AERAGRAM

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Microarchaeology: Taking a Closer Look
Stories from the Small Scale

Wilma Wetterstrom, one of our project archaeobotanists, examines a sample of plant material under the microscope in her makeshift field laboratory at Giza.

We had been digging "black velvet" for the better part of two months, when Wilma Wetterstrom, one of our archaeobotanists, called me over to her makeshift laboratory. "Take a look," she invited, slipping off her magnifier visor that made her look like a card dealer. "This is one of the bakery samples."

A closer look is often needed to extract the full story told in each and every ancient deposit.

I knew she meant "black velvet." Wilma had been peering into a "floated" sample of the homogenous black, ashy dirt that filled the two bakeries we had recently discovered in our Area A7 (see AERAGRAM 1/1 and map on page 8).

"Black Velvet"

Forty-six hundred years ago in these narrow rooms, the Giza bakers mixed bread dough in huge vats (see photo page 10) and baked it in heavy ceramic pots, lined up in a baking trench in the dirt floor. Batch after batch, the bakers must have packed charcoal around the pots and later raked out the ash. When the ash had filled up the two little open-air bakeries, the bakery workers vacated the premises, leaving behind bread pots lying upon the ashy, black layer.

Day after day, supervisors John Nolan and Ann Foster carefully troweled through the "black velvet," filling sand bags with dirt for Wilma to "float." Flotation, or water separation, is one of the archaeobotanist's main tools for recovering tiny seeds and charcoal fragments. Rather then trying to pick out plant specimens while excavating, the archaeobotanist uses water to separate the light plant materials, which float, from the heavy dirt, ceramics, stone and other materials that sink.

In her laboratory, Wilma sits with the patience of Job peering through her microscope or her magnifying visor,

What is in the Heavy Fraction?

- **Exotics**: Stone fragments that must have been culturally introduced to our site. Granite from Aswan, diorite chips from hammer stones, alabaster bits from quarries across the Nile at Wadi Gerawi or Hatnub in Middle Egypt, basalt from the Fayum.
- **Micro-fauna:** Small to tiny bones, splinters from bones of large animals, or bones from rodents, serpents, and birds. These are useful indicators of the climate, seasonality, diet, and local environment at Giza and the micro-environment in the structures we excavate.
- **Lithics:** These are mostly chert and flint from stone tools or their manufacture.
- **Ceramics**: Most of these sherds are too small to be useful but an occasional piece may be informative.
- **Seal impressions**: Fragments of clay impressed with hieroglyphs and symbols that served as seals on bags, boxes, and pots. (See article, page 4). It is easy to assume that this is the most important, if also the rarest, component of the heavy fraction. The ancient texts and symbols of the seals speak to those who can read them in a far more direct way than bones, stones, and seeds, which require a greater degree of inference to draw out their stories.

Sorting heavy fraction. Inset: closeup of the heavy fraction.

picking at a petri dish of dried plant remains, her dissecting needle moving like a Border Collie herding out tiny seeds, fragments of seeds, husks, and hulls. So as I donned her magnifiers and focused on the dish, I expected bits and pieces of barley and emmer.

Instead I saw beaded particles that looked like tiny grayish-green popcorn. "Slag," Wilma said. "It looks like slag." Rather than carbonized seeds and chaff, Wilma was examining the dregs left after all identifiable material has been sorted out. Green, beaded slag. In a bakery? My mind quickly raced to those early Egyptologists who thought the massive bread molds (see photo, back page) were crucibles for molten metal. Then I thought of the dried, scum-like, grayish-green residue that we have found on almost all the bread molds and fragments of bread molds. I think Wilma's slag and the residue on the pots are the same stuff.

Later, after scrutinizing many of these "black velvet" samples, we concluded that the "slag" is probably melted phytoliths, microscopic silica bodies found in plant cells. Phytoliths form in some plants when inorganic silica, drawn from soil and water, is deposited in the cells. Abundant in cereals and other grasses, phytoliths transform grass blades into sandpaper and are responsible for the sheen on ancient sickle blades used to harvest grain.

The clue to the phytoliths was minute, ash-white skeletons of mineralized plant material that Wilma found scattered through some of the "black velvet" samples. After the plant tissue had burned away in these fragments, phytoliths were left, still articulated as they had been in the cells. For some reason these skeletons had not yet disintegrated into a fine amorphous powder like most of the "black velvet."

Our "slag" was probably the remains of phytoliths that had burned at higher temperatures, melting the silica. Perhaps they were located in the hottest part of the fire. The scum on our bread molds might have formed when melted phytoliths, mixed with ash, accreted to the walls of the bread pots like the silica of a ceramic glaze.

We concluded that the source of the phytoliths was cereal straw, chaff, and grass used as tinder. Straw and chaff are good tinder and are used by Egyptian villagers today in their beehive ovens. I also noticed our workmen used big bunches of grass to start the baking fires in the bakery we reconstructed in 1993 (see AERAGRAM 1/1).

This is only one example of how when we take a closer look we see that things are not necessarily what they seem with the everyday eye. A closer look is often needed to extract the full story told in each and every ancient deposit.

Stories from Heavy Fraction

An even better example is found in the heavy fraction, the gravel left at the bottom of the flotation barrel. I still remember the first time we looked at the heavy fraction. With most of our team

assembled around a storeroom table, we dumped out a bag of heavy fraction and began pawing through it so that we might all learn about the texture, at this scale, of archaeological information. From the sandy residue and limestone gravel we sorted out exotics, microfauna, lithics, pottery, and seal impressions (see box, left).

I remember the first seal impression we found. It was in our 1988-89 season. Wilma had found it in a heavy fraction sample she was sorting in the late afternoon on the terrace of our storeroom west of the Great Pyramid. At that hour we can gently turn the little hardened clay clumps so that the raking light of the setting sun draws the glyphs into shadowed relief. There was an unmistakable rectangle, and inside a very tiny, but beautifully proportioned, bull and the bottom of the up-raised arms—hieroglyphs for *ka* ("bull")—the top of the Horus name (that is, the name of the king as an incarnation of the falcon-god Horus) of Menkaure, builder of the Third Pyramid at Giza (see story, page 4).

