

# STRUCTURE AND SIGNIFICANCE

THOUGHTS ON ANCIENT EGYPTIAN ARCHITECTURE



VERLAG DER ÖSTERREICHISCHEN AKADEMIE DER WISSENSCHAFTEN

STRUCTURE AND SIGNIFICANCE THOUGHTS ON ANCIENT EGYPTIAN ARCHITECTURE

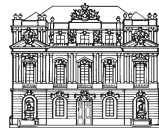
ÖSTERREICHISCHE AKADEMIE DER WISSENSCHAFTEN  
DENKSCHRIFTEN DER GESAMTAKADEMIE, BAND XXXIII

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UNTERSUCHUNGEN DER ZWEIGSTELLE KAIRO  
DES ÖSTERREICHISCHEN ARCHÄOLOGISCHEN INSTITUTES

HERAUSGEGEBEN IN VERBINDUNG MIT DER KOMMISSION FÜR ÄGYPTEN  
UND LEVANTE DER ÖSTERREICHISCHEN AKADEMIE DER WISSENSCHAFTEN  
VON MANFRED BIETAK

BAND XXV



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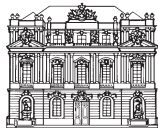
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Editor  
Peter Jánosi



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Zahi  
HAWASS

# Khufu's National Project

## The Great Pyramid of Giza

### in the year 2528 B.C.\*

## INTRODUCTION

Since 1987 we have been excavating at Giza and have made some major archaeological discoveries, including a number connected with the pyramid complex of Khufu. Most of our work came about as a result of a program of site management at Giza that started in 1987<sup>1</sup>. The archaeological sites discovered have added to our knowledge of Giza and the reign of Khufu, allowing us to pinpoint most of the components of his pyramid complex. Many of these discoveries were made through careful archaeological work at the site by the team of archaeologists at Giza, who have since been trained to follow up on this important research.

In this article, I will be discussing the components of the pyramid complex that have long been known, as well as other components that have only recently been discovered, to help shed light on the way the Giza Plateau looked at the end of Khufu's reign in 2528 B.C.<sup>2</sup>.

\* Dieter Arnold is a very good friend of mine. I met him for the first time in 1975 when he was working inside the pyramid of Amenemhat III at Dahshur. It was a very interesting experience to see for the first time the maze of corridors within the Middle Kingdom pyramids. When I wrote my doctoral dissertation on the funerary establishments at Giza, I used his article, «Rituale und Pyramidentempel», *MDAIK* 33, 1977, 1-14, as a guide to understanding the function of the pyramid complex. Our friendship has grown since 1987, when he started working at Lisht and Dahshur. I can say that his knowledge and expertise in engineering and archaeology, which are evident in his many

publications in this field, have vastly increased our knowledge. As result, I decided to write this article on Khufu's pyramid complex in his honor. It is to Dieter Arnold that I dedicate this article.

1. Z. Hawass, «Site Management at Giza Plateau: Masterplan for the Conservation of the Site», *International Journal of Cultural Property* 9, no. 1, 2000.

2. For an excellent map which shows the reconstructed plateau, but made before many of these discoveries, see M. Lehner, «The Development of the Giza Necropolis: The Khufu Project», *MDAIK* 41, 1985, 109-143; *id.*, *The Complete Pyramids*, London 1997, 204-205.



## 1. THE PYRAMID

(pl. I.1)

There is still debate among scholars over the reason for the existence of three burial chambers inside the Great Pyramid<sup>3</sup>. I believe that the design of the interior of Khufu's pyramid changed for religious as well as architectural reasons (fig. 1). These changes may have been linked primarily with changes in the royal dogma associated with the cult of Re. I believe that Khufu did not follow the ancient tradition in which the king was Horus on earth and became the god Re after death; instead, it seems that Khufu may have appointed himself Re during his lifetime, then adapted his pyramid complex to fit this new cult<sup>4</sup>.

