrating on samples of short-lived reed when possible, we sampled monuments ranging from the Dynasty 1 tombs at Saqqara to the Djoser Pyramid, the Giza Pyramids, a selection of Dynasty 5 and 6 pyramids and Middle Kingdom pyramids (Amenemhet I at Lisht, Amenemhet III at Dahshur, and Senwosret II at Illahun) to check in with periods closer to well established historical/astronomical dates. The samples should yield well more than a hundred new radiocarbon dates from well defined contexts. The results may shed new light on the relationship between radiocarbon dating and Egyptian chronology.

ETH is dating the great majority of the samples in this study, whereas the Desert Research Institute is dating a selection of larger samples. We have planned for an inter-laboratory test with another leading AMS radiocarbon facility. ETH has helped to make the study possible by dating samples at a significant reduction over the usual cost of AMS dating. Results will be announced through our colleagues at the Supreme Council.





The bearer of our AERAGram, seen in our banner, is a scribe from the 5th Dynasty tomb of Ptahhotep II at Saqqara. He holds his palette under his arm while reed pens rest on his ears.

Inside

Introducing AERAGram: A Message from Mark Lehner	1
Introducing AERA	4
Pyramid and Sphinx Show at Harvard Semitic Museum	5
Pyramid Age Bakery Reconstructed: Experimental archaeology offers clues to ancient baking technology	6
The 1995 Field Season: A massive fish processing center discovered amidst enigmatic, long low plastered benches ...	8
The 1997 Field Season	9
Ancient Wall Discovered in the Valley Floor at Giza	9
The Pyramids Radiocarbon Dating Project: Traditional historical dates and radiocarbon dates give different ages for the pyramids. Which are correct?	10



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