The Sound and Light Show at Giza tells its audience, in a booming voice, that when Champollion deciphered the hieroglyphs, he brought to life the animals, birds, reptiles, and insects of the ancient picture-writing. They suddenly spoke directly to Egyptologists from tomb and temple wall. Like the hieroglyphs, the other components of our cultural gravel, our heavy fraction—that we could all too easily just chuck—also tell stories, and it takes just as much patience, basic skill, and specialized knowledge to read as ancient texts.

Unfortunately, no excavation can afford to extract the heavy fraction from the entirety of the dirt they move. It is even harder to process it all by flotation. In our excavations we *have,* however, become fairly compulsive about using wet-sieving as an alternative. We sieve most of the ancient "floor deposits" and ancient garbage dumps (which contain the bulk of the telltale good stuff) in big sieves next to the open trenches. We then wet-sieve the dirt-encrusted material caught in the sieves, dipping it by batches into water to wash it all clean, revealing the exotic stones and bones, the flints, and the seal impressions which easily survive the dunk (see page 4).

Microarchaeology

Richard Redding, our faunal specialist, painstakingly identifies and counts each and every bit of bone (see photo, right). Mary Anne Murray and Wilma Wetterstrom continue to pick through what seems like bushels of carbonized plant material. Soon we hope they will identify the many large fragments of charcoal we have retrieved. What kind of trees did the pyramid builders consume for their fuel-expensive project?

Even in digging itself, it is important to look closely at the "micro-stratigraphy." The "black velvet" seemed completely homogeneous, but when we took a closer look we saw *tafla*, yellowish desert clay, in faint lenses and layers intercalated in the ash. "Black velvet," when it dries, turns into fine grey, choking dust. Perhaps the ancient bakers occasionally sprinkled the ash with wetted, clean desert clay to make working conditions a little more bearable.

In this issue of AERAGRAM we describe some of the ways we are taking a closer look in order to flesh out life at Giza 4,600 years ago.

Mark Lehner

Richard Redding hones down on the ancient, excavated bones, comparing the fragments to his modern reference specimens of various animal skeletons.

AERAGRAM

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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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Sealings from Giza
Globs of Mud with Tales to Tell

Like many archaeological artifacts, mud sealings do not look like much but they can offer important clues to the past. These chunks of hard, dry mud, roughly the size of a rubber eraser, served the ancient Egyptians as sealing devices and as a kind of security system. In ancient times wet globs of clean mud were smeared over the lids of storage pots in order to seal their contents and placed over the fasteners of doors, bags, and boxes to deter unauthorized opening. The surface of the mud was often impressed with an inscribed stone cylinder (see drawing below). The impressions of these seals (see photo, below right), which bear many different designs and served a variety of functions, offer insights into the economic activities on the Giza Plateau 5,000 years ago.

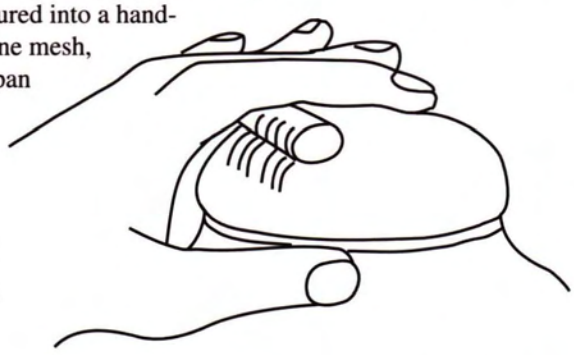
Recovering Mud Sealings

We first became aware of the large quantity of sealings at our site when several inscribed fragments turned up as a by-product of flotation. Wilma Wetterstrom, our archaeobotanist, uses flotation primarily to extract plant remains from samples of dirt (see page 1). But the "heavy fraction," which is caught in a coarse mesh, is saved and sorted to recover bone and other small, heavy objects. While sorting this material, Wilma found several chunks of mud with distinct impressions, one of which Mark Lehner identified as part of the name of Menkaure (see page 2-3).

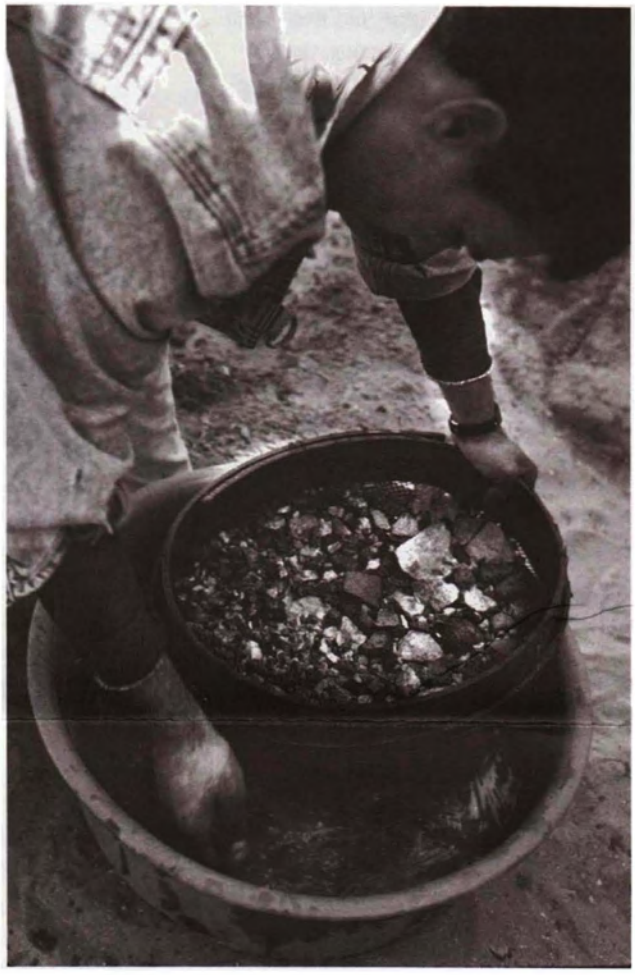
We were delighted to find that unbaked sealing fragments had not only survived the flotation tub, but their inscriptions were clearly visible. Sealings are rarely spotted during excavation as the mud globs look no different than the surrounding dirt and the impressions are impossible to see until the dirt has been washed away.

