GIZA

Mark Lehner

The 1995 season of the Koch-Ludwig Giza Plateau Project began on December 9, 1995 and concluded March 11, 1996. We carried out three separate programs: (1) sample collecting for the Pyramids Radiocarbon Dating Project; (2) a continuation of the excavations in our Area A to the south of the large stone wall called Heit el-Ghurob (which is about 300 m to the south of the Sphinx); and (3) mapping the area to the east of the Great Pyramid of Khufu for Dr. Zahi Hawass and the Supreme Council of Antiquities.

We are grateful for the cooperation of Ms. Sanaʿa Fouad and Mr. Gamal Salem who represented the Supreme Council of Antiquities (SCA) at the excavation site, and Mr.

Ashraf es-Sanussi who served as our inspector in the storeroom. We are also grateful for the assistance of Dr. Zahi Hawass, Director General of Giza and Saqqara, and Mr. Mahmoud el-Afifi, Chief Inspector of Giza. We are also extremely grateful once again to Lietz-SOKKIA corporation of Overland Park, Kansas for the loan of an SET3C11 Electronic Total Station for our survey work.

The team consisted of Professor Mark Lehner, Oriental Institute (OI) and the Harvard Semitic Museum (HSM), director; Dr. Robert Wenke, University of Washington (UW), co-director of the Radiocarbon Dating Project; Dr. Wilma Wetterstrom, Harvard Botanical Museum, paleobotanist; Dr. Peter Lacovara, Museum of Fine Arts, Boston, ceramist and registrar; John Nolan, University of Chicago, archaeologist; Carl Andrews, photographer; David Goodman, California Transportation Department (CALTRANS), surveyor; Susan Weeks, artist; and Dr. Herbert Haas, Desert Research Institute (DRI), geochronologist.

Pyramids Radiocarbon Dating Project

This project was inspired by the results of the 1984/85 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 (SCA), Herbert Haas (DRI), Robert Wenke (UW), Georg Bonani and Willi Wölfli, Institüt für Mittelenergiephysik, Eidgenossische Technische Hochschule (ETH), and Mark Lehner (OI, HSM). Funding for the 1995/96 program is 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 bits 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 that the builders set with far less precision than the fine masonry of the outer casing. The cores of earlier pyramids appear to have been built with less prepared gypsum and more *tafla* mortar—calcareous desert clay. Nonetheless, bits of wood and reed can be found embedded in the corework. Middle Kingdom pyramids, following Senwosret I, were built with mudbricks tempered with large quantities of reed.

The development of radiocarbon dating by Accelerator Mass Spectrometry allows very small samples of organic material to 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 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 B.C. 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 had been deposited during the reigns of kings for whom the pyramids were built. At the same time, fieldwork made it clear that "secure context" in the fabric of colossal pyramids is not something we could take for granted. There is a living ecology in the ruins of pyramids, including vermin, snakes, fox, 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 facility at the

Figure 1. The 1995 excavations in Area A7 with Squares G20 (foreground), F19, and E18. View to the southwest

Eidgenossische Technische Hochschule in 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; pp. 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) 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 Twelfth 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 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 three hundred samples were collected, and their proveniences 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. She worked hand-in-hand with geochronologist Herbert Haas who came later in the season to collect some of the samples. Concentrating on samples of short-lived reed when possible, we sampled monuments ranging from the First Dynasty tombs at Saqqara to the Djoser Pyramid, the Giza Pyramids, a selection of Fifth and Sixth Dynasty pyramids, and Middle Kingdom Pyramids (Amenemhet I at Lisht, Amenemhet III at Dahshur, Sesostris II at Illahun) to check in with periods closer to well-established historical/astronomical dates. The samples should yield well over a hundred new radiocarbon dates from well-defined contexts. The results could shed new light on the relationship between radiocarbon dating and Egyptian chronology.

