



Interim Report from the Field: A Royal Plan Emerges

As our modern count of years flips 2000, we have taken a break in our Millennium Project after having worked from the middle of October until December 10th. This is a good time to sum up what we have learned from our excavations in the pyramid settlement of Giza where the ancient Egyptians constructed the world's largest buildings in the third millennium BC. One of these structures, the Great Pyramid, remained unsurpassed in size until only recently, late in the second millennium AD.

Through a tremendous effort begun in mid-October by John Nolan and Mohsen

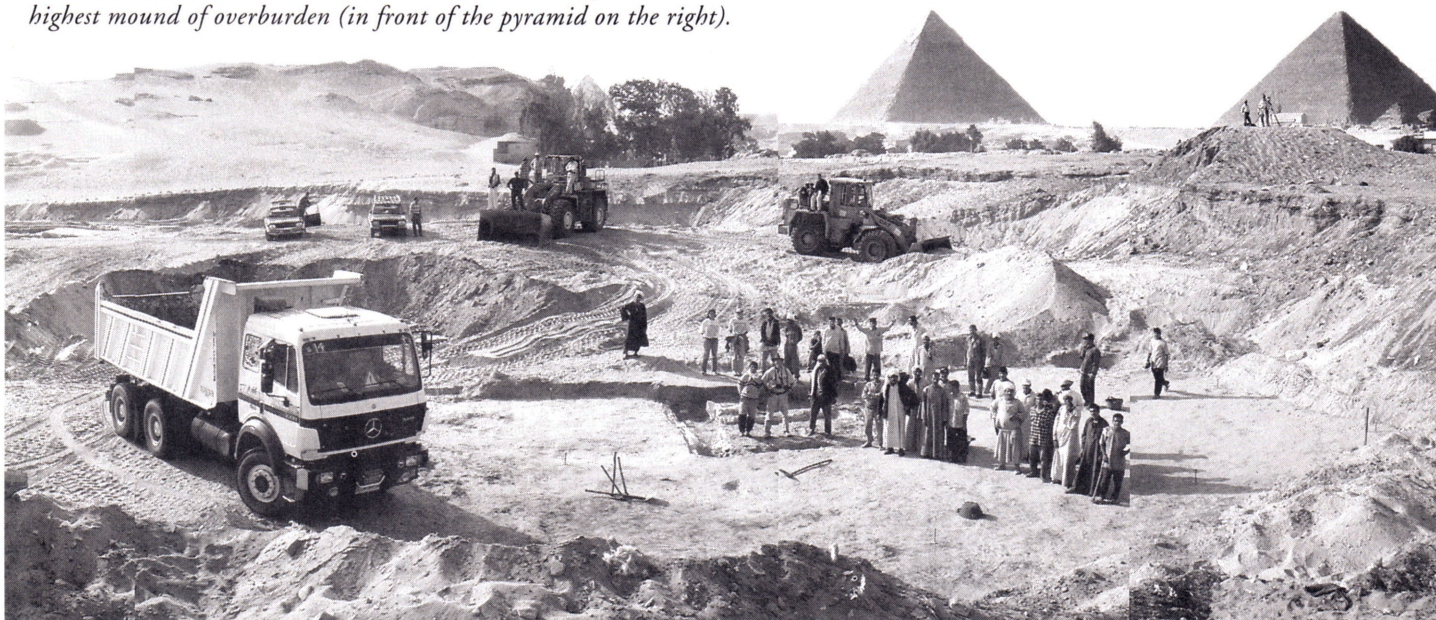
Kamal, with the help of our Inspectors Ashraf Abd al-Aziz and Mohammed Sheeha, and our staff and workers, we have removed the overburden from the entirety of our Zone C. Shown on the map on pages 6–7, Zone C (which stands for “center”) encompasses most of the 5 x 5-meter squares we have excavated so far. The bulk of the overburden—a 6-meter-deep blanket of sand and modern debris—was stripped away by a big, red front loader operated by Mohammed Musilhi and hauled away in a big white dump truck driven by his brother Adel. The final, delicate clearing down to the Old

Kingdom layers was done by hand. Since our goal was not intensive excavation, but “capturing” the overall plan of the architecture, we scraped away just enough of the compacted Old Kingdom deposit to reveal the outlines of walls.

The ultimate result of this work is an open area, 70 meters north-south by 80 meters east-west. It corresponds almost exactly, thanks to our surveyor David Goodman, to the Zone C in our map shown in the last issue of *AERAGRAM* and on page 7, except that it takes in about 10 meters of Zone W. So, what exactly do we have in Zone C?

Continued on page 6

Our gathered forces in a composite photo: one dump truck, two taxies, two loaders, workers, supervisors, and our survey team on the highest mound of overburden (in front of the pyramid on the right).