Knowing that the sealings were very resilient in water, we began using a process called "wet sieving" specifically to recover them. Used only occasionally in Egyptian archaeology, wet sieving begins with a sample of dirt from the excavation. After the sample is roughly sorted for pottery and other large objects, it is poured into a hand-screen with a fine mesh, lowered into a pan of water, and agitated (see photo, above).

After the sieved material has dried in the sun, we carefully scan over it, picking out mud sealings as well as abundant small bone and exotics, pottery, and charcoal. The "microfauna," which we save, is a bonus as it complements the information about diet and environment that we derive from the larger bones.



Rolling a cylinder seal over a mud stopper on top of a storage jar.



Above: Wet-sieving: Mohammed Saleh dunks a sample of material collected from the excavation by screening. Once washed, gravel, sherds, bone, stone, and possibly mud sealings emerge.

An Inventory of Sealings

Through wet sieving we have managed to recover a large amount of sealing material and their inscriptions. We currently have 173 registered sealings from the 1988-89, spring 1991, and fall 1991 field seasons. Many more from the 1995 and 1997 field seasons await processing, which involves recording the seals in a catalogue, describing them, and in some cases drawing the inscriptions, and photographing them.

The registered sealings come from the three excavation areas lying south of the pyramid complex. The vast majority so far (122 registered sealings) were recovered from what we call "Area AA" (see map, page 8), primarily excavated by Fiona Baker. This structure, constructed of carefully fashioned stone and mud brick walls, may have served as a storage building for grains and other materials.

Our bakery area, "Area A7," (see AERAGRAM 1/1 and map, page 8) produced 42 sealings. Another nine registered sealings came from a badly eroded bakery excavated by Augusta McMahon, near the large stone wall called the "Heit al-Gurob," the Wall of the Crow, at the northern limit of our excavations.

Dating the Site

While not all of these registered sealings bear legible inscriptions, those that do most often bear names of the king. Although it is tempting to use these names to date both the sealing fragments and the feature in which they were found, it is not so straight forward. The "nomen," one of the four names which the Fourth Dynasty kings could have had, was often incorporated into the name of the monarch's pyramid, or the personal names of the people who served in the monument. Since these institutions could function for centuries after the death of their founder, there is no guarantee that such a name on a sealing is actually the name of the reigning king.

One of the royal names, called the "Horus name," however, can be a key to dating. It almost never appears in the names of other people or institutions, and, therefore, can be used to date the seal which made the impression. Yet, it is possible that the seals themselves may have been used and reused long after that king had died. If this were true at Giza, we would expect to see in our collection not just the names of all the Fourth Dynasty rulers, but also those of earlier kings. This, however, is not the case. Of the 33 impressions which have traces of identifiable royal names, 26 have the name of Menkaure, builder of the small pyramid at Giza, and seven have the name of Khafre, son of Khufu and builder of the Second Pyramid at Giza. There are no occurrences of Khufu, who built the Great Pyramid and ruled only a generation before Khafre. Nor do the names of any other earlier or later kings appear on our sealings.

Although our sample at present is still rather small, it seems clear that our sealings date our site (or the portions of it that have so far been excavated) to the reign of Menkaure at the latest.

Functions of Ancient Buildings

In addition to dating, our sealings also provide clues to the function of the buildings at our site. For example, three sealings from Area AA mention an institution called the "wabet," or "Purification Place," which is believed to have been a workshop associated with funerals and embalming (see top illustration, next page). While this institution is not attested elsewhere at our site, a sealing mentioning the "Purification Place of Khufu" was found among the funerary equipment in the Giza tomb of Queen Hetepheres, mother of Khufu.

Another interesting sealing from Area AA may have served as a sort of "reference impression." This strip of mud has a single, clear impression of a particular seal, which we believe was used to verify the authenticity of this sealing on doors, bags, or boxes.

A couple sealings from Area AA allude to long distance trade. The Temple of Khnum at Elephantine is mentioned in a priestly title which appears in two separate sealings (see bottom illustration, next page). This indicates goods and raw materials may have been sent to our site from as far away as Elephantine near Aswan, which was a gateway to sub-Saharan Africa.

The sealings from the bakery in Area A7 are not as informative as those from Area AA, but do show a wide range of designs. Some are similar to those from Area AA, mentioning the names (on different sealings) of both Khafre and his son Menkaure and the priestly title "controller of prophets." One even mentions the title "sealer of the magazine." However, mixed in with these, are some sealings with purely graphic designs, bearing no text at all, such as

Ancient "pop tops." A sample of sealings from Giza showing a variety of designs and inscriptions, as well as variations in the mud used for sealing. These sealings are slightly larger than actual size.

one showing a backward-glancing gazelle and a scorpion. There are also sealings which show nothing but clean incisions, as if they were intentionally scratched with a reed while the mud was still wet.

The few sealings from the excavation near the Wall of the Crow are in poor condition. Like the features of the excavation, they are abraded and heavily damaged, as if from prolonged exposure. As a result they are difficult to read, but one impression appears to bear the Horus name of Khafre, and another seems to bear incisions similar to those from the bakery area.

