GIZA

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Introduction

Our 2000/2001 season of the Giza Plateau Mapping Project began on 1 October 2000 and drew to a close on 31 May 2001. This was the second year of our intensive two-and-a-half year marathon clearing, mapping and excavation project at our site 350 m south of the Great Sphinx and south of the gigantic stone *Heit el-Ghurob* ("Wall of Crow"). We have now finished the fourteenth month of fieldwork carried out in the last twenty months.

We continued the program begun in 1999, to clear the sandy overburden across the site (fig. 1), to clean, scrape, or carry out shallow excavation of the surface of the third millennium BC ruins, and to map the ancient architecture to capture the "footprint" of a royal production complex. This season we cleared the heavy overburden on the northwest and southern areas of the site. We focused much of our detailed excavation and mapping on the Wall of Crow. In the south we ascertained a fourth set of galleries and cleared the northwestern corner of a large double-walled building (the "Buttress Building"). We also excavated in the layout that I described last year (see "Giza" in the 1999/2000 *Annual Report*): gallery sets II and III, the Manor, the eastern end of Main Street, and in the western extension. Here I report on new findings from our long 2000/2001 season.

Enclosure Wall and Ensemble

One of the most satisfying achievements of our recent season is the sense of the whole we have gained. The massive Wall of Crow and the large structure that I have provisionally called the "Buttress" Building (see below) frame the gallery system on the northwest and southeast respectively (figs. 2–3). These structures appear to be major parts of a coherent layout. A thick wall of fieldstone[1] connects these two elements and encloses the site on the western and southern sides.

1. I refer to the material as "fieldstone." Strictly speaking, these are not fieldstone walls as might be found in New England — picked up from fields. The material is unshaped broken limestone (*dubsh* in modern Arabic) mostly from the Maadi Formation above our site to the west. "Broken stone" might be more accurate, except that the limestone, ranging from small chips to large pieces, can be bonded with clay mortar.

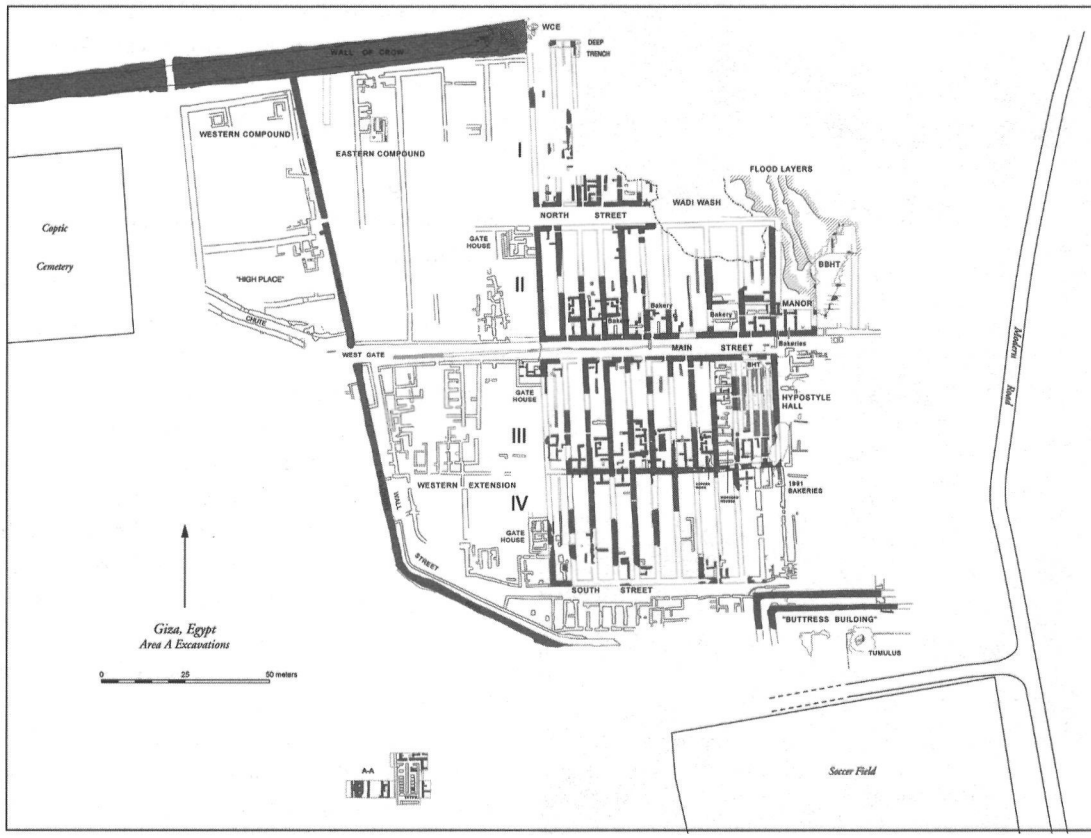

Figure 1. Map of northern part of concession with Coptic cemetery on northwest, modern road on east, and soccer field on south of cleared area

The enclosure wall, 4 m thick for part of its length, is breached only at "west gate" where it crosses Main Street. We have not yet reached the limits of the eastern side of our site. Main Street continues east beyond our cleared area (fig. 4). The area within the complex is divided into the mudbrick ruins of the galleries on the east, and the fieldstone ruins of different structures and open courtyards on the west. Three roadways dubbed North, Main, and South Streets cut west to east through both the fieldstone ruins of the western extension and the gallery complex (figs. 4–5). They divide the ensemble, stretching 185 m north to south, into three large blocks (fig. 3). While the three thoroughfares allowed direct crossings of the blocks east to west, it appears so far that there was only one major way through the site from north to south. It led from the Great Gate in Wall of Crow and probably took a path south to connect with the narrow corridor that I have called the "chute." We have not yet located the path which I believe lies just beyond the limit of our clearing (where the modern Coptic cemetery leaves us little room, see fig. 1). This corridor curves around to west gate in the enclosure wall. From there, one could move northwest to southeast around the gallery system via Wall Street to arrive by way of South Street at the "Buttress Building" (fig. 3).

Gallery System: Northern Gallery Set I

By the end of last season (1999/2000), we had uncovered only the southwest corner of gallery set I. One goal this season was to locate the northwest corner. From this point we could excavate to establish a stratigraphic link from it to the end of the Wall of Crow to determine whether our

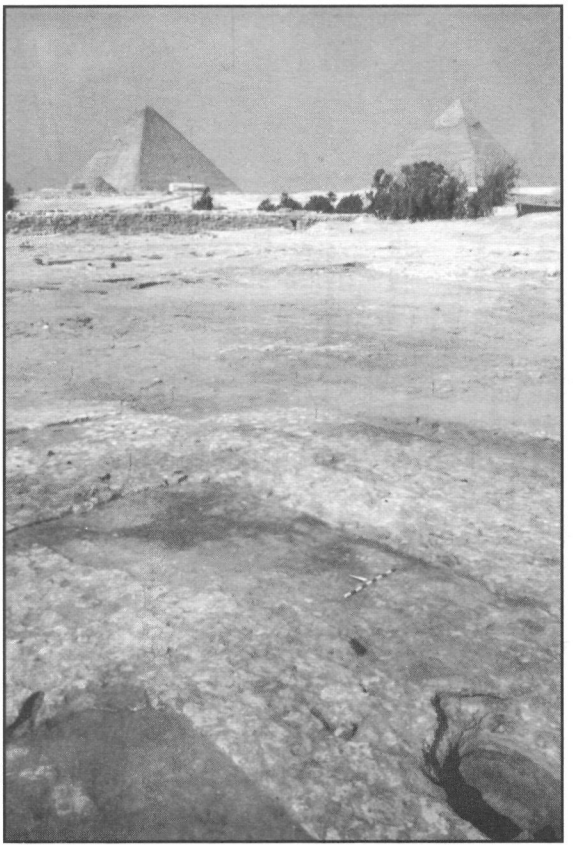

Figure 2. Foreground: Northwest corner of double fieldstone walls of so-called Buttress Building embedded in mud mass. Wall of Crow and pyramids of Khufu and Khafre in background

complex was older, younger, or roughly the same age as the immense stone wall. We suspected that this critical northwest corner was in Square 4.Z6[2] (fig. 3), assuming gallery set I was about 35 m long like the other gallery sets in the complex. However, we were stymied by many Late Period burials around the east end of the Wall of Crow. In the one crucial 5 × 5 m square, 4.Z6, osteo-archaeologist Jessica Holst and Kevin Kaiser excavated and recorded some thirty burials.

Despite the complex burial situation, we found the plastered faces of the west wall of gallery set I, which aligns with the west wall of gallery sets II, III, and IV (fig. 6). But there was no corner in this square. Perhaps the west wall of the gallery set I continues north to the east end of the Wall of Crow. Although as many as 60 burials may lie in the two squares between the gallery system and the Wall of Crow, we still hope to find this connection.

Farther east in this northern gallery complex, we determined that the major north-south walls roughly align with the thick gallery walls of sets II, III, and IV (fig. 3). While the match was less than perfect, we located enough of the ancient architectural layout to be certain that there was indeed a northern set of great galleries. We also ascertained that a roadway, which we named North Street, did indeed run between gallery sets I and II.

Southern Gallery Set IV

At the end of our 1999/2000 season we knew that the major walls of another set of galleries, set IV, lie south of set III, butted against its southern wall. This season we cleared the overburden off the entire area of gallery set IV and found traces of its southern wall, including the southwestern and southeastern corners (fig. 7). We were surprised to find that the two bakeries we

2. We excavate and map according to a system of 5 × 5 m excavation squares. The rows of squares running north south, called *ranges*, have letter designations, while the rows running east west, or *tiers*, have numbers. Letter and number identify each square. However, at the end of our 1999/2000 season we ran out of letter designations to the north (since the ranges were lettered A to Z, south to north), and we ran out of number designations to the west (since we reached tier 1). To expand the system we devised six separate grids: Grid 1 to the northwest, Grid 2 to the northeast, Grid 3 to the west, Grid 4 to the east, Grid 5 to the southwest, and Grid 6 to the southeast. Most of the squares that we cleared, mapped, and excavated up through the year 2000 were in Grid 4. In each grid, ranges are lettered A to Z from south to north, and tiers are numbered 1 through 50 west to east. So we have a Square 4.J10 — Grid 4, range J, tier 10 — as well as, for example, a Square 3.J10, in Grid 3.