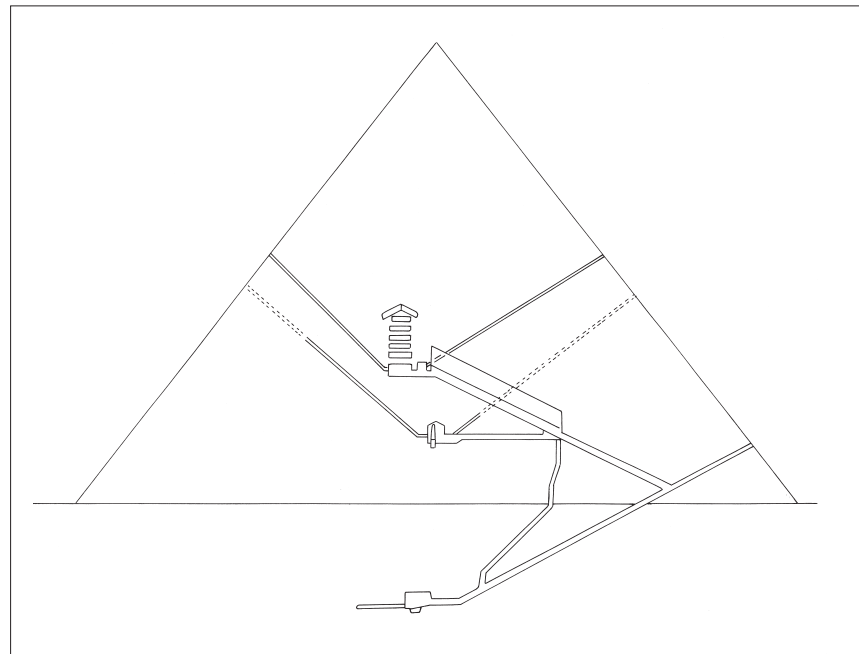


Fig. 1.

R. Stadelmann was the first to introduce this theory, offering two important pieces of evidence to support this idea<sup>5</sup>. The first is that, with the exception of Snefru and his son Khufu, every king of the Old Kingdom who built a pyramid was buried in a chamber constructed beneath it. Only Snefru and Khufu constructed their burial chambers within the pyramid, thus identifying themselves with the sun god Re, rising within the horizon. The second piece of evidence cited by Stadelmann is the fact that the epithet “son of Re” is first attested from the reign of Djedefre, son and successor of Khufu.

3. For the different theories, see: L. Borchardt, «Gegen die Zahlenmystik an der grossen Pyramide bei Gise», Berlin 1922; *id.*, *Einiges zur dritten Bauperiode der Grossen Pyramide bei Gise*, *BeitrBf.* 1, 1937; G. Goyon, «Le mécanisme de fermeture à la pyramide de Chéops», *Rev.Arch.* 2, 1963, 1-24; *id.*, «Les rangées d'assises de la Grande Pyramide», *BIFAO* 78, 1978, 405-413; R. Stadelmann, *Die großen Pyramiden von Giza*, Graz 1990, 117-142; Lehner, *Pyramids*, 111-114.

4. Z. Hawass, *The Funerary Establishments of Khufu, Khafra and Menkaure during the Old Kingdom*. University Microfilms, Ann Arbor, Michigan 1987, 84-85. For more evidence on this theory, see *id.*, «The Great Sphinx: Date and Function», in: *Proceedings of the Sixth International Congress of Egyptologists*. Vol. II, Turin 1993, 177-195.

5. R. Stadelmann, *Die ägyptischen Pyramiden. Vom Ziegelbau zum Weltwunder*, Darmstadt 1985, 126ff.

Furthermore, in my opinion Khufu's architect originally planned his burial chamber to lie underneath the pyramid. Then, in year 5, Khufu changed this, leaving the first burial chamber underneath the pyramid unfinished, its dimensions only roughly carved out of the rock and leaving much of the bedrock left in place. Around this time, the 'overseer of all the king's work' also enlarged the upper temple to allow the inclusion of wall reliefs that would reflect the new cult. The causeway was extended and its angle was changed.

As part of this change in plan, the 'overseer of all the king's work' built a second chamber inside the pyramid, now known as the Queen's Chamber. For architectural reasons, this was never finished; the floor was left rough, the walls were not completely smoothed down, and the two so-called airshafts, running north and south through the body of the pyramid, were not completely cut through to the exterior. The Queen's Chamber is also too small to have been intended as a burial chamber for Khufu, since his burial equipment would have included, in addition to a large sarcophagus, items of funerary furniture. A third chamber, now called the King's Chamber, was constructed at a higher level as the final resting place for the king.

### 1.1 SHAFTS INSIDE THE PYRAMID

The so-called airshafts found in both the King's and Queen's chambers have been investigated several times. In 1872, Dixon discovered the shafts in the Queen's chamber behind the lining blocks of the walls. Unlike the shafts in the King's Chamber, there is no visible termination on the outside of the pyramid. When Dixon started investigating, the objects he found in the southern shaft, amongst other debris, included a copper hook and, inside the northern shaft, a wooden rod and a granite ball.