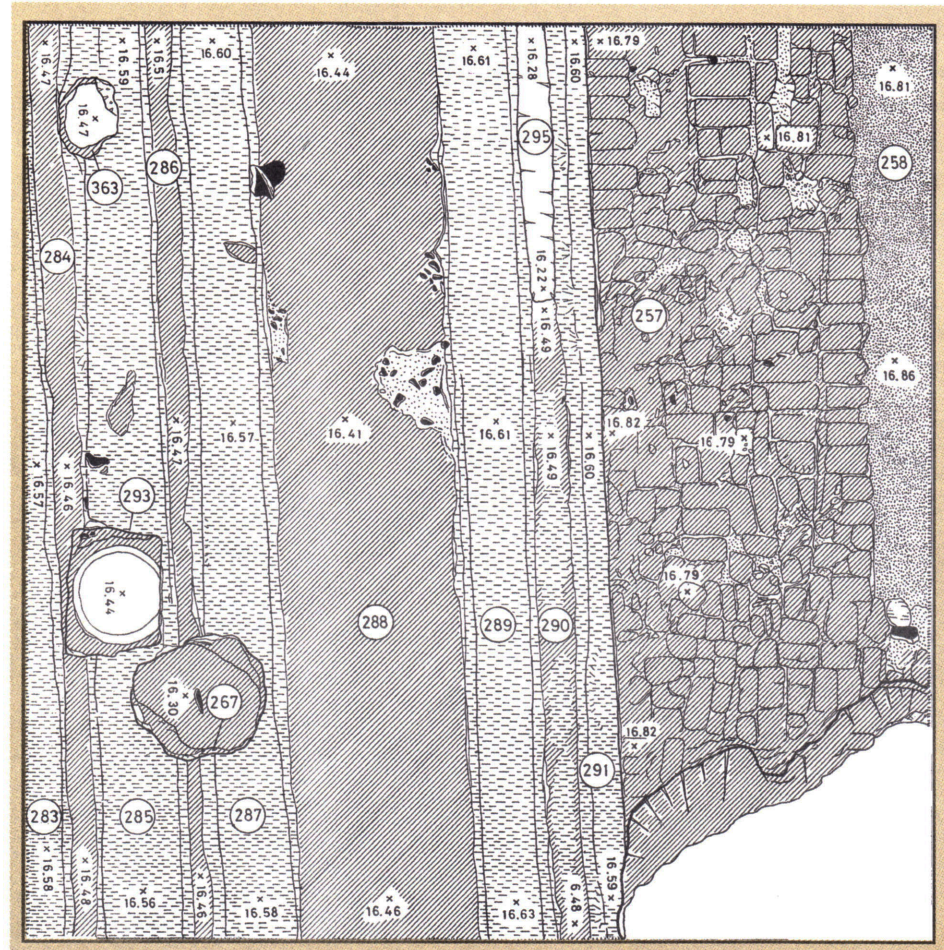


Squares and Scales: “Capturing” Giza on Paper



Above: John Nolan records features in an excavation square, using a scale of 1:20.

Below: Square G20 drawn at a scale of 1:20, but shown reduced here because of space limitations. A great wealth of detail can be seen at this scale, including the bricks of a wall on the right and long low benches, shown in dashed lines.

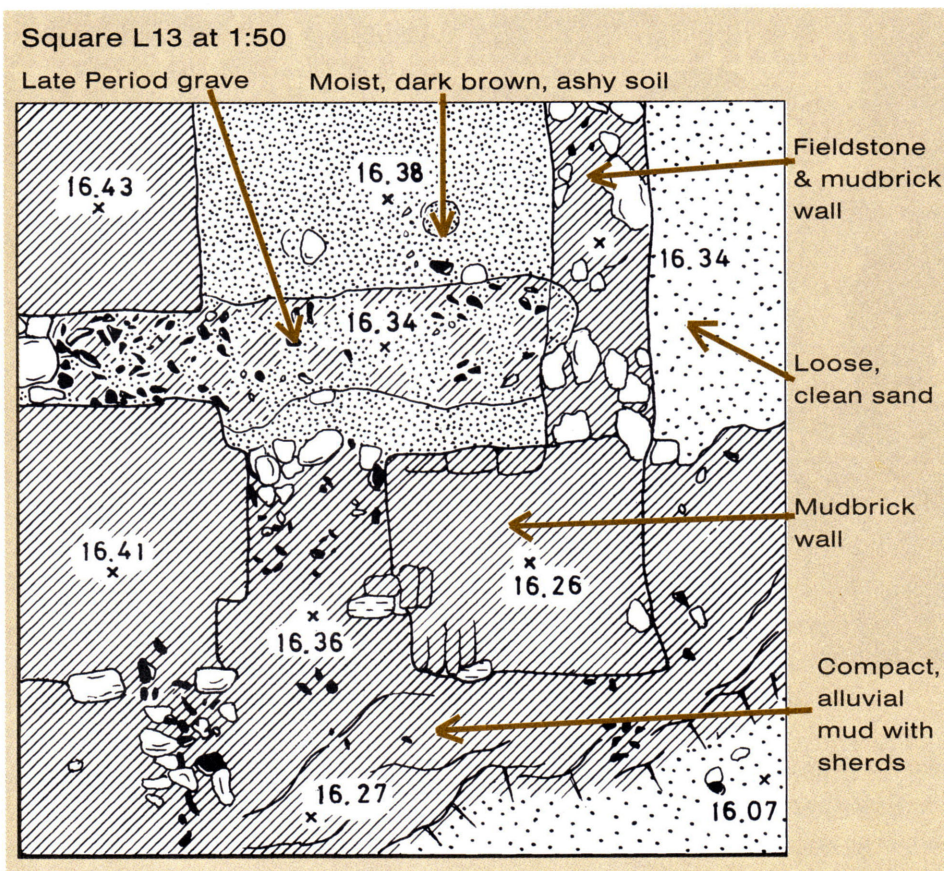


How do we “capture” the ancient Architecture of the Pyramid Age and other information about our archaeological site? One important way is by mapping the ancient walls and other features. Since our excavation began in 1988, our standard unit of mapping and excavation has been, for the most part, the 5 x 5-meter square. We map these squares at three different scales.

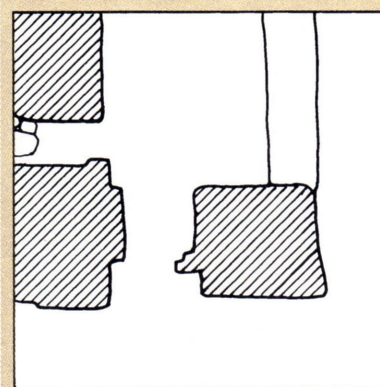
For the most detailed maps, we use a scale of 1:20. That is, we draw the features twenty times smaller than they actually are. At this scale, five centimeters represent one meter on the ground (all our work is metric). We use this scale when we want to map important details in squares that we have excavated intensively. At this scale we can map individual bricks and stones, as illustrated on the left, as well as other features like intact dough-mixing vats, bread pots, and hearths in the bakeries.

We draw important profiles, or sections, at the even more detailed scale of 1:10 (where 10 centimeters represent an actual meter). A section, or profile, is a drawing of the layers seen in the sides of the squares after we have excavated through them. Floors and other layers are so thin that we need the finer scale to “capture” them in our drawings.

In our current program, where the main goal is to retrieve the overall layout of the walls before excavating intensively, we use a scale of 1:50 (where 2 centimeters in the drawing stands for one meter in reality). This coarser scale gives us a “coarse grain” drawing, which ignores many details and thus allows us to map much more quickly. However, we still take notes on the various kinds of soil or other deposits in individual 5 x 5-meter squares after we have scraped the upper surface of the ruins.