The Flip Side

Almost as important as the seal impressions (though, in some ways, more difficult to interpret), are the imprints on the backs of the mud sealings. These impressions of string, basketry, straw, and textiles record the fasteners and containers that the mud sealings covered. Combined with the texts on the front, they offer a window onto the activities carried out in our excavation areas. For example, the presence of numerous sealings in a doorway, with a certain title inscribed on the front, might indicate that that door was frequently sealed by the named official. Also we might be able to determine if bags or storage pots were used as containers in a particular area, suggesting which goods were stored there and where they came from.

This winter when we return to Giza, I expect many of my afternoons will be spent scrutinizing mud sealings, and cataloguing and drawing them. I look forward to the stories they will tell about the goods and doors they secured, about the officials who sealed them, and about the buildings and rooms where they spent the last 5,000 years. When combined with the architecture and stratigraphy from our excavations, these homely chunks of mud will provide direct, physical evidence of the people of the Fourth Dynasty and their daily lives.

John Nolan

Reading a Sealing

Object 00104g

Photo
(twice actual size)

Line drawing
(twice actual size)

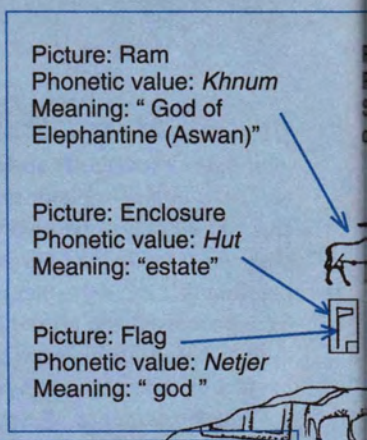
Menkaure's Horus name

Stylized recons
part of the

Note: On the upper right hand side, a thumb print, left when the mud was still moist, destroyed part of the seal impression.

Object 00309

Photo
(twice actual size)



Translation: "Royal Purifier"

Line
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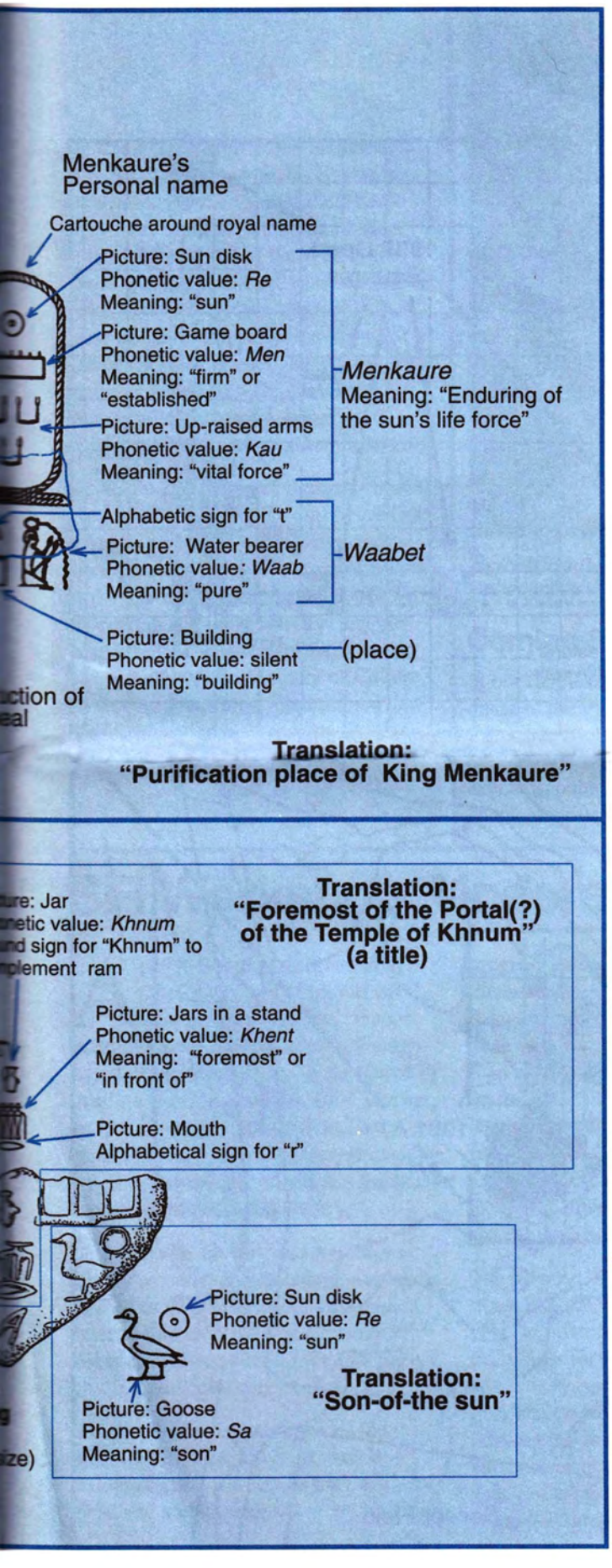


1998 Excavations

If all goes according to plan, by the time you read this issue of AERAGRAM we will be back at Giza opening our excavation squares south of the Sphinx and the gigantic "Heit al-Gurob" or Wall of the Crow.

Our Funders

Major financial support for the 1998 excavation season of the Giza Plateau Mapping Project (GPMP) has been provided by David Koch, the Ann and Robert H. Lurie Family Foundation, Jon Jerde, and Bruce Ludwig. Our work is also made possible by the generous financial support of Matthew McCauley, Glen Dash, David Goodman, Robert Lowdermilk, Fred and Suzanne Rheinstein, the Max and Marjorie Fisher Foundation, Sandford and Betty Sigoloff, and Victor and Nancy Moss. Additional support has been provided by Donald Kunz and Arthur and Bonnie McClure. AERA's activities, including fielding the GPMP, are made possible with the assistance of James Allen and George Link, the law firm of Brobeck, Phleger, and Harrison, and the SOKKIA Corporation of Overland Park, Kansas.