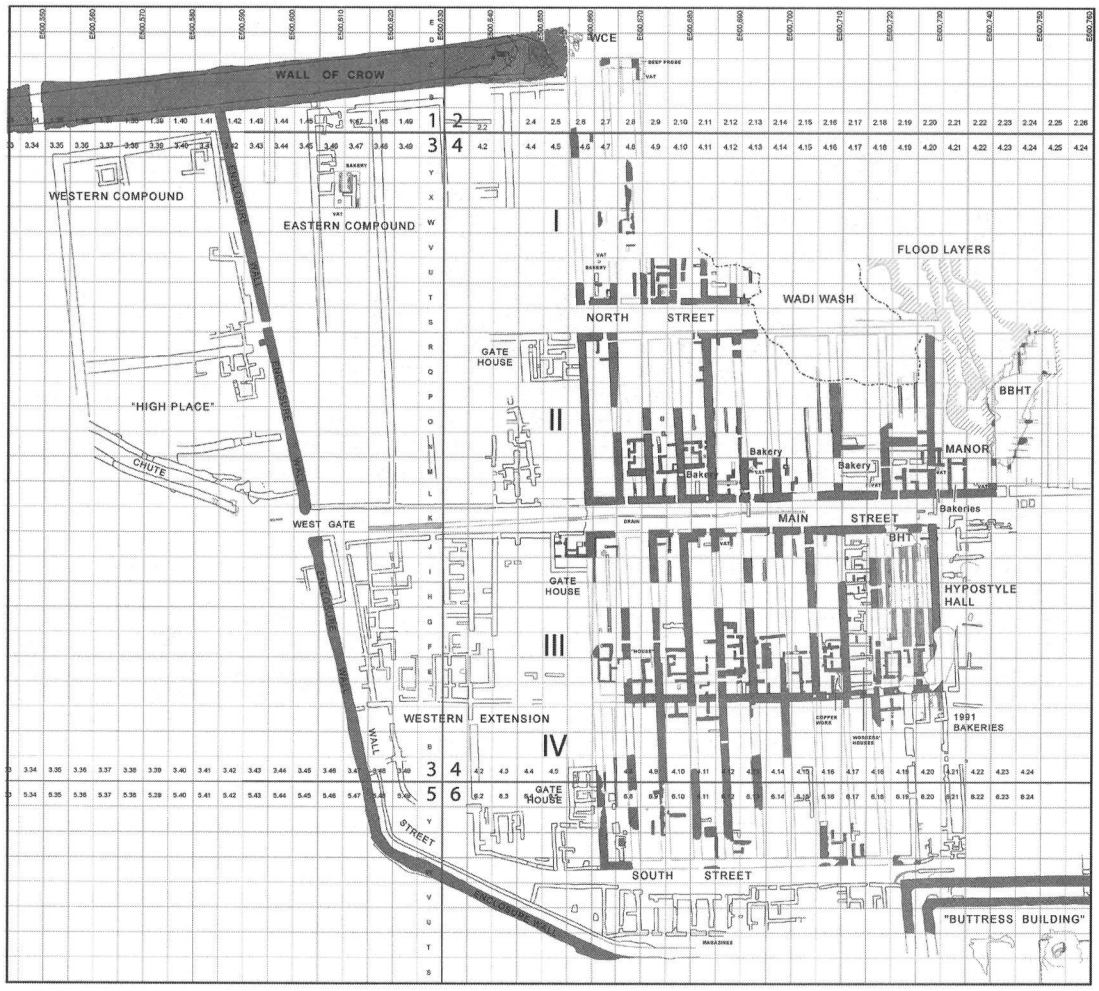

Figure 3. Map of all Old Kingdom architecture retrieved to date through excavation or scraping and cleaning surface of mud mass

excavated in 1991 stand within in a long enclosure of fieldstone walls that was added onto the eastern side of gallery set IV.

South Street

Running along the southern end of gallery set IV, South Street continues into the western extension, like the other east-west streets. Here the walls are fieldstone, as opposed to mudbrick (figs. 5, 7). South Street is 5.20 m (10 ancient Egyptian cubits) at its widest, similar to Main Street and North Street. But some of the magazines constrict the passage. Perhaps the site planners laid out South Street with a width of 10 Egyptian cubits, but the occupants later added structures that narrowed the street. South Street runs the length of the southern side of gallery set IV to the northwestern corner of the Buttress Building, which closes it off on the east.

South Street Magazines

Along the south side of South Street the ruins of magazines built of fieldstone walls thrust up about a meter (figs. 5, 7). Nine or ten rectangular units line up east to west. A few of the cham-

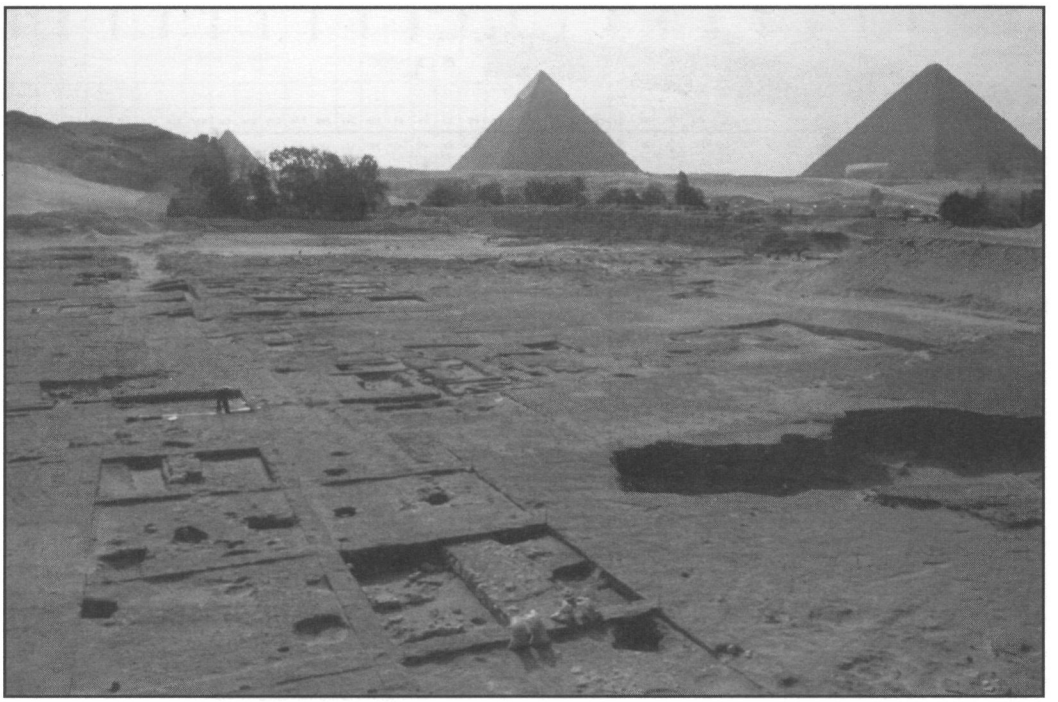

Figure 4. Eastern end of Main Street with grid squares. Background: Opening through the enclosure wall and chute turning toward the Great Gate in the Wall of Crow

bers are stuffed tightly with disintegrating reddish-purple pottery, especially bread molds. This, the large vat fragments we found in one room, and the fact that some chambers measure about 5 × 10 cubits (2.60 × c. 5.00 m) — the dimensions of the two bakeries we found in 1991 — indicate that these might be bakeries. All of the magazines back onto a wall that runs parallel to the inside of the enclosure wall. Between the two walls is a narrow alleyway.

Western Extension

At the end of last season we had only begun to clear the area we call the western extension. We tentatively outlined walls on the basis of concentrations of stone rubble. This season we completely removed the overburden in the western extension (fig. 3), but only finished the final surface cleaning south of Main Street. North of Main Street, where the Late Period burials become more numerous, much work remains to clean the surface and to delineate walls.

Gate Houses

We now have mapped structures immediately outside of all three western entrances to the gallery system (fig. 3). They may have been situated to control and monitor the movement of material and people into and out of the gallery system through the streets, so we dubbed them "gate houses." The gate house at South Street is about 9 × 10 m and appears similar to the Main Street gate house. However, North Street gate house is larger and has a series of long corridor-like rooms, oriented both north-south and east west, not seen in the other gate houses. One of these chambers is as narrow as 80 cm for a length of 6.2 m! These might be storage magazines. Mohsen Kamal, the excavator, found a variety of nearly complete pottery vessels, including bread molds, jars, and carinated bowls, stacked against the walls of one of these chambers.