Square L13 at 1:100



Above, square L13 is drawn at a scale of 1:50 and on the right, at 1:100. At 1:50 we document a great deal of detail about the features, while at 1:100 we only record the basic outlines of the architecture. However, using 1:100 for the Millennium Project allows us to efficiently "capture" the overall nature of the settlement.

Square L13

The drawing of square L13, above, is drafted from the 1:50 field drawing. It is the southern half of a bakery. The alluvial mud patch (shown by hachuring) had to be scraped vigorously before we could see the outlines of the walls within it. However, the ashy soil that filled the bakery remained moist and dark while, over time, the walls and compact alluvial mud dried to a light gray. This contrast made the walls and rooms easy to see. The northeast and southeast corners of the square were filled with clean sand below the levels of the walls, which contrasted with the ashy fill of the rooms, and the mud patch, making it easy to see the wall on the right.

Survey Control Network

We are able to work very accurately because of the survey control network that

we established across the entire Giza Plateau in the earliest years, 1984-86, of the Giza Plateau Mapping Project (GPMP). This control network was designed and implemented through the hard work of David Goodman. With our survey control and modern survey equipment, we can locate any point on the plateau to within millimeters. We position our iron stakes that mark the corners of our 5 x 5-meter squares to an accuracy of half a centimeter.

During our fall season, David and Nubi Abd al-Basat laid out a vast grid of stakes across Zone C as soon as the ancient layers were nearly exposed under the sandy overburden. This dynamic duo often worked up on the highest mound of overburden at the northern edge of Zone C shooting in grid squares with their infrared total station (theodolite and distance

measurer) as fast as we could clear the ground ahead of them (photo on page 5).

Every line and point of the grid can be identified with the coordinate system of the Giza Plateau Mapping Project. By survey observations of Polaris on New Year's Eve in 1984, David oriented the GPMP grid to true north. Our grid takes its center as the calculated center of the Great Pyramid, which we defined as N100, 000 and E500, 000. The grid values increase to the north and east. Thanks to this system, we can lock the maps of each and every 5 x 5-meter square into an overall map. These maps are like pieces of a puzzle. So far, the emerging picture of the puzzle in Zone C is that of a vast royal production complex.

We also have a vertical control system that we use to measure the height above sea level of any point on our maps. The spot heights are the small numbers beside xs in our maps. The main phase of our site ranges mostly between 16.00 and 16.50 meters above sea level. With this recording system we are able to document every feature of the site in three dimensions—standard practice in modern archaeology.

When we excavate intensively, each and every feature in a square—wall, hearth, floor, or any kind of layer, pit, etc.—is assigned a feature number. In our recording system for the material that we extract (pottery, sealings, and other artifacts), the

Continued on page 4

Squares and Scales

Continued from page 3

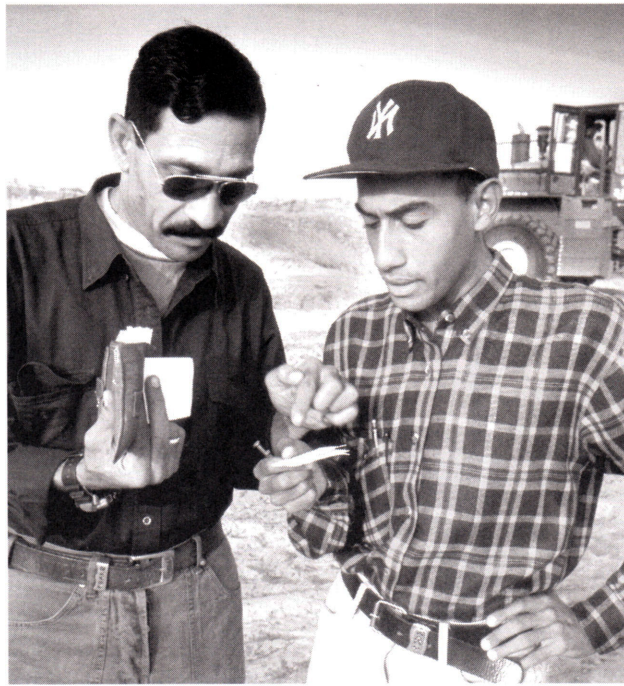
feature numbers rule.

Thus all the pottery from a given feature is put into a container that is labeled with that feature number, along with other information such as bag number, season, and date. In the detailed maps of squares, feature numbers are in circles.

What Level of Detail?

The question of where one feature stops and another begins (feature boundaries) can be tricky.

We are always thinking about the level of detail, and when and where too much detail kicks in a diminishing return on information—obfuscating rather than elucidating. For example, the 1:20 plan of square G20 (on page 2) shows the bricks in the thick enclosure wall on the right (east) as we found them without shaving or scraping. The long low benches are rendered with dashed lines to indicate the marl (desert) clay with which they were paved. The floor between the benches is hachured since this was all Nile alluvial mud. Sandy and ashy deposits, which show through breaks in this floor, are stippled. Sometimes the situation is much more complex, calling for more detail in



Mohammed Musilhi, our loader driver, and Inspector Ashraf Abd al-Aziz review details of the earth moving operation, while the front loader rests behind them.

the coarser scale of 1:100 in order to capture information over larger areas. The two maps on page 3 illustrate the differences in detail between 1:50 and 1:100.

In later season we will go back and map the fine-grained scales we normally use. But during the next two years our focus will be to establish the “big picture” of the site, drawing at 1:100, before we lose this invaluable archaeological record to the forces of modern expansion.

Mark Lehner

our drawings. In square F19, for example, the floor was patchy because of very fragile fish bone we found embedded in it. So here we mapped each patch and every break in all floor levels.

The Big Picture

Such detailed, large-scale maps can be chock-a-block full of information. We have been making maps like this of successive levels in each square since we began our excavations in Area A in 1988. The main thrust of our work now, however, is information at another scale—the overall nature of the settlement. And for that we need to map more efficiently at

Thanks to Our Winter 2000 Crew

While you are reading this newsletter, our crew, listed below, is busy at Giza continuing our Millennium Project. Our next *AERAGRAM* will report on their work.