We originally planned to have a fall 1997 study season with excavations beginning the first of January. Then we postponed excavation so as not to begin in the middle of Ramadan, the Muslim month of fasting. Now we are scheduled to start the project on February 4, just after the three-day holiday marking the end of Ramadan. And we have scheduled our study season to run concurrently with the last two weeks of digging which will conclude in the middle of April. We plan to continue work in the storeroom until the end of April.

The Crew

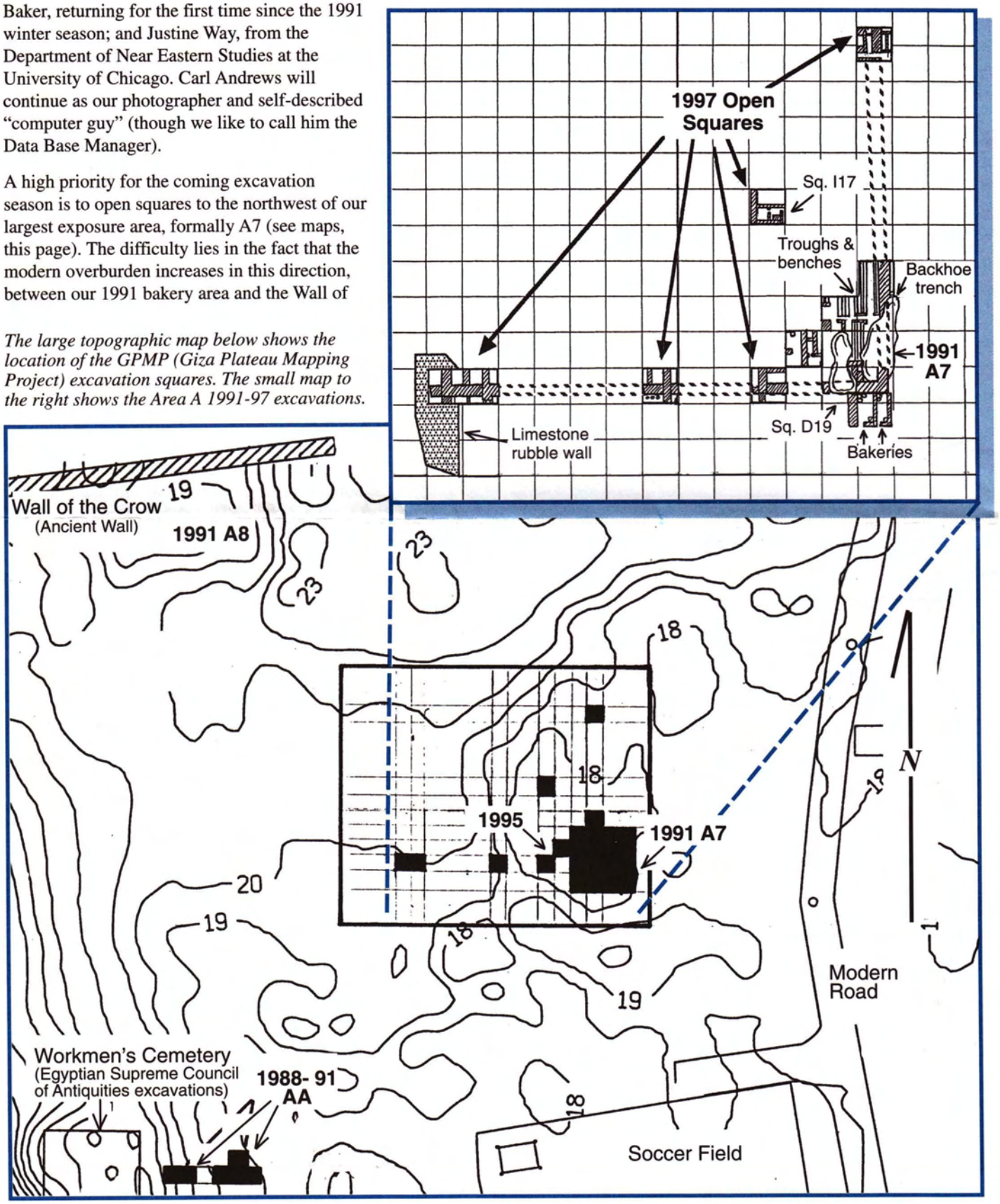
Nicholas Conard, who was with the 1988-89 and 1991 spring excavation seasons, will return to analyze the abundant lithic material we have amassed since his last analysis. Nick, now full professor at the Institut für Vor- und Frühgeschichte, University of Tübingen, will find waiting for him and his student, Cordula Werschkun, many bags of stone fragments, mostly flint and chert, but also a whole corpus of dolerite hammer stones. Peter Lacovara, of the Department of Egyptian and Near Eastern Art, Museum of Fine Arts, Boston, will work with us on the ceramic corpus and typology (see his article on page 10). Mary Anne Murray processed so many huge bags of flotation samples last season (January-March 1997) that we would like her to turn to the microscope and identify the many large charcoal fragments from our site. John Nolan hopes to catch up on many bags of mud fragments, among which could be more inscribed seal impressions (see his article on page 6). Richard Redding will be back at the bones, analyzing our faunal collection.

David Goodman returns to "run the gun"—the SOKKIA Total Station—as our chief surveyor, and coffee-, hash brown-, and pancake-maker. He will be assisted by Nubie Abd al-Basat, once again on loan from Kent Weeks's Theban Mapping

Project. Our excavation supervisors will include Mohsen El-Sayed, who supervised two squares last season and served the Egyptian Antiquities Organization as our Inspector in 1991; Fiona Baker, returning for the first time since the 1991 winter season; and Justine Way, from the Department of Near Eastern Studies at the University of Chicago. Carl Andrews will continue as our photographer and self-described "computer guy" (though we like to call him the Data Base Manager).