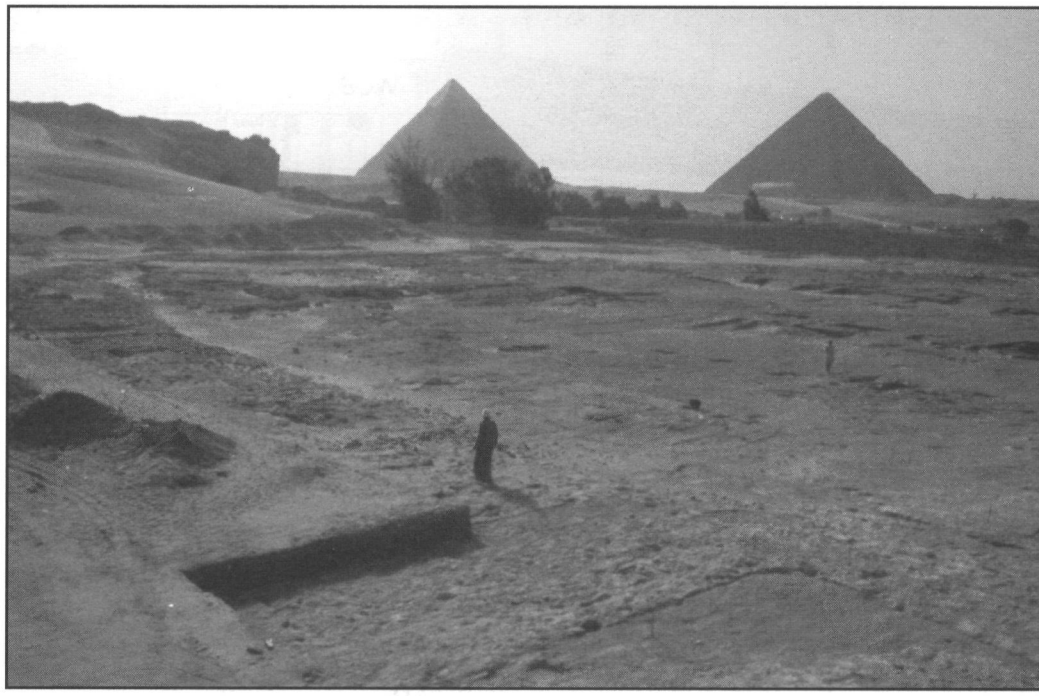

Figure 5. View to northwest across area cleared and mapped. Corner of Buttress Building in lower right foreground, ruins of magazines and sandy path of South Street to left, and Wall of Crow and pyramids of Khufu and Khafre in background

Excavations in Western Extension

This season we cleared and excavated portions of the western extension and found a pattern very different from the mudbrick galleries. The area is organized as a series of open courts surrounded by small buildings (fig. 3).

Just west of gallery set III there is a large courtyard flanked on the west by a row of magazines running south 25 m south from Main Street. At the southern end of the magazines, there is a second set of larger rectangular structures, each about 2.6 × 5.2 m (5 × 10 ancient cubits), running east-west for about 20 m. The magazines and structures frame the southeastern corner of another smaller courtyard. Two large rectangular courts lie south of this layout.

Cordula Werschkun excavated squares 4.D1–E1 that take in a large rectangular unit made up of three rooms, two of which are about 3 m wide, the limit for roofing with organic material such as palm logs, sticks, and reeds (fig. 8). The southernmost room, which is slightly smaller, appears to have been a kitchen area, with a hearth in the northwest corner. Under a trampled floor there was much ash. The structure could be a house.

A lower layer of rubble fill included mudbricks apparently from the upper parts of the walls which fell first. This layer was covered by fieldstone fallen from the lower parts of the walls. The deposits that filled the rooms indicated that the building was occupied, in the period of the Old Kingdom, after mudbrick had fallen from the walls. Cordula found an infant burial, probably dating from this second phase, in a bin built against the western wall of the central room. She found another child burial in a nearby pit.

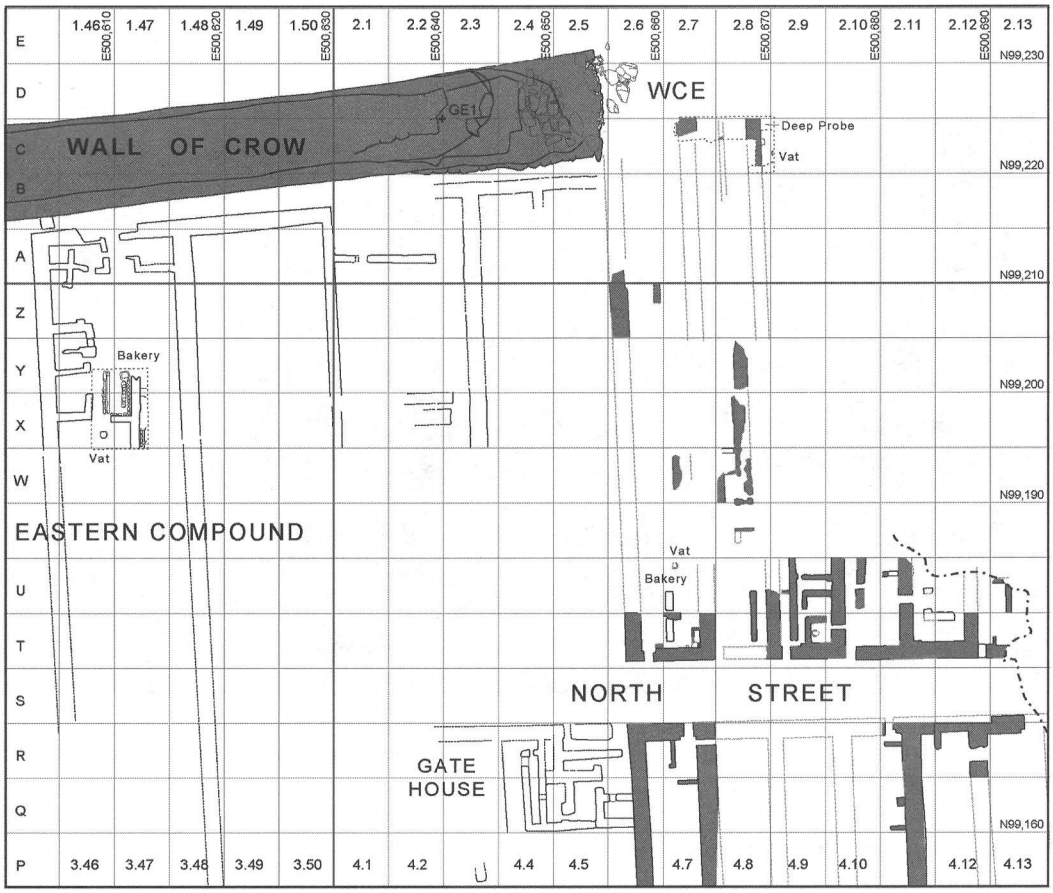

Figure 6. Map of northern part of site with walls gallery set I and operations WCE at east end of Wall of Crow

Parallels for Pattern of Western Extension

The series of open courts surrounded with small buildings in the western extension is similar to a settlement that Abd al-Aziz Saleh found southeast of the Menkaure pyramid in the early 1970s. There were courtyards, houses with ovens, and a row of hearths where copper may have been worked. Horst Jaritz and Gunter Dreyer found a similar pattern of open courts, fieldstone huts, and magazines at a workers settlement at the site of an Old Kingdom dam in the Wadi Gerawi near Helwan. Given these parallels, the western extension might be a workers' settlement for work of a different sort than that carried on in the galleries. The open courts served as spacious and well-lit working areas, while materials and supplies could be stashed in the buildings along the walls. Perhaps craftsmen retired to some of the structures each evening.

Probing the Wall of Crow: Return to 1991 Deep Trench

A major focus of our work this season was the Wall of Crow and its stratigraphy. Fiona Baker, Paul Sharman, and Trina Gibson cleared and mapped a 15 × 70 m swath along the southern side of the Wall of Crow. Another team investigated area WCE at the east end of the wall.

In 1991 we excavated a trench perpendicular to the south side of the Wall of Crow (see "Giza" in the 1991/92 *Annual Report*). The trench cut through a massive deposit of limestone-chip construction debris to reach the bottom of the wall at 15.4 m above sea level, indicating that

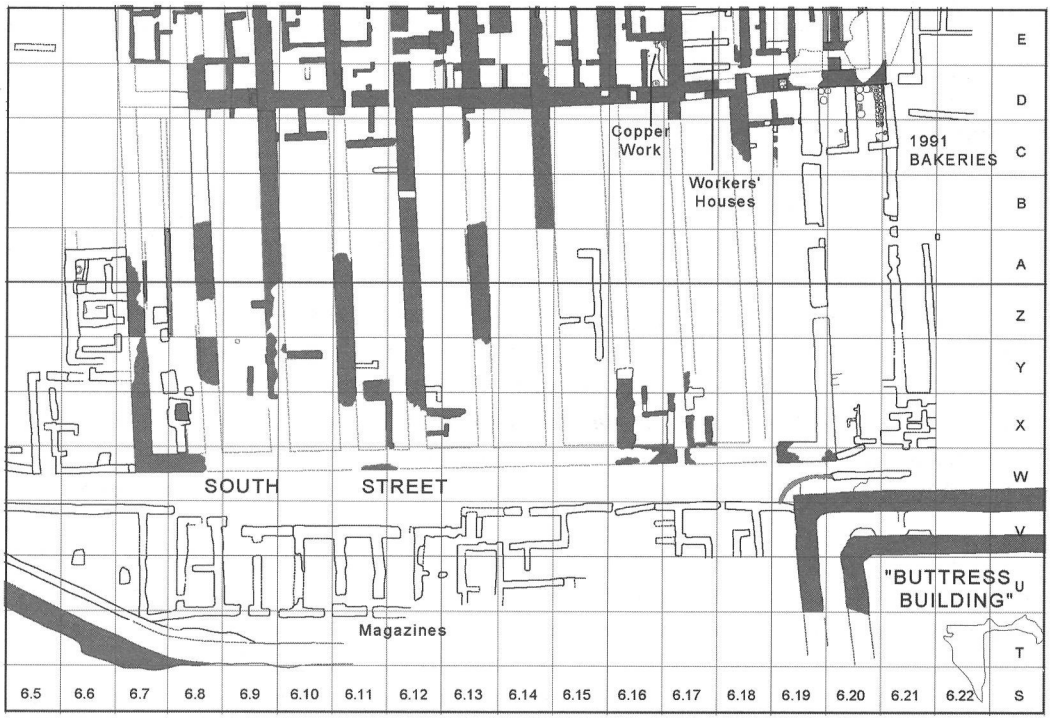

Figure 7. Map of southern part of site with walls of gallery set IV, magazines, and northwestern corner of Buttress Building

the wall is about 10.0 m (30 ft) in height (fig. 9). The limestone chips occur in "tip lines" that slope away from the wall, left, perhaps, by the masons as they worked the successive courses of stone that comprise the wall. Underneath is a thick layer of dense black and lumpy alluvial mud running just to the top of the foundation block that juts out from the face of the wall. A thin paving of desert marl clay (*tafla*) and limestone rubble runs under the alluvial mud layer.