In 1920, Morton Edgar tried measuring the length of these shafts by inserting wooden-tipped metal rods. He estimated the length of the southern shaft as 60 m (197 feet) but, in the northern shaft, the rod broke and he was unable to continue measuring.

In 1991, we began discussions with Rainer Stadelmann about the excessive humidity inside the Great Pyramid, which had reached about 85%. It was agreed that, in order to install a ventilation system, the shafts, which measure only 20 by 20 centimeters, should be cleared out and cleaned up.

In 1992, the S.C.A. and the German Institute embarked on this project, in cooperation with Rudolf Gantenbrink. To examine the shafts, a tiny mobile robot called "Upuauat" was built to carry a video camera through each of the airshafts of the King's Chamber. A ventilation system was installed after the shafts had been cleared and cleaned out<sup>6</sup>. A fan was placed inside the burial chamber to draw in fresh air from outside. It was successful in reducing the humidity, but was unpleasantly noisy and in 1999 the fan was resited at the far end of the shaft on the outside of the pyramid.

In March 1993, it was decided to install a similar ventilation system in the Queen's chamber and a second robot, Upuauat II, was sent up the northern airshaft. Near the

6. See R. Stadelmann with contribution of R. Gantenbrink, «Die sogenannten Luftkanäle der Cheopspyramide. Modellkorridore für den Aufstieg des Königs zum Himmel», *MDAIK* 50, 1994, 285-294, and also *Treasures of the Pyramids* (ed. by Z. Hawass), White Star, Italy 2003.

entrance, a piece of wood and an iron rod were found which must have been left by explorers trying to examine the shaft long ago. The robot found that the northern shaft is not straight as shown in the pyramid plan, but rather turns 45° after about 19 m (60 feet). At this point, it was unable to proceed any further. Upuauat II was then sent into the southern airshaft but, after about 65 m (213 feet), stopped in front of a fine-quality limestone block with two embedded copper pins that completely barred further access (pl. I.2)<sup>7</sup>.

This so-called door fuelled the public imagination to such an extent that it was possible to investigate further and, in 2002, we contacted the National Geographic Society to participate in an attempt to see what lay behind this stone<sup>8</sup>. They sent over a team of experts to conduct this research using the latest equipment; a robot, called the Pyramid Rover, carrying a video camera and lights as well as an echo-impactor that measures the thickness of stone and a miniature ground-penetrating radar antenna. They ascertained that the stone 'door' was only 6 cm thick, so they were able to drill a small hole through it, about 1.1 cm wide, into which a miniature camera equipped with lights was inserted for a live television transmission. To everyone's surprise, all that lay beyond was another blocking stone, this time rough-hewn, of about the same size as the first, but without copper handles.

The Pyramid Rover then continued its investigation in the northern shaft. It was found that this shaft, which heads north as it heads away from the chamber, bends 45° to the left after 19 meters, bends back to the right at 76 and 84 feet and again to the left at 96 feet. This bend was necessary to bypass the Grand Gallery and demonstrates that both features were being built at the same time.

At about 63 meters (208 feet), it came up against a blocking stone, similar to the one in the southern shaft and also bearing two protruding copper pins covered in green patina. The copper pins may have been for the attachment of ropes to pull the stone into place, similar to those seen on the canopic chest of Tutankhamun, now in the Cairo Museum. The correspondence with the southern blocking stone suggests there will be another stone behind this one. Or possibly, it will reveal the real burial chamber of Khufu, or another chamber of some sort. This hypothesis is based on the tale of Khufu and the Magician, written perhaps in the Middle Kingdom, which tells the story of the king's search for the plan of the secret chambers of Thoth to use in designing his pyramid.

Further scientific investigations are planned to examine the outside of the pyramid and see if the shafts from the Queen's chamber continue to the outside. If they do, this might suggest that the blocking stones within the shafts are symbolic doors that the king's spirit would have to open before it could travel in the afterworld. It is interesting to note that this is the only pyramid with such devices.

We also went inside the five relieving chambers above the King's Chamber and recorded the graffiti found written in all five areas. The most important graffiti was written on the back of the slabs and could only have been added by the workmen who were moving the stones. This work will be published in a separate article.

7. Stadelmann, *ib.*

8. This expedition was headed by Zahi Hawass (principal investigator) with Chris Sondreal and Meg

Watters. See Z. Hawass, M. Waters, C. Sondreal. «The Recent Investigation of the So-called Doors Inside the Great Pyramid», *ASAE* 2004, forthcoming.