A high priority for the coming excavation season is to open squares to the northwest of our largest exposure area, formally A7 (see maps, this page). The difficulty lies in the fact that the modern overburden increases in this direction, between our 1991 bakery area and the Wall of

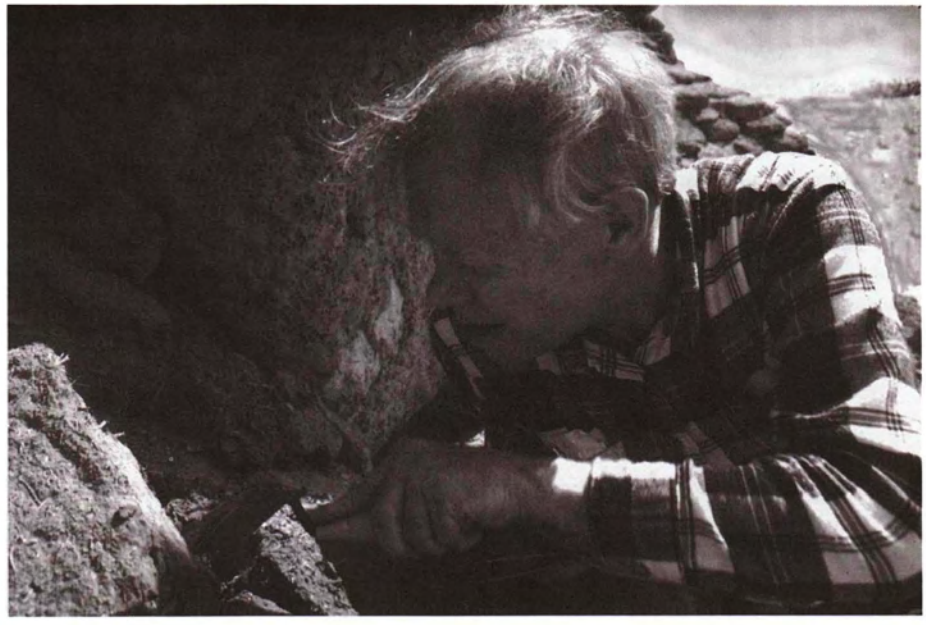
The large topographic map below shows the location of the GPMP (Giza Plateau Mapping Project) excavation squares. The small map to the right shows the Area A 1991-97 excavations.



the Crow. This overburden includes massive dumps from Selim Hassan's excavations of the Central Field cemetery. He ran his Douqeville rail lines around the east end of the Wall of the Crow. But this challenge must be met in order to further test the hypothesis that what we have exposed so far is part of a palace complex, namely the production facilities inside an outer enclosure. If there is a core structure, possibly a residence, it should lie to the northwest.

We also want to expand the area between square I17 (where, at the end of our last season, something resembling a workman's house was revealed) and the areas of the low troughs and benches (for fish processing and other activity) and the bakeries. This will be especially important if the Egyptian Ministry of Culture carries out plans for a modern road that would pass even closer to our site than the current road.

Mark Lehner



Herbert Haas, of the Desert Reseach Institute, pries a sample of straw for radiocarbon dating from a mud brick in the pyramid of Senwosret II at Illahun.

Coming Soon: Radiocarbon Project Publication

In our first issue of AERAGRAM we reported that we were carrying out the second phase of the Pyramids Radiocarbon Dating Project with the goal of examining the relationship between radiocarbon dating and the traditional historical Egyptian chronology. We are now working on a monograph that will report our results and expect to publish it by the fall of this year. The final report will consist of eight chapters written by the various specialists participating in the project.

SFI Workshop: Understanding Small Societies

AERA Board Member Matthew McCauley and Mark Lehner attended a workshop, "Understanding Small-Scale Societies through Agent-Based Modelling," at the Sante Fe Institute (SFI) in Sante Fe, New Mexico, on December 4th through 7th. Their attendance and participation was made possible through the efforts and financial support of Matthew McCauley.

The Santa Fe Institute is a multidisciplinary research and teaching foundation formed to nurture research on complex systems and their simpler elements in fields as diverse as biology, economics, physics, and computer studies.

The workshop, an extension of the institute's cultural program, included primatologists, anthropologists, sociologists, and archaeologists.

Mark Lehner presented a work in progress entitled, "The Fractal House of Pharaoh: Ancient Egypt as a Complex Adaptive System." Although the talk dealt with Egyptian civilization rather than a small-scale society, it was based on the idea that, like other complex adaptive systems, social systems emerge from simpler elements, and the structure and dynamics of the components of ancient society are similar at various scales.

The purpose of the workshop presentations, like much of the work at SFI, was first "to propose and refine candidate metaphors for the description of complex adaptive systems."[1] And secondly its goal was to seek out candidate bodies of information to see "which metaphors survived when subjected to the reality check of experiment, observation, or computer simulation based on models which incorporate essential features of complex adaptive systems."[2]

The subject matter of the papers was diverse: primate foraging behavior, social theory, marriage in Polynesian society, Balinese water management systems, Pueblo and Anasazi settlement patterns, modeling artificial societies, and other topics.

The workshop was chaired by Timothy Kohler, Washington State University, and George Gummerman, Santa Fe Institute, and closed with a summary and presentation by Henry Wright, University of Michigan.

References:

1. George A. Cowan, David Pines, David Meltzer, *Complexity: Metaphors, Models, and Reality,* (Reading, MA: Addison-Wesley) 1994. p. v.

2. Ibid., xvi.

From Pots to Pyramids

Ancient Pots Serve Up Clues to Everyday Life at Giza

Pot sherds are among the most abundant artifacts on archaeological sites (except those dating from before the advent of pottery) and are among the most intensively studied. And rightly so. Pottery, with its many functions and many different manufacturing techniques, offers a vast window unto the past.