Our re-examination of the deep trench revealed that the ancient builders cut through the mud, marl, and lower limestone rubble layers to make a foundation trench for the Wall of Crow. An intriguing feature of the alluvial mud layer was a smooth linear track that runs diagonally across the trench from southeast to northwest. This feature, which is convex in cross section, resembles a slip way that was found in Nubia for dragging boats around a cataract. Fiona and Paul had the impression that these deposits had been moist when the ancient builders cut the foundation trench. We wonder if wet conditions prompted the ancient builders to leave the construction debris as landfill, to aid drainage, or as a sealant against water on the north side of the wall. Later on when we worked on the gate area we had further insights into the roles of the debris (see below).

Area WCS: Wall of Crow South

Our clearing this season revealed that the deep trench begun in 1991 was centered in an open area between two walled compounds. In this area we found a great deal of black ash and quantities of bread mold sherds upon the layer of builders' debris. The surface was riddled with small pits and hearths. Some of the hearths had been outfitted with flues, apparently designed for pyrotechnic activities that required specific temperatures. We found no slag deposits or obvious signs of copper working, but a nearby dump of pottery and ash included a faience necklace of around

seventy beads. A remarkable number of flint hammerstones or pestles were recovered from this area.

Western and Eastern Compounds

Our clearing along the south side of the Wall of Crow revealed the northern ends of long rectangular enclosures, which we dubbed the eastern and western compounds. Lying on either side of the enclosure wall, they are bordered by thick fieldstone walls that run north-south and extend beyond our clearing.

The eastern compound is 27.5 m wide with a north-south fieldstone wall, 1.7 m thick, separating it into two large rectangular divisions, each about 11 to 12 m wide. We only cleared and mapped the northern end of the western division, where we found small rooms along the large fieldstone wall. Ash deposits sealed *in situ* floor surfaces that included mud-lined and stone-built basins, hearths, and flint tools. We now see that a badly denuded bakery that Augusta McMahon excavated in 1991 is in the southeast corner of the western division of the eastern compound (fig. 3).

The western compound is enclosed on its east side by a 1.4 m thick mud and stone wall that parallels the enclosure wall, leaving a narrow corridor less than 80 cm wide between the two. The north fieldstone wall of the western compound, 2 m thick, was built along the Wall of Crow in two phases of construction. The corridor between this wall and the Wall of Crow varies in width from 4 m on the eastern end to 5.2 m on the western end. Inside the western compound, thinner fieldstone walls form rooms that are attached to the thick enclosure walls. At the western side of our cleared area we found the foundations of a small rectangular structure, 3.7 × 4.0 m.

Figure 8. Fieldstone walls of building (house?) in squares 4.D1–E1 of western extension

Extramural High Place

Just in front of the Coptic cemetery on the far northwestern corner of our site (fig. 1), the ruin surface rises 18.63 m above sea level compared with about 16.50 on the top of the mud mass in the gallery complexes. Whatever building lies buried in this "High Place," extending about 75.00 m south of the Wall of Crow, must be part of the western compound. In two widely separated places on the edges of the High Place we have found nicely cut slabs of fine white limestone, each with face cut at an angle like the casing stones on pyramids and mastabas. (The chisel marks do not seem like those commonly found on Old Kingdom tomb casings, however.) All over the top of the high place there are chips and fragments of Aswan red granite.

Near the chute, two large walls running approximately east-west subdivide the High Place (fig. 3). We have not excavated here, but as far as we can see from cleaning and mapping part of the surface, smaller walls further divide the space into small chambers filled with black ash. It seems, therefore, that the High Place was another zone where much pyro-activity — most probably baking — took place. The red granite fragments so abundant in these walls must indicate that much waste granite lay around. This waste must have come from the same granite works that produced the thick granite dust off the east end of the Wall of Crow, and the granite dust layers in the dump of masons' debris on the south side of the Great Gate.

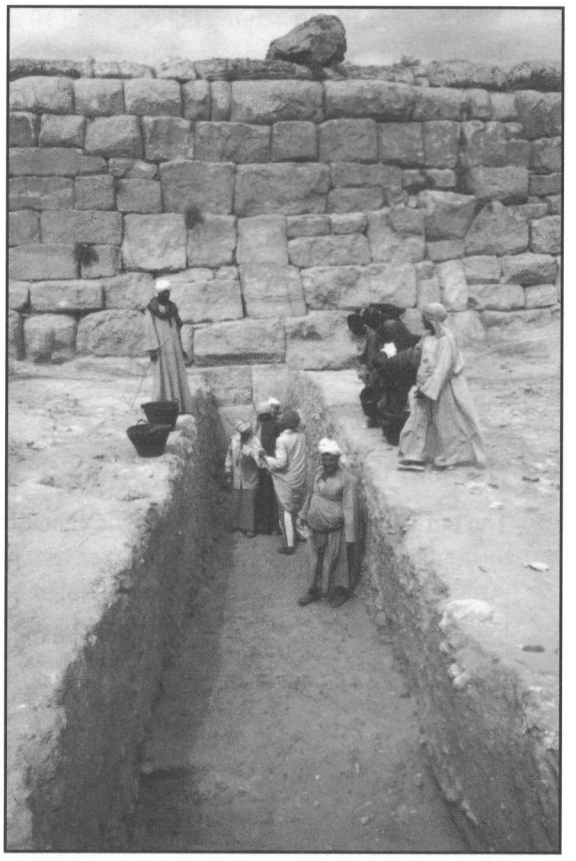

Figure 9. Deep trench to Wall of Crow in area WCS, begun in 1991 and continued in winter/spring 2001

Inside the Great Gate

In March we cleared the sandy overburden inside the enormous gate of the Wall of Crow. The gate is 2.5 to 2.6 m wide (about 5 ancient cubits), capped by three massive limestone lintels, and about 7.0 m tall.

However, it is probable that no one has ever viewed the full height of the gate. We found the bottom buried in the same "masons' debris" that is banked up against much of the southern side of the Wall of Crow (fig. 10). Here it consists of compressed limestone chips, sand, and marl clay with rings and pockets of granite dust. Directly in front of the south face of the gate the material appeared similar to what geomorphologist Karl Butzer identified as oxidized, calcified sand in the northeastern part of our site (see below), probably laid down by water washing out of the main wadi to the west. We had been calling that material *tafla* (Arabic for marl clay).

The masons' debris in our 1991/2001 deep trench seems to have been left from building the wall. But in examining the gate, we realized that the wall alone could not have generated this much material which must have also derived from some massive construction activity involving both limestone and granite. From the summit of a mound west of the gate, the debris slopes like a ramp along the south side of the wall down to the eastern compound. A path that slopes down into the tunnel and through the gate was sunk into the surface of this ramp (fig. 10). John Nolan suggested that the ancient builders used the ramp to slide the huge limestone lintels into place over the gate.

Bands of bluish gray granite dust interspersed with tafla-limestone material arc outward from the southern opening of the gate. These bands must mark tip lines of granite dust that workers dumped intermittently with the limestone debris either from atop the wall or after they carried the material through the gate. The builders must have created the sunken path down through the gate as soon as they had set the lintels in place and removed the supporting debris from underneath them.

The gate is really a tunnel through the 10 m thickness of the Wall of Crow. Inside the tunnel, the compact limestone debris was covered by three thin deposits of brown sandy soils and pottery, including five Old Kingdom miniature votive offering dishes such as are commonly found at temples and tombs. In a deep probe inside the gate against the east wall, Fiona Baker found five use-surfaces. At elevation 16.30 above sea level she came across a cut through the limestone rubble, which must mark the trench for the wall's foundation. The foundation cut is 90 cm higher than the bottom of the Wall of Crow in the WCS deep trench 45 m farther east (where the foundation is 15.40 m above sea level). We also found the mortared foundations of the wall in a test pit that Inspector Ashraf Abd al-Aziz excavated in 1995 just outside the southwestern corner of the gate (fig. 11). The difference in elevations between the foundation of the Wall of Crow at the gate and in the deep trench might indicate the eastward slope to the surface on which the wall was built.

North of the Great Gate

The north side of the Wall of Crow is encumbered a thick layer of trash and dirty sand dumped in the last decade and, under this, cleaner sand. After Mohammed Musilhi used his loader to push the recent material aside, Fiona Baker was able to excavate a 5 × 5 m square just outside the northern mouth of the gate (fig. 12). The clean layer of sand contained pottery from the Eighteenth Dynasty and later periods. Underneath the clean sand, a layer of gravelly sand contained 1,450 pieces (30.5 kilos), of Egyptian alabaster, 103 of which had worked faces and traces of relief carving. There were 4 fragments of a pleated skirt or wig (probably wig), three fragments with edges of hieroglyphs, including one with an *f* (horned viper) and an *r* (mouth). Fiona also found 100 kg of granite in this deposit. Many pieces look like chips from dressing granite with a pick.