Ashraf Abd al-Azzis	Inspector
Sarah Sterling	Pottery
Anna Wodzinska	Pottery
Cordula Werschun	Sq. Supervisor/Lithics
Hratch Papazian	Sq. Supervisor
Mohsen Kamel	Sq. Supervisor
David Goodman	Surveyor
Nubie Abd al-Basat	Assistant Surveyor
Richard Redding	Zooarchaeology
Mary Anne Murray	Archaeobotany
Rick & Laura Brown	Brickwork analysis

On the Web

See the Giza Plateau on these web sites:

- AERA web site
Reports on field seasons, back issues of *AERAGRAM*
www.fas.harvard.edu/~aera/index.htm
- Oriental Institute, University of Chicago
Web page on the Giza Plateau Mapping Project
www-oi.uchicago.edu/OI/PROJ/GIZ/Giza.htm
- Semitic Museum, Harvard University
Web page on the “Sphinx and the Pyramids” show
www.fas.harvard.edu/~semitic/semitic-exhibit5.html

The Complete Pyramids Honored by Biblical Archaeology Society

Mark Lehner's book, *The Complete Pyramids: Solving the Ancient Mysteries*, was selected for the 1999 Biblical Archaeology Society Publication Award in the category of Best Popular Book in Archaeology. *The Complete Pyramids* was published in 1997 by Thames and Hudson.

Thanks to Those Who Make our Millennium Project Possible

We have learned a great deal in our six-week pilot season. I cannot emphasize too much what a tremendous opportunity it has been to pull together our previous seasons of excavation on this site. We owe this opportunity to Ann Lurie's inspiration, encouragement, and support (see *AERAGRAM* 3/1). Other staunch supporters have also made our work possible: David Koch, Bruce Ludwig, Jon Jerde, Robert Lowdermilk, Matthew McCauley, Fred and Suzanne Rheinstein, Sanford and Betty Sigoloff, Victor and Nancy Moss, Glen Dash, David Goodman, Dr. Marjorie Fisher, and Don Kunz. I owe a special thanks for this pilot season to David Goodman, who surveyed a forest of grid-square stakes, all to an "accuracy of a gnat's eyelash," and to Bob Lowdermilk, who gave us valuable advice on our loader and truck hauling operation.

None of our work would have been possible without the extraordinarily

generous assistance of the Supreme Council of Antiquities (SCA) and the Giza Inspectorate. I am pleased to carry out this research as part of a long collaboration with Dr. Zahi Hawass, Undersecretary of State for the Giza Pyramids. I would like to thank Mr. Ahmed el-Hagar, Director of the Giza Pyramids; Mansour Bureik Radwan, Chief Inspector; Inspector Mohammed Sheeha, and Ashraf Abd al-Aziz who has skillfully supervised two of our excavation squares. I owe a special thanks to Mr. Abd al-Hamid, Chief Engineer of the SCA at Giza for his help with equipment used in moving the overburden, without which we could not have done our survey and excavation. A hearty thanks goes to Mohammed Musilhi for his skillful use of the front loader.

We are honored to carry out our research with the sponsorship of the Harvard Semitic Museum and the Oriental Institute of the University of

Chicago. I would like to thank Larry Stager, Gene Gragg, and the faculty of the Departments of Near Eastern Languages and Civilizations of those institutions. Ancient Egypt Research Associates, Inc. (AERA) administers our research. I owe much to AERA board members James Allen, Jon Jerde, George Link, Bruce Ludwig, and Matthew McCauley for their constant support and advice.

Mark Lehner

AERAGRAM

Volume 3, Number 2, 2000

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AERAGRAM is published by AERA, the Ancient Egypt Research Associates. It reports on ongoing research and other developments on the Giza Plateau for friends and supporters of AERA and others interested in ancient Egypt.

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David Goodman and Nubie Abd al-Basat survey grid squares from high above Zone C on a mound of overburden. They shoot in squares with their Sokkia Powerset 3000 total station (theodolite and distance measurer) as fast as we can clear the ground.



A Royal Plan Emerges

Continued from page 1

A Royal Plan Emerges

The ancient architecture that we have “captured” so far is shown on the map of Zone C on the right. Because all of the walls in the large area we have cleared so far line up with one another, except for a deviation in the far southeast corner, it appears that we have here one vast complex, planned at a stroke. There is little doubt that this is a royal plan emerging.

We now have broad horizontal exposures of the last phases of Fourth Dynasty architecture in the four corners of Zone C. The intensive excavations of previous seasons have given us detailed information from the small windows opened in these four areas. This field season’s work now allows us to see how the architecture is related horizontally. In other words, we are finally catching a glimpse of the big picture.

From past seasons we had learned the following about Zone C:

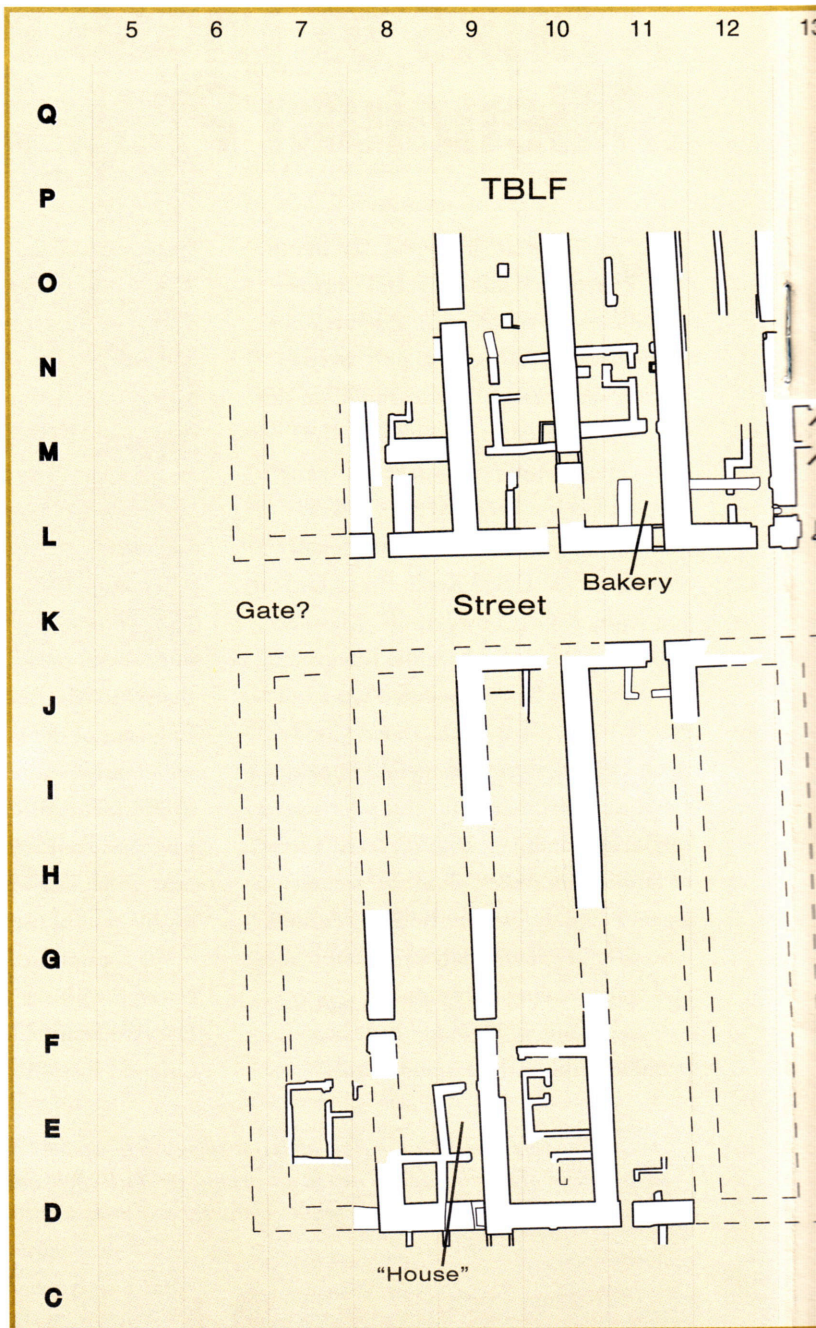
*** The southeast corner:**

In 1991 and 1995, we cleared squares inside and outside the corner of a 1.5-meter-thick mud brick wall. Inside that corner are the curious, ankle-high benches and troughs, which had been carefully paved with marl desert clay. Masses of fish bone in between and alongside these long, low benches suggested to us they were somehow used for processing fish. Earlier, in 1991, we had excavated and mapped two nearly intact Old Kingdom bakeries abutting the exterior of this same corner. So, I could use the phrase, “loaves and fishes.” Also in the southeast corner we found evidence of copper working in squares D17 and D17x.

*** The southwest corner:**

Squares D8, D9, E9, opened in 1997-98, recalled in some respects the layout of the long, shotgun houses constructed 1,000 years later at Deir el-Medinah. In D9, in what appeared to be the back room of a gallery, we found grinding stones and spatters of pigment on the floor.

Mohammed Musilhi's big red loader stands ready while workmen scrape to reveal walls.



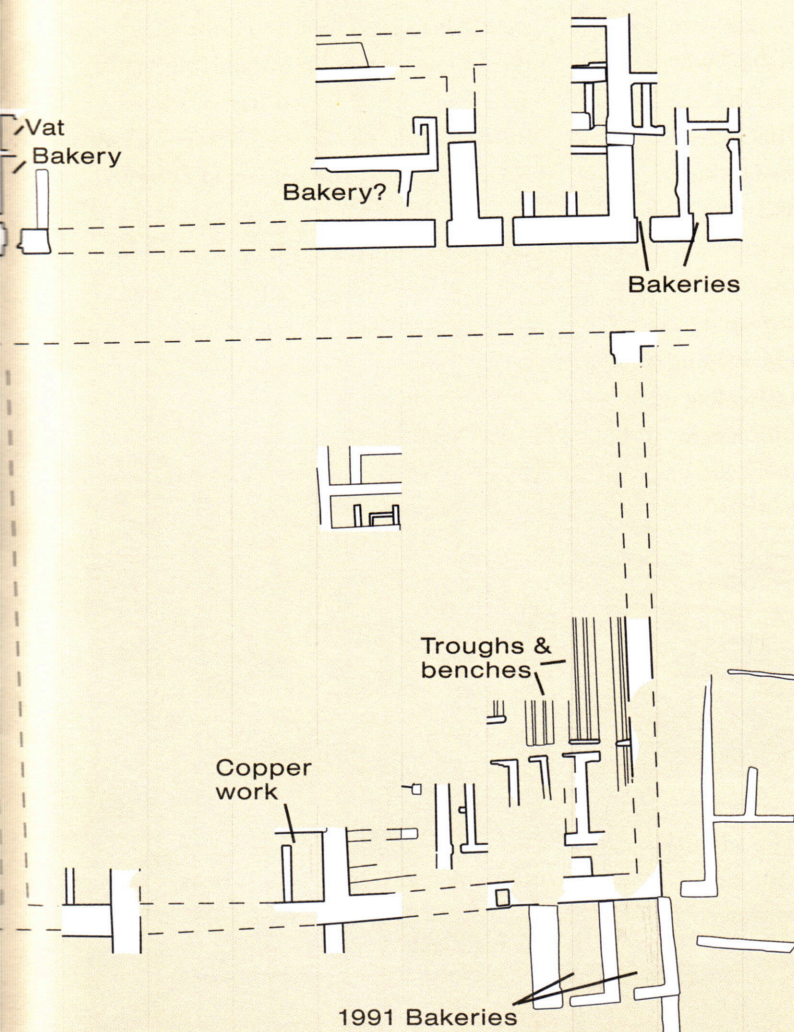
*** The northeast corner:**

In 1997, we excavated square MN20 which seemed to be outside of the main Old Kingdom settlement, perhaps close to the edge of the Nile valley or the Nile itself. Its architecture was dense and free of the ash and sherds which had been so common in the rest of the site.

*** The northwest corner:**

In 1998, we opened up TBLF (“The Big Leap Forward,” see *AERAGRAM* 2/2), which was a large 20 x 20-meter excava-

13 14 15 16 17 18 19 20 21 22 23 24

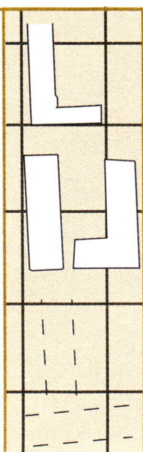


Map Key

Mudbrick walls

Stone walls

Probable walls —
We did not actually see
the outer faces or lines
but we are reasonably
certain the walls exist.



Above: A map of Zone C, the area we cleared during the first stint of our Millennium Project this fall.