Giza has proven to be no exception in terms of the quantity of pottery recovered. We have found thousands of sherds, and occasionally whole pots, during each of our field seasons. All of these have been systematically recovered and are part of an ongoing study which began in 1988-89. During this first field season Michael Chazan and Bridget Crowley, University of Pennsylvania, began setting up a system for categorizing the sherds. I took over the project during the following season and continue to study the ceramics.

Our pottery work begins in the field when the sherds are pulled from the dirt. Once recovered, the sherds are bagged and tagged, and then sent on to the storeroom for processing and analysis. Here they are washed and labeled. Those that can be reconstructed into whole vessels are carefully reassembled; some sherds are drawn. During our 1995 study season Ashraf al-Senusi, skillfully reconstructed many bread pots and the huge vats from our bakeries (see photo, right), while Susan Weeks illustrated type sherd specimens.

The focus of much of our ceramic analysis since the first field season has been to develop a typology, that is, a description of each of the various kinds of pots used at Giza. Typologies are an essential tool in archaeology; they allow us to organize and categorize the many thousands of pottery fragments coming from the excavation. Once we know the charateristics and condition of the pottery from which a sherd derived, we can make inferences about the functions of the pottery and the activities in which it is used. This in turn helps us to determine how different areas of the site were used.

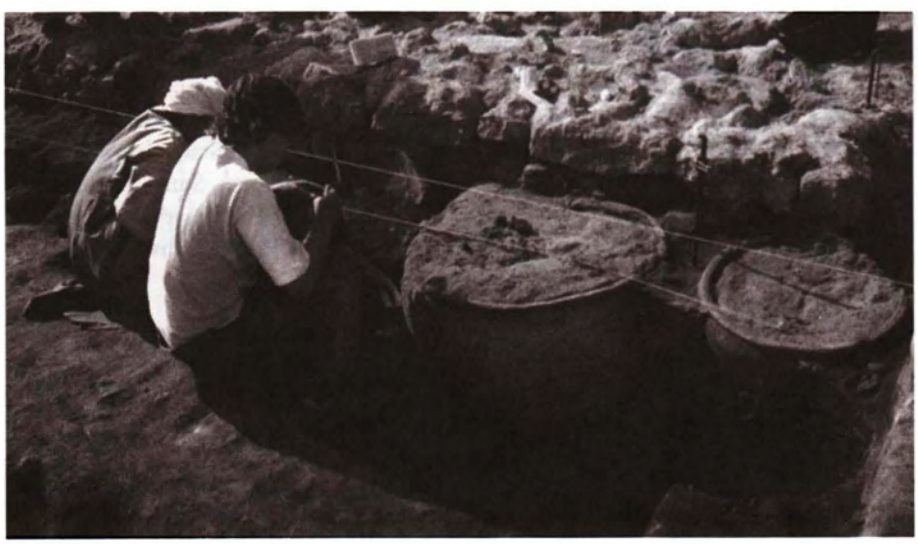
We started with a typology set up in the early 20th century by George Reisner, a pioneer in Egyptian archaeology. Working for the Boston Museum of Fine Arts and Harvard University, Reisner spent much of his adult life excavating Giza's Old Kingdom tombs and during the course of his work did ground breaking studies of the pottery. We also drew upon typlogies established by archaeologists and Egyptologists who have studied Old Kingdom ceramics elsewhere in Egypt.

We could not, however, simply sort our material according to Reisner's types, which were developed primarily for whole vessels used to hold tomb offerings. Our ceramics, most of them sherds, derived mainly from the activities of everyday life. We could not assume that a typology for mortuary pottery would adaquately describe pots used for baking, brewing, cooking, storing, serving, eating, and drinking. Nor were Reisner's types, describing whole vessels, always useful for sorting out bits of broken pottery.

Therefore, as we have been attempting to correlate our ceramic data with these existing typologies as much as possible, we have been developing an adaptation of Reisner's typlogy. Reisner defined forty-two pot types, grouped into a number of functional categories, such as large jars (for wine, beer, water or grain), large basins (for beer-making, storing liquids, etc.), and dishes and bowls. He further sub-divided these according to surface finish, base shape, and other diagnostic features. Here is a sampling of our most common types.

Rough "beer jars" are one of our most abundant Type A/B vessels (see drawing, bottom right). "Beer jars" were often considered ceremonial bcause their highly porous compositon would surely render them useless as containers. Yet great quantities of their sherds turned up in our domestic areas. With the help of Dr. Cornelius von Pilgrim of the German Archaeological Institute's expedition to Elephantine, we were able to test how functional "beer jars" actually were. We filled a whole "beer jar" with water and left it overnight. By morning more than 90% of the contents was still in the jar, nicely cooled by evaporation through the porous clay walls.