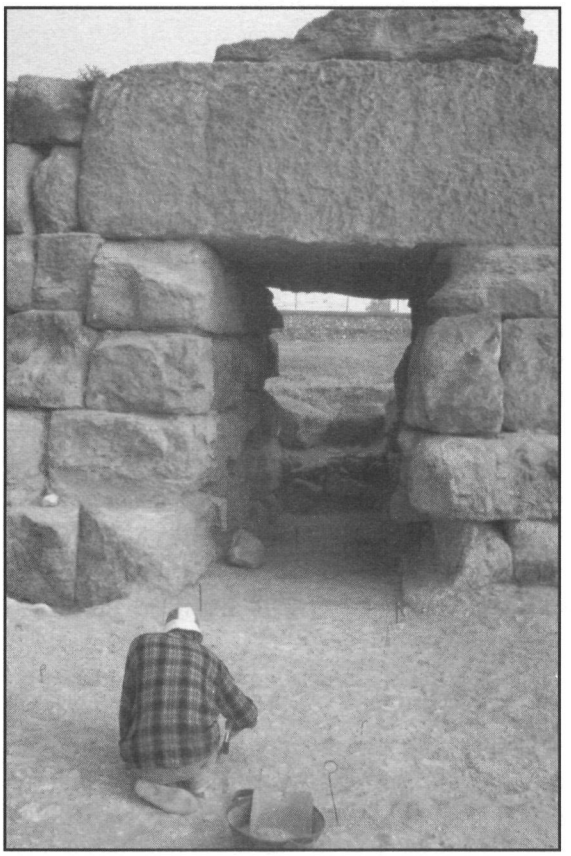

Figure 10. Great gate in Wall of Crow. Surface of compact, clayey limestone debris slopes down through gate to north

Cambered Ceramic Way

Underneath the gravely sand, Fiona came upon a compacted layer, 5 cm deep, of abraded and rounded pottery sherds in brown sand (70% sherds). The surface sloped down to the North, continuing the slope of the tafla/limestone debris through the gate. Next was a more compact layer of trampled, worn or abraded ceramic fragments. The path across the crushed ceramic surface has a subtle camber—a convexity characteristic of ancient roadways in other contexts, where the sides slope away from the central path. Beneath it Fiona revealed a layer of washed and calcified marl that overlay well-washed and sorted limestone debris. This is the

same compact limestone debris that is mounded up on the southern side of the gate, and that slopes down to the north through the tunnel.

One speculation is that the path slopes up to the gate from the north because of a harbor located on this side of the Wall of Crow. If there were a harbor close to the wall, the water level could never have been any higher than that of the annual inundation. For certain reasons we might estimate the flood plain at Giza around 13.00 m above sea level in the Fourth Dynasty with a usual flood depth of 1.50 m bringing the water to 14.50 above sea level. The Fourth Dynasty floors across our site are generally 16.00 to 16.50 m above sea level. If things were offloaded alongside some kind of harbor or revetment north of the wall, they would have to be brought *up* as much as two to 4 m to the higher level of our production center on the low desert above the flood plain.

One of the core drillings that Serena Love did across the site in April 2001 is relevant to the harbor hypothesis. (We are grateful to David Jeffreys for the use of his equipment). Located 30 m north of the gate, a core drilling cut through the same thick layers of modern debris and clean sand that we cleared from above Fiona's excavation square. Serena's coring then hit what must be the same hard surfaces that Fiona found, with no drop-off or other indication of a harbor.

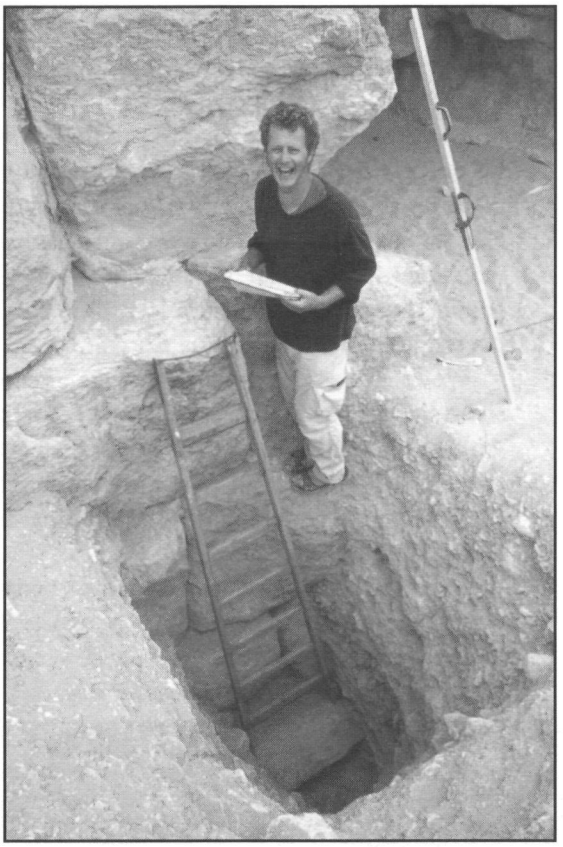

Figure 11. Paul Sharman stands next to pit through limestone debris to foundation of Wall of Crow at southwest corner of Great Gate

East End of Wall of Crow: Operation WCE

At the eastern end of the Wall of Crow (WCE) the sand was banked up close to the top of the wall — 4 or 5 m thick (fig. 13)! Tobias Tonner supervised the excavation and recording of each sandy layer, producing three-dimensional computer renderings of these deposits. Many of these layers, we learned, were backfill from excavations in modern times.

As we cleared the sand, the end of the Wall of Crow sloped ever deeper down toward the east. Last season I thought this slope might indicate that the wall was never finished and that the slope served as a ramp to haul stones up to the higher courses. Now it appears the slope resulted from people removing stones from the east, causing the end to collapse. Near the bottom of the sandy layers, Tobias found a cache of limestone splinters and chips where some of the limestone blocks of the wall had been broken up. Nearby lay fragments of amphorae jars, like those we find associated with the Late Period burials across the northwestern part of our site.

Mystery of Granite Dust

Under the sandy layers Tobias exposed the surface of a thick deposit of granite dust mixed with sand. Granite dust, ranging from light gray to sky blue (the mix of crushed feldspar, hornblende, mica and quartz), is the by-product of pounding or dressing granite smooth. The granite dust included so many large fragments of red granite and dark diorite that we hauled several sandbags of larger fragments away from our narrow trenches. Much granite work must have occurred close to this spot. The same works may have produced the layers of granite dust that splurge out in concentric arcs from the southern entrance in the Great Gate, 110 m to the west. The sandy granite dust covered the entire 10 × 10 m area that Tobias exposed under the deep overburden at the end of the Wall of Crow.

We excavated two trenches into the granite dust (figs. 6, 15). Jessica and Kevin Kaiser, assisted by Mohsen Kamal, supervised the first trench which was oriented north-south at the eastern side of the 10 × 10 m area. We hoped that by working at the eastern side we would avoid the many Late Period burials so evident close to the wall. As it turned out, they were unavoidable. Six Late Period burials were carefully excavated and removed (fig. 14), while a few additional burials were left undisturbed.

Once we ascertained that the thick granite dust covered the remains of a gallery wall, we wanted to find the relationship to the end of the Wall of Crow. For this reason Lauren Bruning excavated a second trench 2 m wide and oriented east-west toward the end of the Wall of Crow (fig. 15). Again burials blocked the way, eight of them all together. After we removed the burials, the 2 m width of the trench gave us a limited view of what lies below the granite dust, which was 85 cm to 1.30 m thick.

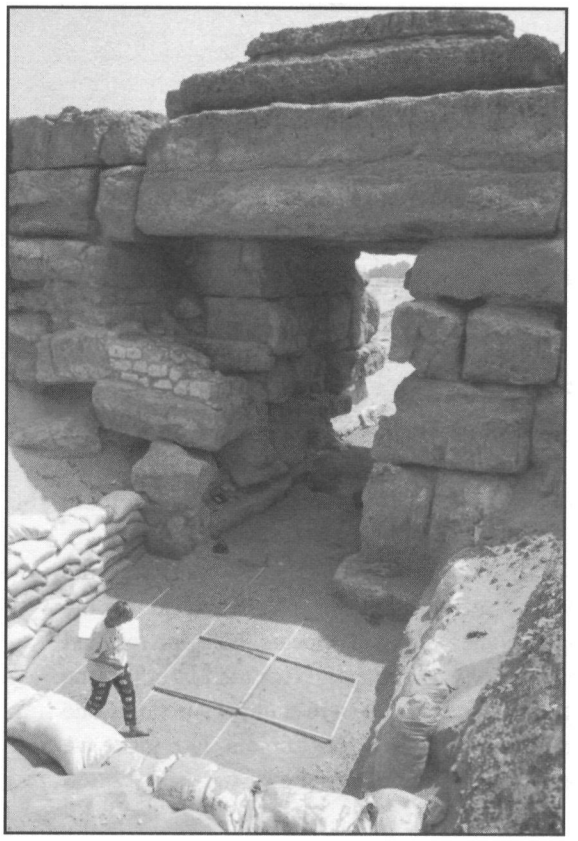

Figure 12. North side of Great Gate. Fiona Baker maps surface of cambered path in excavation square

Under Granite Dust: Demolished Gallery

Under the granite dust we found enough evidence to be certain that the gallery system once continued north as far as the end of the Wall of Crow. The first trench revealed the remains of a brown sandy mudbrick wall with marl (*tafla*) plaster (fig. 6). The mudbrick wall was 1.30 m wide, the width of a number of walls in gallery set I. (The gallery walls in sets II, III, and IV tend to be around 1.57 m wide, 3 ancient cubits). Also, the mudbrick wall in the WCE trench lines up with the third gallery wall from the west in gallery sets I, II, III, and IV in the 8–9 tiers (north-south grid rows) to the south (fig. 3). The wall has a little curb, about 20 cm wide, along its western base, just like the gallery walls to the south. These features suggest that the wall does indeed belong to another gallery. Where the west wall of this gallery should be, a shallow linear depression crosses the trench north-south. A bed of sherds was scattered on