In addition to this new information about the interior of the Great Pyramid, there are two important points I would like to address here. The first is the traditional estimate of the number of stones, mentioned in almost every book about the Great Pyramid, is 2,300,000. There is no scientific basis for this number, and we were not even able to track it to its original source. We now believe that the pyramid was built over a natural rock-core about 9 m high. A scientific estimate for the number of the stones used in the pyramids has been made by architects of Helwan University, who suggest that there were just 1,200,000 blocks.

My second point concerns the number of years of Khufu's reign. The Turin Papyrus lists 23 years for Khufu. In the Old Kingdom, regnal dates were kept according to the taking of a cattle-count that usually took place every other year, rather than to the actual years of reign. Stadelmann has suggested that this cattle census was always biennial, and that the Turin Canon records the number of cattle censuses that occurred during Khufu's reign, rather than his regnal years. In this case the ancient records would show that Khufu's reign lasted 46 years<sup>9</sup>. Recently, an inscription of year 27 of Khufu has come to light at a mining site in the desert south of Dakhla oasis<sup>10</sup>. This leads us to the necessary conclusion that Khufu's reign was at least 27 years long or, more probably between 30 and 32 years (pl. I.1-2).

## 2. THE TEMENOS WALL AND THE SURROUNDING COURT (fig. 2)

The Great Pyramid was surrounded on all sides by a temenos wall, remains of which are visible today primarily on the eastern and northern sides, but also on the western and southern sides of the pyramid. This wall is about 10.2 m from the base of the pyramid to the east and north, and about 10 m from the base of the pyramid to the south and west<sup>11</sup>.

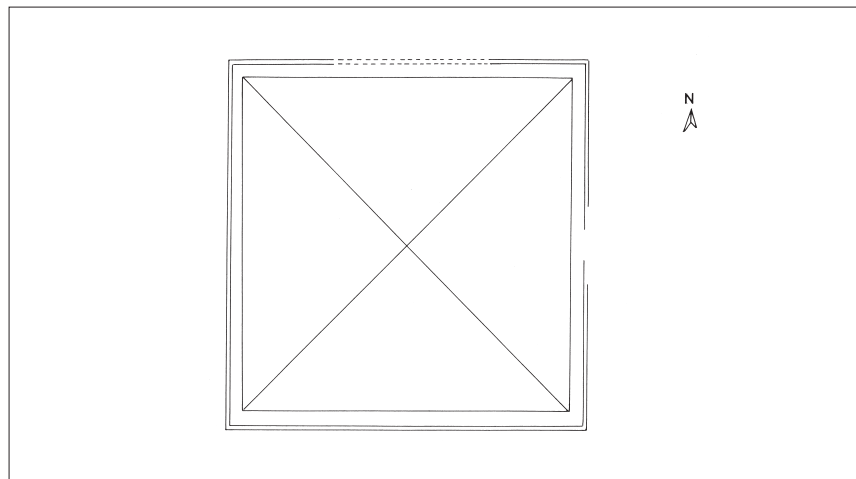


Fig. 2. Khufu's pyramid.

9. R. Stadelman, «Beiträge zur Geschichte des Alten Reiches: Die Länge der Regierung des Snofru», *MDAIK* 43, 1978, 239.

10. The site is known as Redjedef's water mountain and lies about 100 km south-east of Balat. See K.P. Kuhlmann, «The Oasis by Path, or the issue of

Desert Trade in Pharaonic Times», in: *Archaeology in Egypt 2002*, 132-137.

11. V. Maragioglio, C. Rinaldi, *L'Architettura della Piramidi Menfite*. Vol. IV, *La Grande Piramide di Cheope*, Rapallo 1965, 66.

Its estimated height was 3.15m<sup>12</sup>. Between this wall and the base of the pyramid we can still see the pavement of the pyramid court, made of Tura limestone.

The court surrounding the pyramid seems to have been isolated from the outside, because the only access to it was through the upper temple. This indirect route may indicate that the court was accessible only to officials and people who were responsible for performing the king's cult in the pyramid complex. Thus it would seem that the court was connected with the cult of the king and that the purpose of the wall was to isolate the court from the outside.

In H. Junker's plan of the area, a second outer wall can be seen in the north, south, and west. The distance between the inner and outer walls is about 23.60 m on the north and west sides and about 18.75 m on the south. No traces are visible on the east<sup>13</sup>. This outer temenos wall was made of rubble and cased with mud plaster and possibly was whitewashed. The southern side of this wall is about 237 m long and still stands from 0.20 m to 1.66 m high.