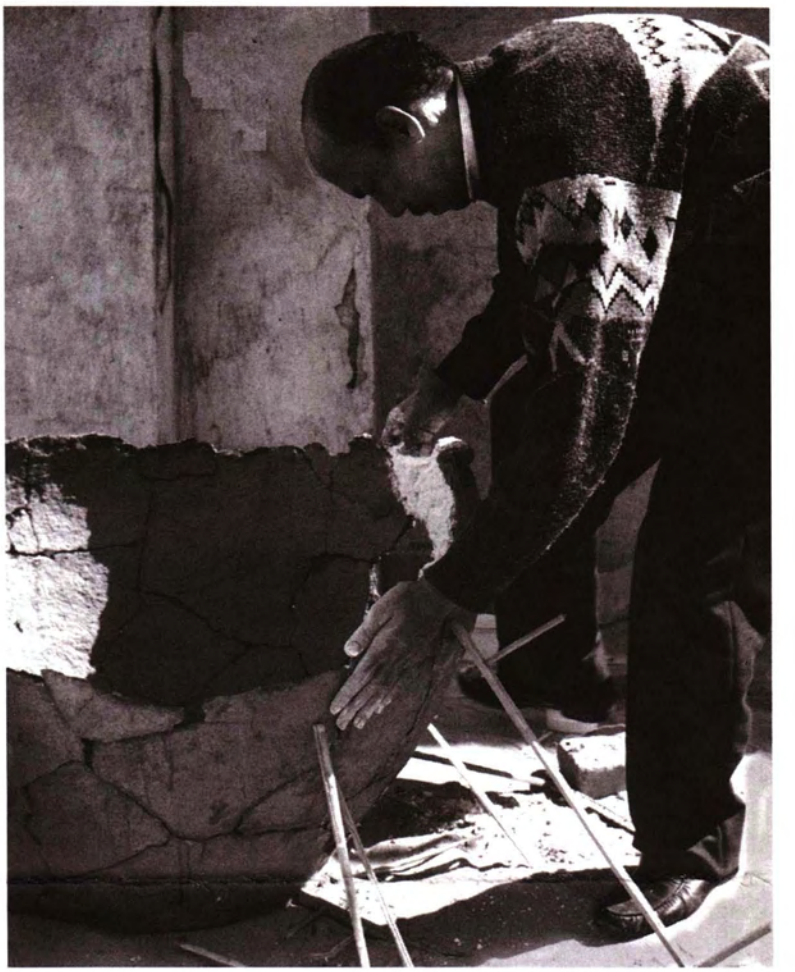
John Nolan and Mohammed Mahmoud prepare a "profile" along a line running through the bread vats in the corner of one of the bakery rooms in Area A7.



Dishes and bowls are our second major category (Type C/D). Made either of Nile mud or a finer, desert marl clay, they are frequently covered with a brightly burnished red wash on the interior and exterior. This was probably in imitation of more expensive copper bowls which also inspired the angular shape of many Old Kingdom vessel forms. One of Reisner's unusual types is a carinated "cooking pot," coated in a white slip (a thin coating of white clay). It is rare in tombs, but abundant in some of the areas we excavated at Giza. The surface of these bowls frequently shows evidence of burning, abrasion, and other signs of use.

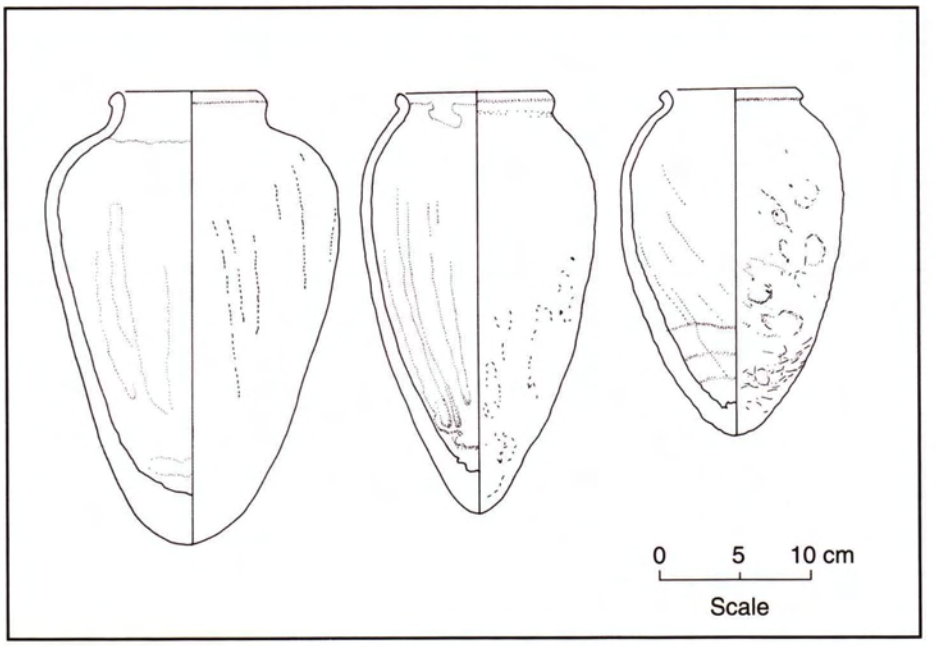
In terms of weight, more conical bread mold sherds (Type F2) have been pulled from our site than any other type (see photo, back page). Coarse and thick-walled, bread molds were hand-made of Nile mud and fired at very low temperatures. Shaped like flower-pots, the molds come in three sizes: small (10 by 10 cms.), medium (21 cms. by 19 cms.), and large (33 cms. by 34 cm.), with either round or flat bottoms. The round ones are probably the tops of the mold and the flat ones, the bottoms, as depicted in the hieroglyph for bread. This would also explain why the round-bottomed examples tend to be better preserved, since the tops would have been pulled off first and more easily broken. Finger marks, occasionally found on the interior surface of the mold, were perhaps intended to leave an identifying mark on the bread.

Lids (Type G) were recovered as whole specimens in the bakery area, A7. The interiors are often smoothed and sometimes have a red slip, while the outer surface is rough, probably because of their function. Tomb scenes show the lids tied onto vessels with cord; the rough surface may have prevented slippage and helped in sealing the pot.



Supreme Council of Antiquities Inspector and ceramic specialist Ashraf el-Sanusi reconstructs one of the vats from the bakery which was used for mixing bread dough. The vat can be seen in the photo to the left.

A selection of beer jars from Giza. The left half of the jars shows the cross-section of the pot. Drawings by Susan Weeks, based on reconstructed pots.



Our ceramic studies, combined with our other data, are helping us to interpret our excavation areas. We believe they will also add much to our knowledge of Old Kingdom archaeology. In addition, our typology should help bridge the gap between tomb studies and settlement archaeology. Since we are trying to link our sherds to whole vessels, our ceramic data will be useful to scholars working with traditional mortuary ceramics.

Peter Lacovara

Inside

Farag Ghanem lifts a giant bread mold from a cache hidden in the main enclosure wall, Square D19. Map on page 8, story on page 10.

AERAGRAM

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