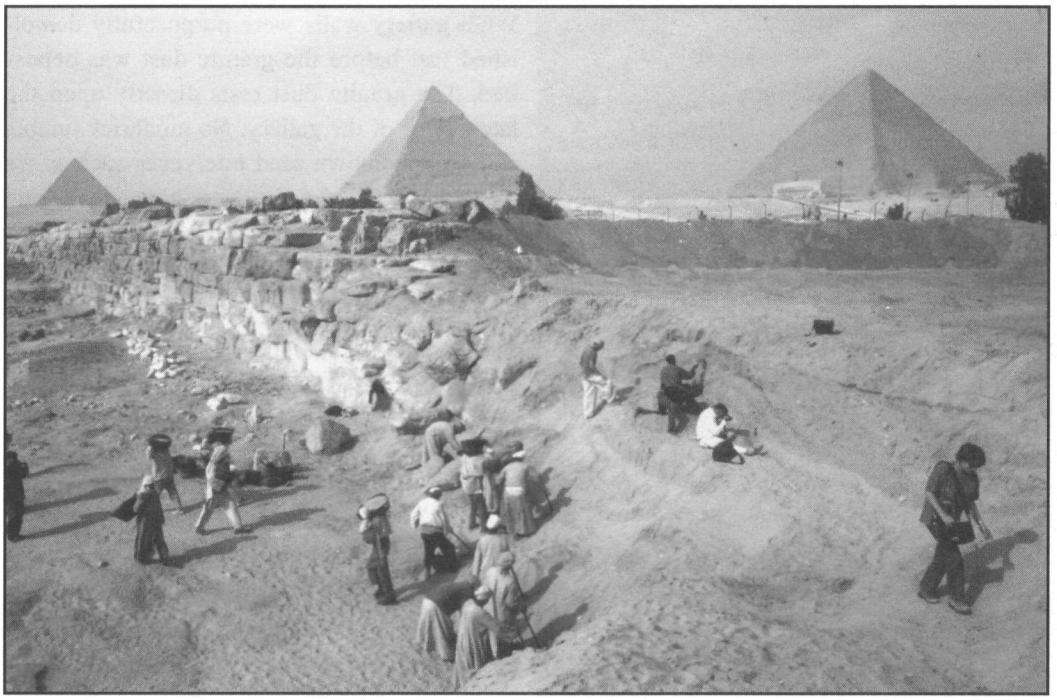

Figure 13. Beginning of operation WCE at east end of Wall of Crow. Tobias Tonner, Karl Butzer, and Justine Way examine sand layers

the bottom of this depression, and underneath these was a smooth clay surface. It is probable that another gallery wall was here and that it was removed before the granite dust was laid down. Between this "ghost wall" and the wall with marl plaster, Lauren found the remains of a thin, low wall just like those that divide the more open ends of other galleries. Like those low walls, this one ran about 2 m west of the eastern gallery wall. Only a bit of the low wall remained to be seen through the many burial pits that riddle the Fourth Dynasty surface. A nearly complete red pottery vat, like the vats we have found in bakeries across the site, projected from the eastern section of the first trench.

Lauren carefully excavated six distinct floors (albeit punctuated by burials) so that we have a better idea of the sequence of floors and use over time of this hapless gallery than of the many other better preserved galleries where we have excavated only the last phase of use. There is little doubt that a gallery like those farther south swept up to the east end of the Wall of Crow, and that it was already demolished when the massive granite dust was dumped over this area.

There may have been another whole set of galleries north of set I (fig. 3). We do not know yet if it was separated from set I by a street like those between sets I and II (North Street) and II and III (Main Street). It is also possible that the gallery walls in the WCE deep trenches are the continuation of gallery set I to the north. If so, set I is much longer than gallery sets II through IV, each of which stretch 34.5 to 35.0 m north to south.

Only a few centimeters of the lowest course of bricks of the gallery walls remain in the WCE trenches. This architecture must already have been as ruined as we found it *before the granite dust was deposited.* The last major granite works at Giza were for the lower sixteen courses of stone casing the third pyramid of Menkaure, and for the tomb chamber of Queen Khent-kawes. At least part of our gallery system could predate the end of the Fourth Dynasty. It looks like the

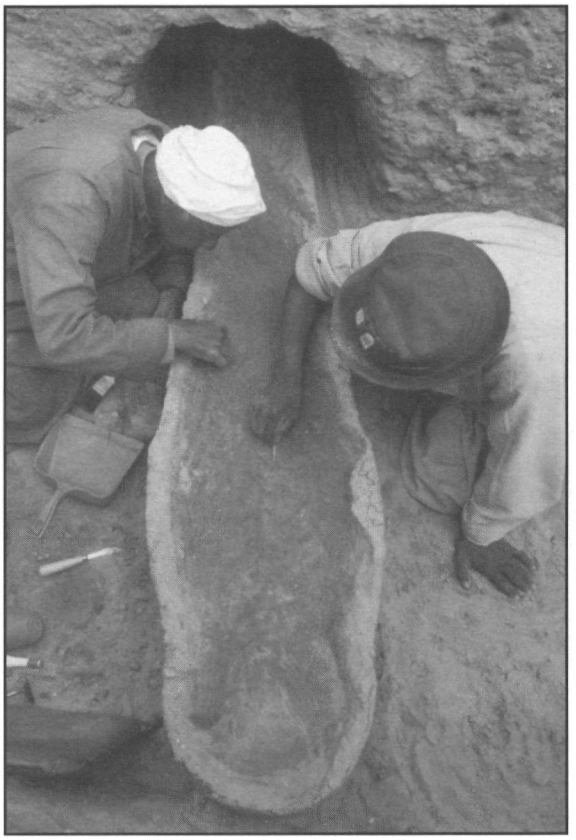

Figure 14. Excavating one of many Late Period burials in thick layer of granite dust in operation WCE. Baulk of trench is compromised to maintain integrity of burial

WCE gallery walls were purposefully demolished just before the granite dust was deposited. The granite dust rests directly upon the latest floor of the gallery. No mudbrick tumble and no windblown sand intervenes such as we might expect if the site were abandoned long before the granite dust was deposited.

WCE Deep Probe

Jessica Kaiser sunk a small probe, about 1 m square, at the North end of the first WCE trench (fig. 6). The probe went about 1.5 m deeper than the level of the mudbrick wall, through fairly clean sand with faint mud-tinted lenses, and limestone flecks. At elevation 14.88 m above sea level, the sand is damp, gravely, and mottled with very dark brown clay and ash. This layer includes pottery fragments and pebbles such as we find in natural gravel in the high desert, possibly washed by the Main Wadi between the Mokkatam and Maadi Formations from the higher desert. Limestone rocks in the southwest corner of the pit could belong to a fieldstone wall.

At 14.88 m above sea level the muddy layer is 1.12 m deeper than the thick mud layer (at 16 m above sea level) in the WCS deep trench 75 m to the west of WCE (fig. 3). The builders of the Wall of Crow cut into that mud layer to make a foundation for the wall. If the two muddy features belong to the same deposit, the difference in elevation reflects the slope of the ground toward the east. The mud and stone layers that predate the construction of the Wall of Crow may in fact be demolition rubble, possibly even flood destruction levels of settlement that predates the Wall of Crow.

At the east end of the Wall of Crow, we can now list a sequence of deposits from latest to earliest:

1. Late Period burials
2. Concentrated granite dust, top at 17.60 m above sea level
3. Mudbrick architecture of the gallery system, 16.43 m above sea level
4. 1.50 m of clean sand
5. Early settlement material on gravely sand, 14.88 m above sea level

Connection of Wall of Crow to Gallery System

This season we failed to obtain a direct stratigraphic link from the gallery walls to the end of the Wall of Crow. In WCE two layers of large displaced stones obscured the actual eastern end of the wall, leaving our east-west trench 7 m out of reach (fig. 15). After Tobias Tonner and Trina

Gibson mapped the displaced stones, Lauren Bruning supervised their removal. Underneath this, a layer of clean sand contained a human burial and two caches of animal bone, one with a cattle skull and the skull of another smaller animal, possibly a goat. The other cache included two cattle skulls. In April 2000, when we first cleared the southern side of the Wall of Crow near the east end, we found a bovine skull and an amphorae tucked into a niche between the blocks of the wall. The cattle offerings and the burials certainly attest to a sense of sanctity associated with the wall in the Late Period.

Under the sand layer, Lauren Bruning mapped and removed a second layer of toppled stones to find the actual end of the Wall of Crow characterized by many small pieces stuffed between the larger blocks (fig. 16). This end appears to have never been intended as a finished surface. The sandy granite dust that continues right up to the end of the wall shows patches of cleaner sand that indicate many Late Period graves. This end of the wall lines up almost exactly with the west face of the west wall of the entire gallery system (figs. 3, 6) stretching 150 m southward.

The fact that the western wall of the whole gallery system lines up exactly with the straight eastern end of the Wall of Crow, which is not a finished face, indicates that, in spite of its gargantuan size and its composition of large limestone blocks, the Wall of Crow was of a set piece with the mudbrick gallery system.

Southeastern "Buttress Building"

In May we came upon a curious curved wall at the east end of South Street, 27 m due south of the bakeries we found in 1991 (fig. 3). A curving row of mudbricks forms an arc about 4 m long and is attached to the foundation of what once was a very large building (figs. 3, 7). Initially I thought it was the outer face of a buttress—hence the designation "Buttress Building"— but now I am not so sure. The arc is attached on the west to the south fieldstone wall of South Street and the magazines. The curve rounds the corner of the Buttress Building, which protrudes into the street, and then runs east about 3 m to a fieldstone wall, 70 cm wide, that runs east for 7 m. Close to the corner, the corridor is filled with stone material that interlocks with the bricks of the semicircle. So it looks like this fill is intentional, possibly forming a buttress. (So far we see these structures only as a pattern on the ground). This "buttress" and the narrow wall reduces the passage at the end of South Street to about 1.1 m — just enough for one person to pass.