Right: A map of our entire concession showing the location of Zone C. We will be working next in Zone W, which we began clearing in the final days of the fall 1999 field season.

tion square, containing sixteen 5 x 5-meter squares. This gave us our first glimpse of the long, comb-like galleries.

Galleries and More Galleries

During this pilot season of the Millennium Project, we were finally able to connect TBLF

Continued on page 8

Navigating Around Zone C

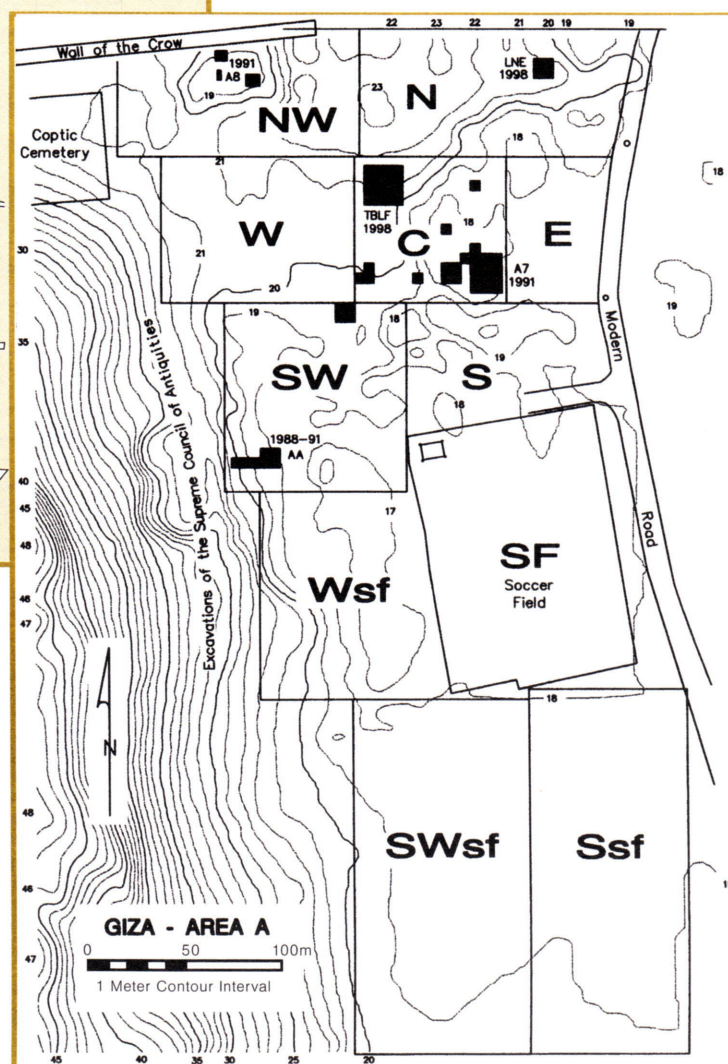
Our 5 x 5-meter squares are identified by letter and number.

→ East-west rows = letters

→ North-south columns = numbers

For example:

We can speak of the whole L-row or the 6-column. These two intersect as Square L6.



A Royal Plan Emerges

Continued from page 7

in the northwest to squares D8-D9-E9 in the southwest. This has revealed that the large TBLF galleries, defined by L-shaped walls about 1.5-meters (3 royal cubits) thick, are duplicated by another set just to the south. The long, shotgun “houses” in squares D8-D9-E9 turned out to be the back rooms of long galleries, perfectly aligned with those in TBLF! However, the southern set is much more badly deflated, probably from water running off the central wadi at Giza, not long after the site had been abandoned. Nonetheless, we have practically the full length of the southern set, which is 35 meters long. The first set, the TBLF galleries, however, disappears underneath the 6-meter-high wall of modern overburden on the

northern border of Zone C. Each gallery in both sets is about 4.60 meters wide.

The northern end of the southern galleries, like the southern end of the TBLF galleries, is filled with dark ashy soil. There seem to be few cross walls until the far southern ends, where we find complex room structures. It turned out that the “worker’s house” that we excavated down to floor levels in squares D8-D9-E9 in previous seasons is nestled into the southern end of one of the galleries.

Scraping the Old Kingdom surface just to the east of squares D8-D9-E9 in the southern set of galleries, we found more evidence of complex architecture. The ancient deposits here gave up the outlines of walls easily after a light scraping and brushing of the surface, revealing walls preserved to a considerable height. We

have begun to wonder if these house-like room structures indicate that a workers’ town lies south of Zone C.

So far we have clear evidence that both sets of galleries had at least four comb-like compartments, but each may yet have a fifth gallery to the west. In the last two days of work (December 8th and 9th) we were able to push west into Zone W thanks to Mohammed Musilhi, our loader driver, who made a good start on clearing the overburden at the southwest corner of Zone C, moving 10 meters into Zone W. Just inside Zone W, in squares D7 and E6, we began clearing a thick fieldstone wall. Although the wall is collapsed, it appears to be thicker than the 3-cubit- (1.57 meters) thick main walls of the long galleries. This wide stone wall may form the west side of a fifth gallery.





Above: Inspector Ashraf Abd al-Aziz studies an intact jar in square K11 where the "street" was first found. During the final phase of the site, the jar, along with other debris, was discarded in the street.

Left: The walls emerge as Cordula Werschkun and workmen clear square M19. In the background, Inspectors Ashraf Abd al-Aziz and Marian Raouf Sadek carefully excavate the "street."

The TBLF galleries do not appear to continue further east than the 12 column. In squares L12-L13 we found a southeastern corner to the northern set of galleries in TBLF, a corner formed, again, by 3-cubit-thick walls.

A Street Emerges

One entirely new discovery was a corridor or "street," 5.25 meters (10 royal cubits)

wide which runs east-west and separates the two sets of galleries. This "street" may be a major organizing element of the site. At 5.25 meters wide, it seems too broad for a roofed corridor, particularly since we have found no column bases or other evidence for supporting a roof. It runs east as far as the MN20 area and may go all the way to the edge of what was then the flood plain.

On the west, the "street" disappears into the immense overburden covering Zone W. Somewhere under there, it may turn 90 degrees and run straight to the 7-meter-high gate in the center of the Wall of the Crow. Before turning, the "street" may pass through a smaller gate at the edge of the galleries. If the fifth gallery forms the western boundary to the whole set of galleries, we expect to find a gate precisely in squares J6-K6-L6.