The function of the inner wall was to isolate the pyramid court from the rest of the complex, and the purpose of the outer wall was to separate the complex of Khufu from the surrounding cemetery. We can conjecture that ritual activity went on inside the inner court, especially on the east side between the upper temple and the base of the pyramid. This area may have contained an altar and two stelae.

### 3. THE UPPER TEMPLE

(fig. 3)

Very little of the upper temple on the east side of Khufu's pyramid remains today, as the stones have been quarried away. However, the ground plan of the eastern side can be reconstructed with some degree of certainty from the foundation trenches cut into the bedrock. An entrance from the head of the causeway led into a large open court with square pillars around the perimeter. The remains of the western portion of the temple were badly damaged by a Saite or Roman well.

Many scholars have attempted to reconstruct this area. All of the surviving upper temples of this period are different in their arrangements but, according to I.E.S. Edwards<sup>14</sup>, they all include these features: an entrance hall, an open court, statue niches, magazines and a sanctuary. J.-Ph. Lauer has reconstructed a long north-south hall in the western area with two false doors in the western wall and possibly statues of the king placed in small niches<sup>15</sup>. He also suggests that there were magazines in the masonry thicknesses at the northwest and southwest corners. H. Ricke agrees with Lauer in the reconstruction of a long hall, but disagrees with the positioning of a false door or doors in this hall, since

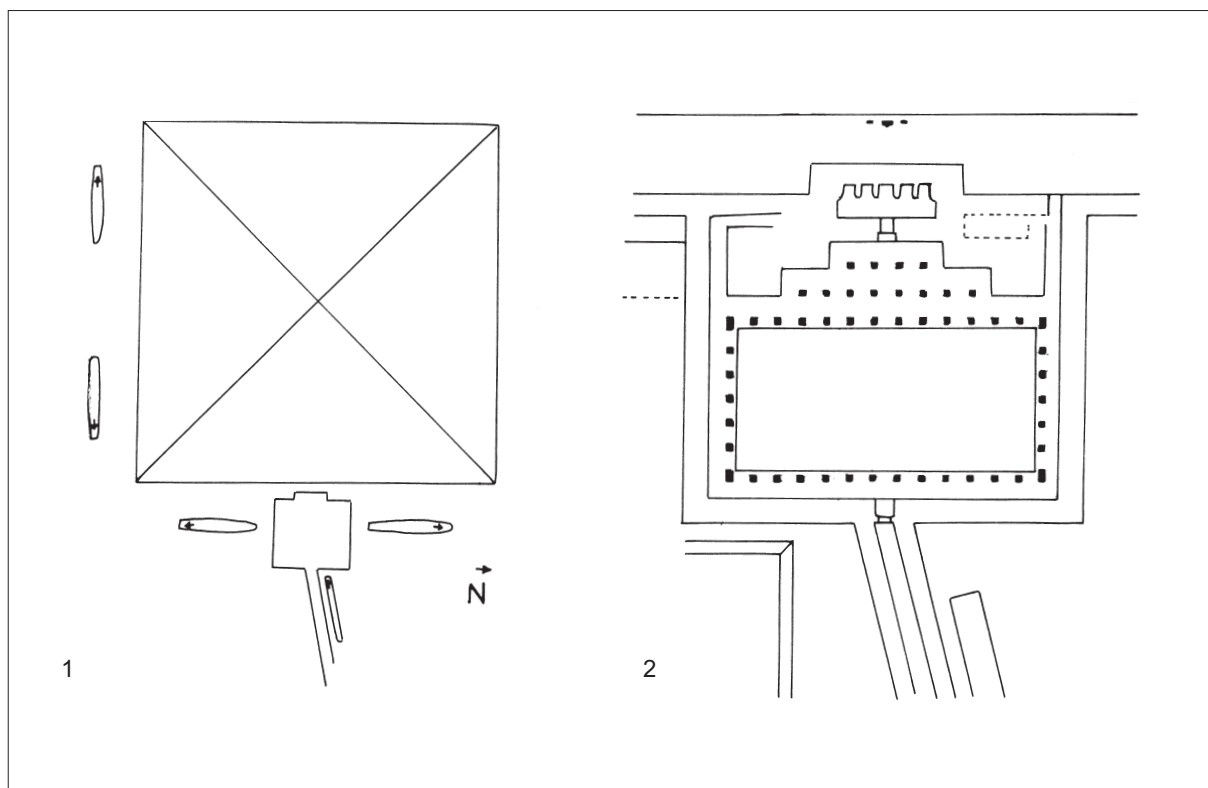
12. J.-Ph. Lauer, «Le temple funéraire de Khéops à la Grande Pyramide de Guizeh» *ASAE* 46, 1947, 246.