The Buttress Building has two exterior fieldstone walls, each about 1.80 m wide, running in parallel about 1.1 m apart (fig. 7). The width of the corridor that separates the walls is 2.30 to

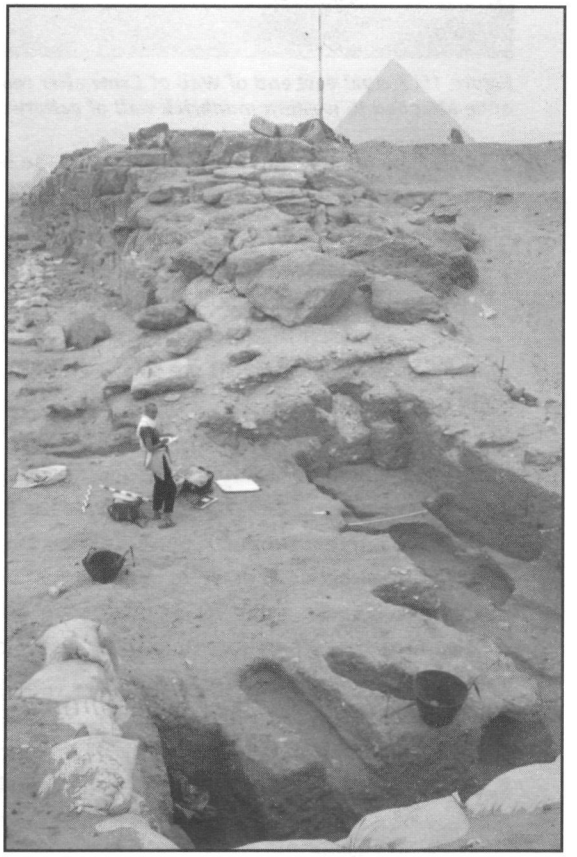

Figure 15. Excavation trenches through granite dust to remains of mudbrick gallery in operation WCE. Two layers of large stones displaced from east end of Wall of Crow and numerous Late Period burials delayed stratigraphic connection to wall

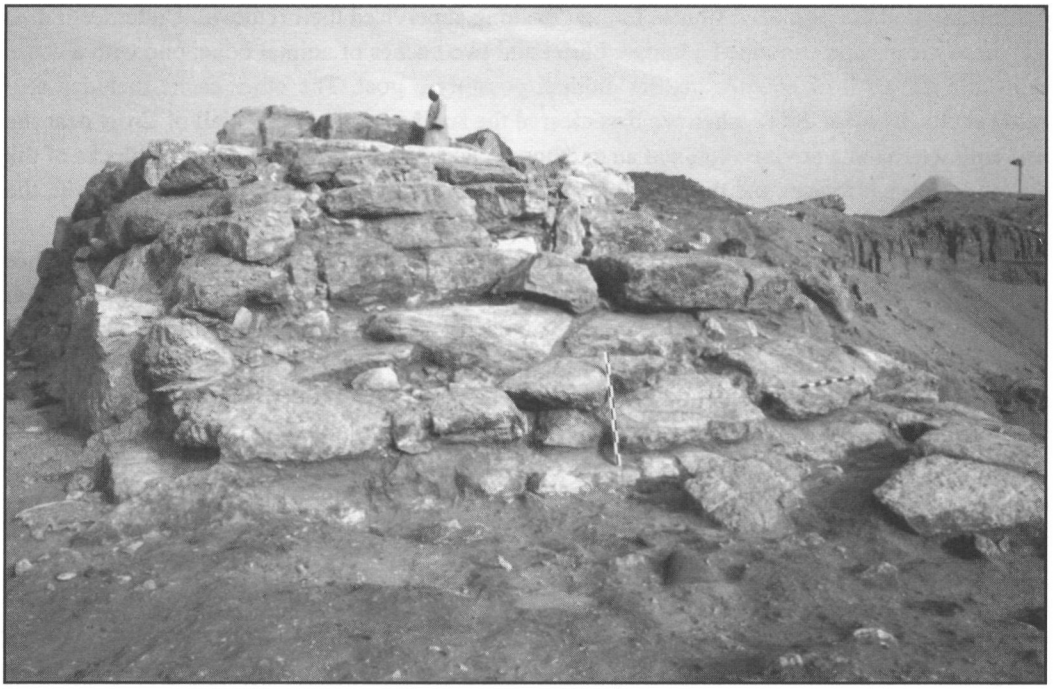

Figure 16. Actual east end of Wall of Crow after removal of two layers of large displaced stones. Wall was once attached to western mudbrick wall of gallery system

2.56 m. Thus far we have only uncovered the northwest corner. We traced the northern walls for a total length of 41.5 m and the western walls about 10 m. The northern walls run very slightly north of east while the western wall is oriented more west of true north, like the gallery walls. This results in an odd corner, slightly less than 90 degrees, where the two segments meet (fig. 7). The inside corners of both walls are curved (fig. 2).

The overburden that we removed in the area of the Buttress Building was entirely modern, ranging from only 15 to 90 cm thick, with plastic wrappers, chaff, and modern brick (fig. 17). Sand diggers from the nearby riding stables removed the ancient sand cover. The site was wetted in recent times, as evidenced by tire tracks of heavy machinery impressed in the ancient "mud mass" in the area of the Buttress Building and gallery set IV.

We have not had a chance to excavate the interior of the Buttress Building but we see indications of an internal room structure. In the sandy mud fill inside the enclosure, each morning we saw a contrast between dry/gray and wet /dark along very straight lines forming a rectangle 5 × 8 m. Mudbrick walls, about 70 cm thick are showing, some with marl (*tafla*) plaster faces.

The area that we exposed along the walls of the Buttress Building is very flat, except for a stony tumulus, an isolated pile of broken stones about 7.4 × 7.2 m situated 6 m south of the inner wall of the Buttress Building (fig. 1). Sitting on clean sand above the mud mass, the tumulus probably dates from a later period. The stones surround a pit which goes down into the Old Kingdom layers past another semicircular mudbrick wall. At the bottom of the pit, we caught a glimpse of a human skull, which we reburied until our osteo-archaeologists would properly excavate next season.

We suspect that the stone of the tumulus came from a massive Old Kingdom wall that someone removed from this spot. The trench and lower stone material that remain from the missing wall pass under the stone tumulus and make a northwestern corner (fig. 1). The grave diggers cut through the remains of the wall to put in the grave, penetrating what appears to have been a

rounded mudbrick corner very similar to the curved "buttress" described above. They then used the fieldstones from the wall to build the tumulus above. As the wall was dismantled (at the same time?), the portions around the grave were left undisturbed.

Environmental History of Site

We were fortunate to have geographers Karl and Elisabeth Butzer join our team in January to sort out the evidence of a complex environmental history at our site. Karl wrote the seminal book, *Early Hydraulic Civilization in Egypt,* which lays out the basics of Nile Valley geomorphology ("the shape of the land"), Egyptian climate change, population growth, settlement distribution, basin irrigation and the agricultural cycle. The Butzers agreed with our suspicions that the sequence of layers in the northeastern part of our site comprise a rare and crucial record of environmental change from the late Fourth Dynasty through to the Greek and Roman periods.

Our suspicions were aroused by the conditions in the northeastern part of the site. The deteriorated settlement material becomes highly compacted, light gray, homogenous and speckled with pottery sherds. This undifferentiated material fills walls between marl plaster, as though the bricks dissolved. In other cases the walls "melted" into wavy patterns. The sherds appear to have been bedded like pebbles along a brook or the shells along a shoreline. These conditions begin around the northeastern corner of the Hypostyle Hall and the eastern end of gallery set II (fig. 3).

Farther north and east, the gray compact soil gives way to gravely, tan-colored, sandy soil that I tentatively called *tafla* (marl clay). This material is so hard we have had to dig it with picks. It forms a broad swath, extending like a frozen wave across gallery set I and across the northeast corner of gallery set II (fig. 3). Almost like fossilization, the fabric of Old Kingdom walls and Late Period burials near the edge of the swath appears to have been substituted by this

Figure 17. Workers scrape last of sand layer off double-enclosure walls of Buttress Building in southeast corner of site

Figure 18. Layered record of post-occupational environmental history in northeastern corner of cleared area. Far right, eastern wall of Manor turns into tough* tafla *before it is cut off by wadi wash. Left, layers of sand and alluvial mud are record of Nile floods

tough *tafla*. The *tafla* phases upward into a sequence of soft clean sand interspersed with loamy alluvial mud layers that slope markedly down to the northeast (figs. 18–19).

Wadi Wash

Karl identified our curious *tafla* as stream beds laid down by water that intermittently washed out of the wadi between the Mokkatam and Maadi Formations. Our royal production facility was built on the lower southern edge of the wadi channel. As flood waters washed down the wadi and around the end of the Wall of Crow, they repeatedly scoured and filled shallow channels, gradually building a fan of gravelly sand before and during utilization of the site. A high water table led to oxidation of these sands, accounting for the yellowish color, and eventually the dissolved lime in the groundwater led to their cementation. Much later, after the Late Period burials, repeated but very modest floods left standing waters, rich in lime, that further cemented the top of these sands into a very tough *tafla*. Old Kingdom walls and Late Period burials near the wadi wash were likewise cemented where the wadi stream did not completely wipe them out as it did much of gallery set I (fig. 3).

The intermittent wadi stream was probably much more powerful in the Old Kingdom than in periods after our site was abandoned. Egypt during this period and earlier was moister than today, with more rainfall and a higher water table in the desert. Trees and a variety of shrubs grew along the wadi. (Even today dozens of trees shade the Coptic and Muslim cemeteries in the wadi mouth, supported by the high water table). As the pyramid builders quarried the edges of the limestone formations on both sides, they widened the mouth of the wadi. The wadi channel today is partly obscured by quarrying, piles of construction debris, and drifting sand. During the

Fourth Dynasty, frequent heavy rains converted the wadi into a rushing torrent, hundreds of meters wide and several meters deep. On occasion it could have flowed with enough force to move very heavy objects. Inconceivable as such powerful floods might seem today, they were known in Old Kingdom times. Near Helwan, wadi flooding punched straight through a massive dam that the Old Kingdom Egyptians were building across the Wadi Gerawi.

Sandy wadi wash forms thick layers under the first major phase of our settlement as seen in the deep backhoe trenches in the eastern part of the site (fig. 20), and under the foundation blocks of the Wall of Crow in the WCS deep trench (fig. 9). The Fourth Dynasty builders would certainly have been aware of the threat of powerful floods. Perhaps this was one of the motivations for building the Wall of Crow. It directed the wadi stream as far as possible to the east. The bank of debris that the builders left along its south side may have made the wall a kind of dike. When the floods cut through the northeast corner of the site after abandonment, they apparently ran along the north side of the Wall of Crow and then washed around the damaged end. While the site was a functioning production facility, there may have been a barrier off the end of the Wall of Crow, or on the other side of the wall, that prevented the wadi from washing around it. Possibly a harbor, in the form of a large basin that was regularly dredged, took up the flow. If the basin were allowed to fill up, the wadi wash may have returned to its old channel through the site.