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

Excavations

Our 1995 excavation season began on January 15. We opened only one of our three excavation areas of previous seasons, A7, where we found two intact bakeries in 1991. Because they were so complete, these bakeries took a good deal of our time and attention. However, they might have been somewhat ancillary to the main purpose of the site, signified by the remains of a large mudbrick building, enclosed by 1.5 m thick walls, to which the two bakeries were attached on the southern side. Prior to our excavations, a backhoe had gouged a large trench through the southeastern corner of this building, just missing the two bakeries. Our goal, in a season of excavation limited by Ramadan work hours and by the other two principal projects, was to find out more about the purpose of the large structure.

Our first task was to clear from 1.5 to 2 m of sand that loaders and graders sent by the Giza Governorate had pushed over the site of A7 in the days just prior to the beginning of our season. We are grateful to the Giza Inspectorate for providing a loader to remove this sand so that we could continue excavating. Then we removed the sand that we had backfilled into the excavation at the end of the 1991 season, as is our usual procedure in order to preserve the sites for future investigation. We opened three 5 × 5 m excavation squares to the north, west, and southwest of our original 15 × 20 m area (fig. 1).

As before in A7, we found the mudbrick architecture directly under an ancient layer of dry and slightly gravelly sand. The sand lies directly over the tops of the larger walls, or directly over a layer of disintegrated mudbrick, about 20 cm thick, that fills the spaces between the low walls and benches. The total depth of our excavation in the area to the north and west, down to floor level of the mudbrick building, was 50 to 60 cm. The Old Kingdom remains just under this sand, however, are all at

Figure 2. Excavation Square G20, view to the south, showing low benches and troughs. Main enclosure wall along left, two column bases in holes to the right. Larger round hole is an intrusive pit

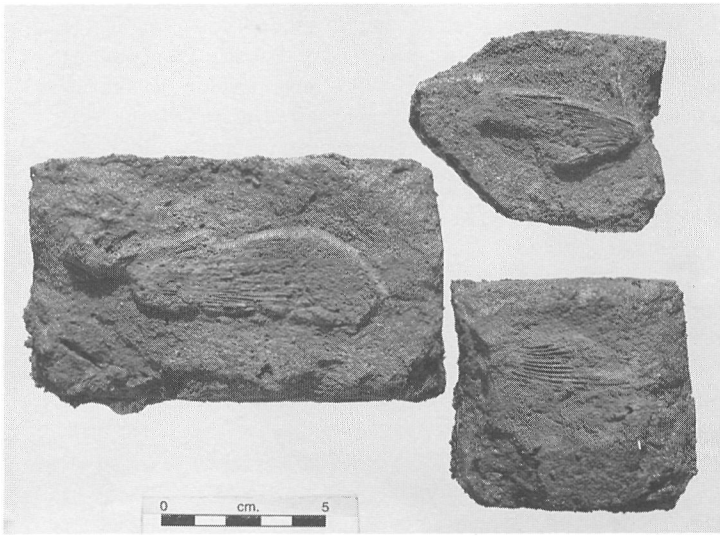

Figure 3. Fish remains from floor along low benches in excavation Square F19

about the same elevation as though the site had been carefully leveled when it was abandoned. There is very little debris or mounding such as would be produced by a gradual collapse of the walls. The stratified occupation deposits extend about another meter below the phase of the bakeries and mudbrick building.

In two of our 5 × 5 m excavation squares (F19 and G20) we excavated the fill of the mudbrick building to floor level (fig. 1, foreground). Our third square (E18) to the southwest was only partially excavated at the end of the season (fig. 1, background).

Square G20 is directly to the north of the 15 × 20 m area excavated in 1991 (fig. 2). During that season we excavated a bit of the floor of the large building on the opposite side of the backhoe trench (Area A7b). Here we found low partition walls and two sets of low benches separated by troughs, about 10 to 15 cm high. They were formed of alluvial mud and paved with marl clay (*tafla*). We also found a small cache of complete Old Kingdom jar stands and small internally flanged bowls (possibly lids) on the set of benches that runs along the 1.5 m thick east wall of the building.