13. See the discussion by Maragioglio, Rinaldi, *L'Architettura* IV, 66; H. Junker, *Giza. Bericht über die von der Akademie der Wissenschaften in Wien auf gemeinsame Kosten mit Dr. Wilhelm Pelizaeus*

*unternommenen Grabungen auf dem Friedhof des AR bei den Pyramiden von Giza*, vol. X, 8, fig. 5.

14. I.E.S. Edwards, *The Pyramids of Egypt*, Harmondsworth 1961, 148.

15. J.-Ph. Lauer, «Note complémentaire sur le temple funéraire de Khéops», *ASAE* 59, 1949, 118-120.



**Fig. 3.** Legend: 1: Khufu's boat-pits, 2: the five niches in the upper temple of Khufu.

these would not have been in contact with the pyramid itself<sup>16</sup>. He proposes, instead, five niches in the western wall. R. Stadelmann reconstructs the temple by comparing it with the upper temple of Userkaf. In his plan, the sanctuary of the temple is at the center of the western part of the temple and contains a false door flanked by two niches in its western wall<sup>17</sup>. G. Goyon believes that there was an offering place between the upper temple and the pyramid. He hypothesizes a false door in front, before which stood an altar<sup>18</sup>.

I believe that the physical evidence found in Khufu's temple, combined with evidence from other Old Kingdom temples, suggests the following reconstruction of the western part of Khufu's temple: a long hall, running north-south and containing five statue niches, which may have contained four statues of Khufu and one statue of the goddess Hathor<sup>19</sup>. This hall would have been reached through a door in the westernmost pillared recess of the courtyard. There would have been magazines within the masonry to the north and south of this hall. An east-west passage along the inside of the north wall of the temple would have led from the colonnaded court to a courtyard on the east side of the pyramid, in which would have stood an altar flanked by two stelae on a platform up against the east face of the pyramid.

<sup>16</sup> H. Ricke, *Bemerkungen zur ägyptischen Baukunst des Alten Reiches*. Vol. II., *BeitrBf.* 5, 1950, 44.

<sup>17</sup> Stadelmann, *Pyramiden*, 122, fig. 32.

<sup>18</sup> G. Goyon, *Le Secret des Bâisseurs des grandes pyramides*. «Khéops», Paris 1977, 239f., fig. 93.

<sup>19</sup> For full discussion of the temple's reconstruction see Hawass, *Funerary Establishments* I, 9-30 and for the decoration of the wall reliefs in the temple, see *op.cit.* II, 514-523.

## 4. THE SUBSIDIARY PYRAMIDS

(fig. 4)

## 4.1 THE QUEENS' PYRAMIDS

Three subsidiary pyramids lying in a north-south row just outside the east enclosure wall of the Great Pyramid and south of the causeway have been attributed to Khufu's queens. There is archaeological evidence for the existence of a small chapel on the east side of each pyramid; two boat-pits were also found, one each on the southern sides of the northernmost and the central pyramids.

H. Vyse opened the three pyramids in 1837. They are mentioned by K.R. Lepsius, W.M.F. Petrie, G.A. Reisner, and discussed in detail by V. Margioglio and C. Rinaldi<sup>20</sup> as well as P. Jánosi<sup>21</sup>.