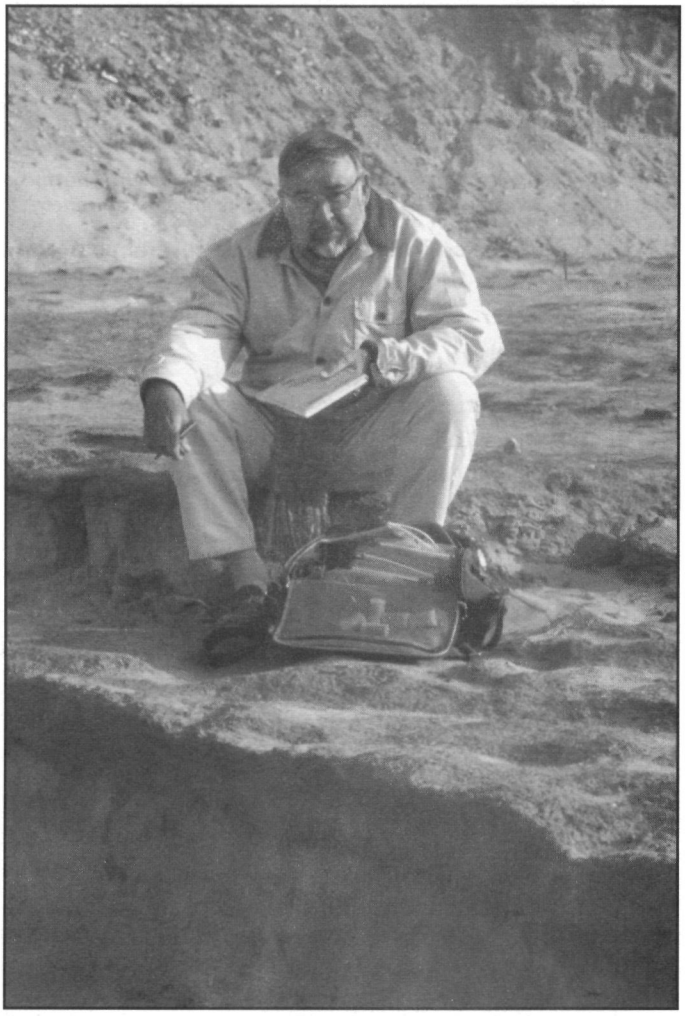

Figure 19. Karl Butzer logs Nile flood deposits in northeastern part of site

Rainfall Meltdown

When the site was occupied, repetitive and sustained heavy rains "liquefied" major portions of the settlement creating the "melted" conditions we observed and the homogeneous light gray mud with pottery sherds distributed throughout. Karl referred to this material as *settlement sludge*, caused by rain pooling throughout the settlement, running around and between structures. We see big swaths of such sludge between mudbrick walls in the section that a backhoe cut through the settlement layers creating a large trench (BBHT) in the northeastern part of our site in 1990 (fig. 3, 20–21). The Fourth Dynasty occupants rebuilt some of the rain-damaged walls, such those of the Hypostyle Hall. But we also found architecture that was dismantled or razed in the Old Kingdom, such as parts of the gallery system, perhaps

Figure 20. BBHT (biggest backhoe trench) cut through northeastern part of site in 1990. Nile alluvial deposit forms broad, flat surface layer around top of trench

because of water damage. There were several phases of meltdown during the life of the settlement.

Final Demise

During the period of progressive abandonment, channels of rain water ran through corridors, doorways, and alleys. This late sludge also incorporates crude rock from the field stone walls. Lastly, the site started to erode, producing the rolling undulations of our "mud mass" that we scrape to find wall lines.

When the Late Period burials were cut into the mud mass, erosion by wind and floodwaters had scoured out small depressions in the northwest corner of the galleries to form rolling undulations. Even as the cemetery was being used, water sometimes puddled here, leading to fresh cementation that almost fused the burials, making them very difficult to excavate. But after an interval of time, several meters of windblown sands began to build up around the end of the Wall of Crow, setting the stage for another environmental switch.

Nile Flood Deposits

In the northeast corner of our cleared zone, Karl identified a series of overlapping mud and sand layers as a record of rising Nile floods that spilled out over the sandy edge of the desert. Late in Graeco-Roman times, unusually high floods eroded small dunes on the margin of the flood plain or lapped up onto the dune sand covering the Late Period burials. These repeated and powerful floods are roughly dated by Graeco-Roman sherds in a late mud layer, and they probably span several centuries. We also found Graeco-Roman sherds in our 1998 LNE excavations of a thick

layer of Nile alluvium about 25–30 m farther north than our current cleared area (see "Giza" in the 1998/99 *Annual Report*).

Conclusion

I must conclude this report by quoting Karl Butzer himself on the environmental record of our site, since so much of the preceding section was his words correcting ours. "At our site, some three millennia of detailed environmental history are recorded in a 5 hectare area by wadi wash, the mud mass of Fourth Dynasty ruins, erosion of the site, later wadi wash, and finally, wind-blown sand inter-bedded with Nile muds. Fragments of such an environmental history had previously been recorded from scattered and disconnected locations in Upper Egypt. But the Giza excavations for the first time provide a clear record of the whole sequence, in one place. It now makes the cores previously taken in the floodplain near Giza intelligible, and carries important implications for reconstructing both the Old Kingdom landscape of the Giza Plateau and the settlement history of the adjacent floodplains. Next season we hope to follow up further leads, carry out further sediment sample processing in the Giza laboratory, and fill in the regional picture for a unique Egyptian environmental history that often runs counter to theoretical expectations."

Thanks to Our Colleagues in Egypt

We are grateful to Dr. G. A. Gaballa, Secretary General of the Supreme Council of Antiquities, and Dr. Zahi Hawass, Undersecretary of State for Giza and Saqqara. We thank Mr. Ahmed al-Hagar, Director of Giza for his kind assistance. For their assistance we are grateful to Mr.

Figure 21. Karl Butzer pointing out significance of layers in BBHT trench. Layer of modern trash at top. Thick Fourth Dynasty mudbrick wall in section to right. Layer of "settlement sludge" between wall and Karl. Compact wadi material at bottom of trench. While trench gives a valuable stratigraphic profile, it also points out urgency and salvage aspect of our archaeology on this site

Mahmoud al-Afifi, Chief Inspector for Giza, and Mansour Bureik, Senior Inspector. We thank Ms. Wahiba Saleh and Mr. Ashraf Abd al-Aziz who represented the Supreme Council of Antiquities at the excavation site. We would like to thank Mr. Ahmed Eiz who served as our inspector in the storeroom. We are especially grateful to Engineer Abd al-Hamid Kotb for assistance with mechanized equipment for clearing modern overburden from our site so that we could carry out the archaeology. As he did last season, Mohammed Musilhi carried out this task with skill and determination. Without this help we could not have carried out the work summarized above. Reis Shehat Abd al-Basat did a remarkable job supervising the workmen who cleared the last, or lowest, layers of the modern overburden over broad areas of the site to expose the ancient surfaces and architecture so that we could map and excavate.

Thanks to Supporters: A Gift to Science and Scholarship

This ancient settlement, with its streets, galleries, and bakeries, already seems familiar to those of us who have worked long months at the site. But consider that very little of this 4,500-year old urban center was known as recently as twenty months ago. Without our marathon Millennium Project, it might not have lasted very much longer.

For the opportunity to salvage and map this newly discovered city of the pyramids, and to retrieve the information embedded in its ruins, science and scholarship will always be indebted to those who made our Millennium Project financially possible. Ann Lurie challenged us to embark on the Millennium Project. Ann Lurie, David Koch and Peter Norton provided major financial support. Bruce Ludwig, Jon Jerde, Fred and Suzanne Rheinstein, Robert Lowdermilk, Matthew McCauley, Glen Dash, George Link, James Allen, David Goodman, Marjorie Fisher, Sandford and Betty Sigoloff, Victor and Nancy Moss, Don Kunz, Richard Redding, Lora Lehner, Bill and Kathy Dahlman, Bonnie Sampsell, Art and Bonnie McClure, and Charles Rigano contributed to the work that is represented by this map. Our thanks go out to all these benefactors.

The Team

The team consisted of Mark Lehner (Harvard Semitic Museum and the University of Chicago), director; John Nolan (University of Chicago), archaeologist, assistant director, and epigrapher; Mohsen Kamal (University of California, Los Angeles), assistant director and archaeologist; Karl Butzer (University of Texas, Austin), geomorphologist; Trina Arpin (Boston University), geo-archaeologist; Jessica Holst Kaiser, osteo-archaeologist; Mary Anne Murray (Institute of Archaeology, University College, London), archaeobotanist; Richard Redding (Michigan Museum of Natural History), faunal analyst; Nicholas Conard (University of Tübingen), lithics analyst; Cordula Werschkun (University of Tübingen), lithics analyst and archaeologist; Rainer Gerisch, charcoal analyst; David Goodman, surveyor; Glen Dash, geophysical surveyor; Anna Wodzinska (University of Warzaw), ceramicist; Jadwega Iwasczuk (University of Warzaw), assistant ceramicist; Kevin Kaiser (University of California, Berkeley), photographer and archaeologist. Our team of archaeologists included Fiona Baker, Paul Sharman, and Catriona Gibson (Firat Archaeological Services); Tobias Tonner (University of Tübingen); Lauren Bruning; Ashraf Abd al-Aziz (Supreme Council of Antiquities); Justine Way (University of Chicago); Sarah Sterling (University of Washington); Justine Gesell (University of Heidelberg); Caroline Hebron (University College, London); Serena Love (University College, London); Tanya Ashkar (Beirut University); Wahiba Saleh (Supreme Council of Antiquities).