Huge!

The potential importance of the "street" began to dawn on us after many days bent over, myopically focused on one 5 x 5-meter square after another. We finally realized we have something enormous. The road combined with the two sets of galleries, assuming that

both galleries are of equal size, would total 75 meters in length. Huge!

Although Mohammed Musilhi has completed loader operations in Zone C, much of the fine cleaning and drawing remains to be done. After more hand clearing and intensive excavations in later field seasons, we may find that the whole plan in Zone C consists of different blocks of buildings, each with its own set of

bakeries. Two bakeries are attached to the southeastern exterior corner of a structure in the area of squares MN20. Another bakery is attached to the exterior southeastern corner of the TBLF galleries in squares L13 and M13. The two bakeries we found in 1991 are attached to the exterior southeastern corner of a large building that was cut through by modern backhoe trenches just before our 1991 season. The largest building block would be the great double galleries, which take up the full western third of Zone C.

A Hunch

Based on our results this pilot season, I have the feeling, only a hunch, that if there is some central building, institution, or royal residence, it does not lie to the west. In Zone W, I think we will find walls bounding our "street," which may turn 90 degrees to run north-south to the entrance in the Wall of the Crow. I believe that the core building lies to the north and northwest (Zones N and NW). It is hard

Continued on page 10

Help Support Our Millennium Project!

The Lurie Family Foundation helped initiate our Millennium Project and is supporting our work this field season. The foundation will continue to help fund our project if we can find additional donors. Please help us meet this challenge!

Contributions of any size are welcome. If you would like to contribute or make inquiries please write to us at:

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Above: Looking southwest over the western side of Zone C. The long galleries of TBLF ("The Great Leap Forward," our 1998 20 x 20-meter excavation area) can be seen in front and a matching set of galleries beyond.

A Royal Plan Emerges

Continued from page 9

to imagine it would be located to the south which would put it downwind from our many bakeries and other hearth facilities. But housing for the legions of people who worked in our shops and galleries might lie to the south.

The half-buried Wall of the Crow, which originally stood 10 meters high and 200 meters long, is one of the features of the site that prompts us to suspect that a royal residence might lie somewhere just south of it. If you walked through that gate 4,600 years ago, you would have been in full view of the valley temples of the Khafre and Menkaure pyramids to your left. To your right you would have seen the harbors or flood basins that may have allowed ships and boats to come close to these temples and to the foot of the Giza Necropolis. These vessels might have brought produce from provincial estates to be processed in our galleries.

When we get it all sorted out, this complex of buildings and passages will tell us much about how the Egyptians of the Fourth Dynasty organized their labor.

We hope to be able to push on to the west and north starting in January. By the time you read this, work should be well underway in our effort to clear all the way to the Wall of the Crow.

Mark Lehner

Below: From the southwestern side of Zone C looking north towards TBLF along one of the gallery walls.



Clockwork Pyramid: the Millennium Clock Project

AERA's Giza Plateau work has attracted the attention of renowned computer scientist, Dr. Danny Hillis. Now a vice president and Fellow of the Disney Corporation, Danny visited Egypt in the winter of 1998, touring the pyramids of Giza and Sakkara with Mark Lehner. While looking for inspiration from the stone monuments, he is also providing a new perspective to AERA's work.

The Millennium Clock

Danny's interest in the monuments was related, in part, to an ambitious project based on a new invention of Danny's—the Millennium Clock. Danny hoped to learn about how the Egyptians engineered structures for the long term. His clock employs a revolutionary digital-mechanical design, engineered to last 10,000 years,

and it will require a housing capable of weathering this expanse of time.

The driving philosophy behind the time piece is the notion of disseminating a sense of extended present—the Long Now—intended to facilitate a greater sense of how the decisions we make today reach deeply into the future.

Danny has long been struck by how the year 2000 has been a barrier to thinking about the future in meaningful ways; the millennium, as a milestone, has obscured our ability to imagine what life will be like in the years following. His goal might be stated as follows: when we learn to envision something that we create lasting through ten millennia, our sense of the consequences of our actions will be forever expanded.

Engineering for the Long Term

The ancient Egyptians set their time horizon for the truly long term—*djet*, eternity. Egyptian tombs from the Old Kingdom on were called “Houses of Eternity,” *per-djet*. Ramesses III's mortuary temple on the West Bank at Luxor (now known as Medinet Habu) was “Ramesses, Ruler of Thebes, united with Eternity.” Even more explicit about this eternal vision is the name of Ramesses II's mortuary temple, also at Luxor. Now called the Ramesseum, its original name was *hwt net heb en renpoot khenemet Waset*, which means literally, “Mansion of Millions of Years United with Thebes.”

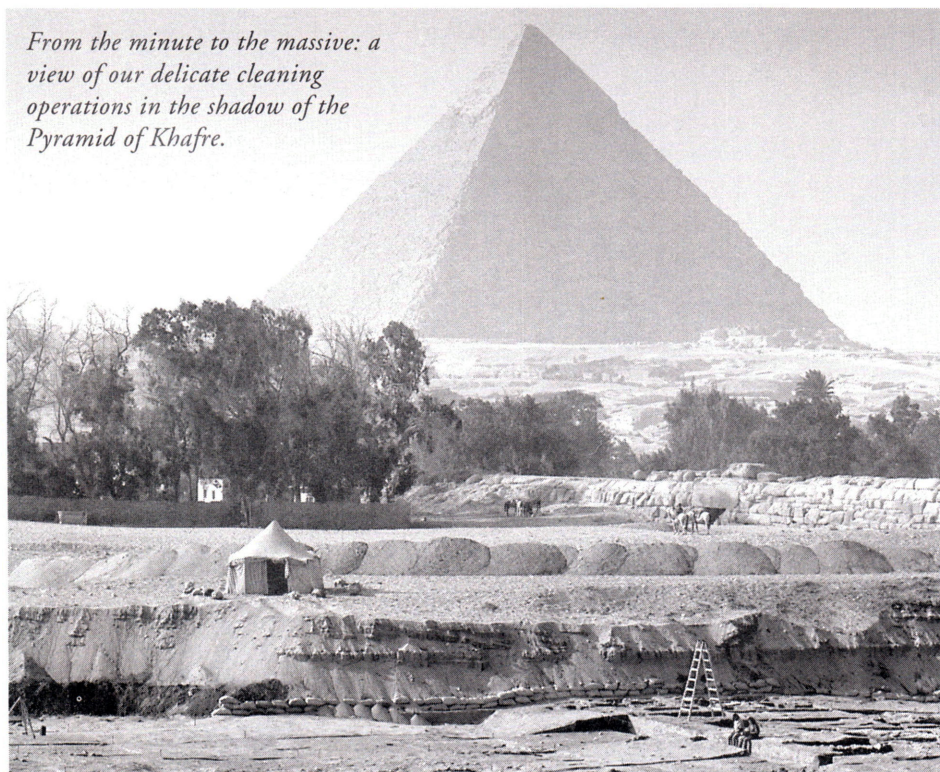
According to Egyptologist Jan Assmann ancient Egyptians thought in terms of stone-time (*Steinzeit*). Egyptian concepts of time also revolved around the simplicity of form—a pyramid or obelisk—and the simplicity of time-keeping in terms of alignments and observations of stars (Sirius, the harbinger of New Year's), or the moon (the *baladi* monthly calendar), or the sun. These concepts stand in stark contrast to the industrial age's notions of “clock” and timekeeping which hinge on intricate, complex mechanisms, or, now, “software.”