In Square G20 we found that the low benches and channels continue to the north (fig. 2). However, we did not find more complete ceramic bowls and jar stands on the benches as we did in the 1991 season. We found a great quantity of bread mold sherds lying on the floor that separates two groups of benches in this square and a number of flint blades and scrappers. The first two benches to the east (fig. 2, left) are built against the base of the 1.5 m thick eastern mudbrick wall of the building that continues beyond our square. Interrupting the middle of three benches to the west, we found two holes at the bottom of which were smooth round limestone pieces (fig. 2); the larger hole is an intrusive pit cut from a higher stratigraphic level. The limestone pieces must be bases for columns that were probably wood. The middle bench was built around each column after it was installed, judging from the way the side of the bench bulges out near the hole. The columns were probably removed when the building was abandoned.

On the southern side of Square F19 we found two small square rooms, defined by walls that are, similar to the benches, very low, from 20 to 30 cm high at most. These rooms contained ashy deposits, and many rounded clumps of concentrated mud, perhaps material for making mud sealings. Another group of three benches and channels projected from the northern side of the square toward the south to a corridor just in front of the small square rooms (fig. 1). Again we found nothing on these benches. The

floor was covered by a slightly ashy deposit a few millimeters thick. Embedded in the floor alongside the western bench we found very fragile remains of fish bone, including fins, gills, and cranial parts. These remains were easily destroyed. We retrieved the larger pieces by consolidating them and the floor around them and then lifting the whole as one block (fig. 3).

These finds prompted us to take soil samples from the troughs between the low benches in G20 for Wilma Wetterstrom to examine microscopically. She found small broken fish bone through the samples.

The articulated fish bone that we recovered could be Tilapia, although we do not yet have a specialist's identification. Achilles Gautier and Win Van Neer worked out the seasonality of catfish (*Clarias*) and Tilapia harvests for the Late Paleolithic site of Wadi Kubanniya. The annual rise of the Nile floodwaters, roughly from late June to July during dynastic times, triggers a lateral spawning migration out onto the alluvial plain where there is abundant food for fry and shelter provided by the submerged vegetation while the predatory fish, the Nile perch (*Lates Niloticus*) and tigerfish (*Hydrocyon*) remain in the deep river channel. Either during the spawning runs, or later, as the flood recession leaves fish in shallow catchment basins, the fish are a ready source of protein for human predators.

The systemic layout of the troughs and benches suggests formally organized, large-scale fish harvests and processing, perhaps in a seasonal regimen similar to the far earlier culture at Wadi Kubanniya. If so, the fish needed to be stored for some length of time before being consumed, and therefore they must have been smoked, which may account for the ashy character of the floor deposits, salted, and dried. This kind of preservation and short-term storage could explain the missing jars that were fitted with the jar stands and lids(?) that we found on the low benches in our 1991 season.

The Twelfth Dynasty tomb of Antefoker contains a scene on the northern wall of what appears to be gutted and splayed fish (or possibly meat) being hung on a cord tied between two slender columns that support a low roof. This scene might be compared to the two column bases in Square G20 that could have supported columns used for similar purposes. A low and light roof may have extended from the main eastern wall of the mudbrick building. However, our impression is that much of the interior of our large building was left unroofed, notwithstanding the 1.5 m thickness of the enclosing walls. Next to the columns in the Antefoker scene a man sits on a small square stool and works with a knife on some material laid on a platform supported by a small bench. Scenes of cleaning fish in Old Kingdom tombs show workers seated on the ground, sometimes with a back support, or on a low

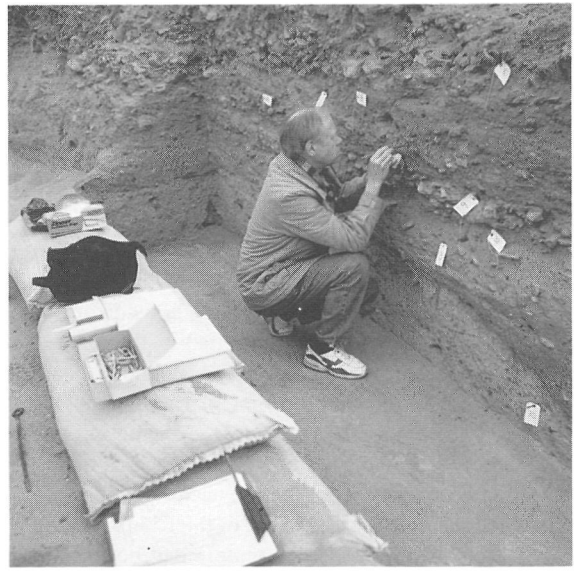

Figure 4. Herbert Haas sampling layers in Area A7, main section of backhoe trench for radiocarbon dating