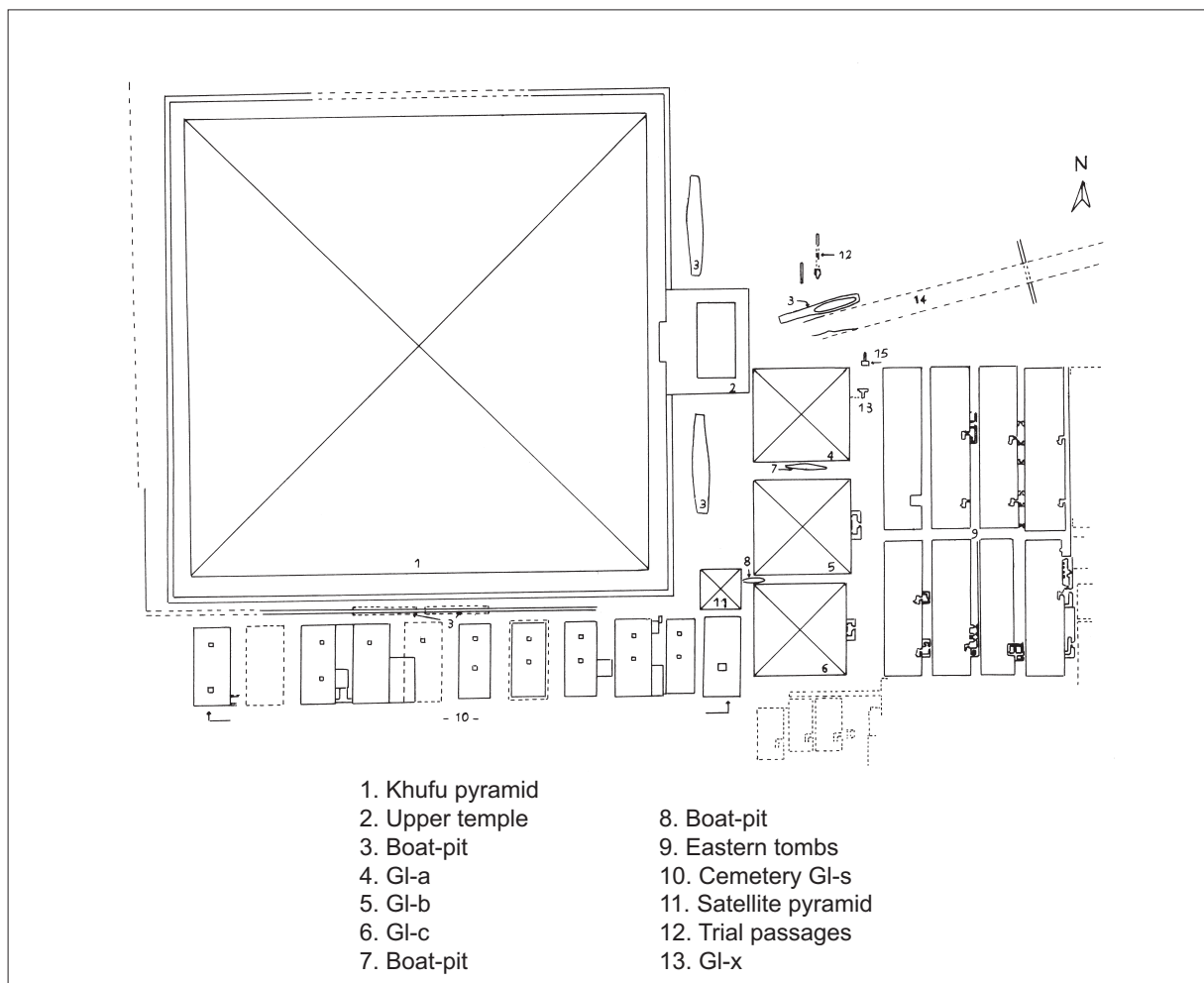


Fig. 4.

20. H. Vyse, *Operations carried on at the Pyramids of Gizeh*. Vol. II, London 1841, 63, pls. facing pp. 63, 66, 69; K.R. Lepsius, *Denkmäler aus Aegypten und Aethiopien, Text* (ed. E. Naville). Vol. I, Leipzig 1897, 29; W.M.F. Petrie, *Pyramids and Temples of Gizeh*, London 1883, 12ff.; G.A. Reisner, *A History of the Giza*

*Necropolis*. Vol. I, Cambridge (Mass.) 1942, 3, 16, 17, 70-72, 134-136; Margioglio, Rinaldi, *L'Architettura IV*, 76-96, 174-182.

21. P. Jánosi, *Die Pyramidenanlagen der Königinnen. Untersuchungen zu einem Grabtyp des Alten und Mittleren Reiches*. UZK XIII, Wien 1996.

G I-a lies 61 m east of the base of Khufu's pyramid. Its base measures 49.50 m, and its original height would have been 25.30 m high. It was suggested, based on the stone fragments found inside, that the burial chamber contained a sarcophagus<sup>22</sup>. Reisner suggested that this pyramid belonged to Kawab's mother because it is located close to Kawab's tomb<sup>23</sup>. I believe that it originally belonged to Queen Hetep-heres I, Khufu's mother<sup>24</sup> (fig. 5) and that, in the First Intermediate Period, loyal priests moved her burial equipment from the pyramid to the nearby shaft where it was found by Reisner. This shaft was probably already there, as it dates architecturally to Dynasty 3.