While the Millennium clock may seem radical, such thinking is not new to Danny. Early in his career Hillis was a pioneer in the field of massively parallel processing. His company, Thinking Machines, manufactured the Connection Machine, a computer which used 64,000 processors to solve complex problems which were beyond the reach of traditional computing.

We welcome Danny Hillis' original ideas and unique perspective.

Matthew McCauley

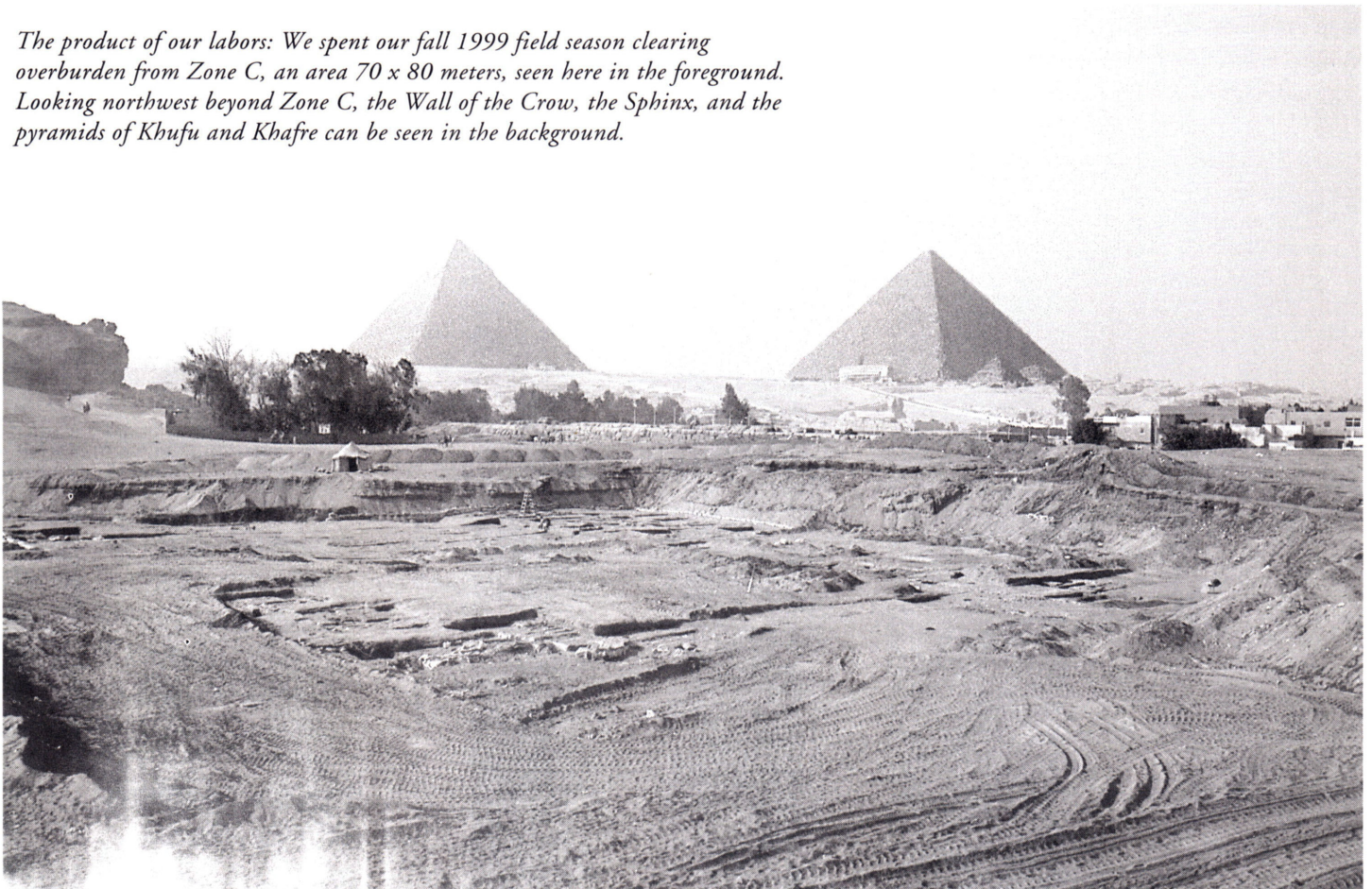
From the minute to the massive: a view of our delicate cleaning operations in the shadow of the Pyramid of Khafre.



Inside

- Interim Report from the Field: A Royal Plan Emerges **1**
Squares and Scales: "Capturing" Giza on Paper **2**
The Complete Pyramids Honored by Biblical Archaeology Society **4**
Thanks to Our Winter 2000 Crew **4**
Thanks to Those Who Make our Millennium Project Possible **5**
Clockwork Pyramid: The Millennium Clock Project **11**
-

The product of our labors: We spent our fall 1999 field season clearing overburden from Zone C, an area 70 x 80 meters, seen here in the foreground. Looking northwest beyond Zone C, the Wall of the Crow, the Sphinx, and the pyramids of Khufu and Khafre can be seen in the background.





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