square seat or stylized reed mat, performing the work on a very low table set on short legs in front of them. The benches in our excavation may have functioned like these low tables, but the tomb scenes do not entirely clarify how the troughs and benches were used. The troughs come to dead ends at low perpendicular partition walls, and would not have functioned to drain off the fluids and dross from cleaning fish.

We only began to excavate the architecture in Square E18 after we removed ancient sand layers and large deposits of sandy mud and pottery that filled ancient pits dug into the architecture. The walls in E18 are more complex than the other squares, but include two north-south walls forming a corridor. A small probe across the corridor revealed large pieces of gypsum, *tafla*, granite, alabaster, and a complete crude red ware jar. The corridor could have been a storage place for caches of various materials.

It is certain that the interior of the large mudbrick building extends further beyond our excavation area to the west and to the north. We can only make preliminary hypotheses about its function until we analyze more of the material. Given the fact that we have bakeries, huge quantities of bread mold sherds, and remains of fish, we can legitimately infer that loaves and fishes were processed in systemic large-scale procedures. This lends support to our earlier hypothesis that the whole complex could belong to an administrative institution for processing food, of the sort that the Old Kingdom texts call, *pr šn ᶜ*.

The orthogonality and cardinality of direction of the entire arrangement suggests an institution of the royal house, i.e., "the state." The period is that of Menkaure, judging from numerous seal impressions that bear his name. The deep section left by the backhoe, which we trimmed back, suggests that similar kinds of production had been carried on at this spot in earlier times, albeit less formally organized. Herbert Haas's radiocarbon dates on samples extracted from this section (fig. 4) suggest that the site was used over several generations. The lowest levels include large fire pits or hearths and much ash and charcoal, which could relate to thick ash and charcoal deposits in the lowest levels dug into by the deepest trenches of the AMBRIC sewage project for the nearby modern town. In A7 we could have our finger on the transition from production for a labor camp into that for a formal ritual center.

Eastern Field and Khufu Mortuary Temple Mapping

During the two years prior to our 1995 season, the Giza Inspectorate of the Supreme Council of Antiquities, under the direction of Dr. Zahi Hawass, had taken up the modern road that for many years had run along the eastern side of the Great Pyramid of Khufu (GI). The large northern boat pit was exposed and cleared out for the first time in decades. This is one of a pair with the boat pit to the south that has long been open. The surface along the entire eastern side of the pyramid was cleaned down to bedrock. Toward the south, this resulted in the discovery of the base, passage, chamber, and capstone of a small, heretofore unknown "satellite" pyramid (ca. 20 m to a side) belonging to the Khufu complex. The foundations of the three Queens' Pyramids (GIa, b, c) were exposed on all sides, revealing important new evidence about how these pyramids were built. A small boat pit, which had never been properly mapped, was cleared between the two southern Queens' Pyramids. The remains of the pavement, and foundation cuttings in bedrock, of the Khufu Mortuary Temple were also laid bare. From the 1940s to the 1960s the temple had been mapped, and reconstructed plans were published, but a detailed facsimile map of all the architectural evidence had never been produced.

On behalf of the Giza Inspectorate we mapped many of these features using the Giza Plateau Mapping Project survey network that we had projected over the Giza Plateau from 1984 through 1986. David Goodman and his assistant, Nubie Abd al-Basat, worked on this program full time for most of the field season, plotting major features at scale 1:200. The survey team provided 5 m grid points for Mark Lehner, John Nolan, and Carl Andrews to hand-measure and field-plot a 1:100 map of the satellite pyramid (GId). This data was shared with Nairi Hampigian of the German Archaeology Institute who produced a 1:50 map of the satellite pyramid. For most of the season, each late afternoon and evening was spent plotting a 1:100 map of the Khufu Mortuary Temple. The data are still in the process of being reduced and drafted.