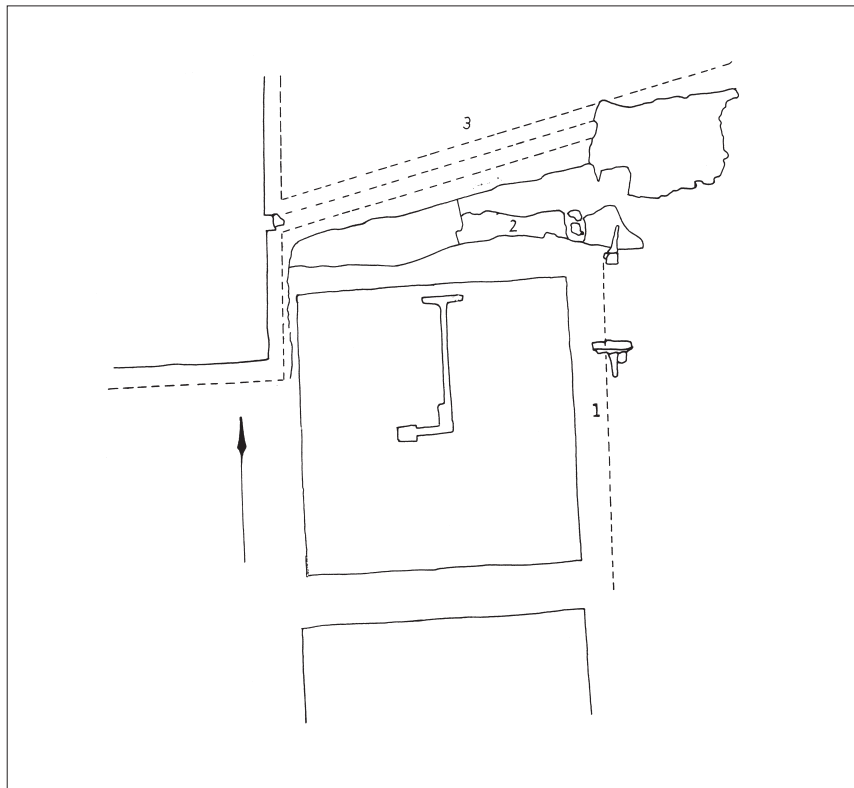


Fig. 5. Legend: 1: Subsidiary pyramid, 2: Hetepheres I shaft, 3: Causeway.

G I-b lies about 10 m south of G I-a. Its base is 49 m square and its original height would have been 30 m. It is certain that a cult chapel stood against the east face of the pyramid and that there was also a boat-pit similar to the boat-pit alongside G I-a. It has been suggested that this pyramid belonged to Queen Meritetes<sup>25</sup>.

G I-c is the best preserved of the three small pyramids. It lies about 3.80 m south of G I-b, and its north-south axis is several meters east of the north-south axis of the other two small pyramids. The length of its base is 46.25 m and its original height is estimated

22. Vyse, *Operations* II, 68ff.

23. Reisner, *Giza* I, 129; cf. M. Lehner, *The Pyramid Tomb of Queen Hetep-heres I and the Satellite Pyramid of Khufu*. SDAIK 19, 1985, 41.

24. Hawass, *Funerary Establishments* I, 47; Lehner, *Hetep-heres*, 35-44.

25. Stadelmann, *Pyramiden*, 124.



at 29.62 m. On the eastern side are the remains of the 4th Dynasty cult chapel which was later turned into a temple of Isis<sup>26</sup>. The pyramid is generally attributed to Queen Henutsen<sup>27</sup>, whose name is mentioned on a Late Period inscription found in the temple. The south side of the pyramid was prepared for the cutting of a boat-pit however, this was never executed. On the east side of the pyramid, lines carved into the paving stones indicate that it was never finished, that the queen was buried here before her monument could be completed.

#### 4.2 THE SATELLITE PYRAMID G I-D (fig. 4)

Lehner has suggested that the cuttings referred to as the trial passages, which lie to the east of the Great Pyramid, were intended as the substructure of a ritual pyramid for Khufu, planned at the same time as the pyramids of the queens<sup>28</sup>. He has identified another mysterious cutting in the rock, known as G I-x, as the beginning of the original subterranean chamber planned for pyramid G I-a. According to his hypothesis, the location of the first queen's pyramid was changed, and the original satellite pyramid was never completed, probably due to the expansion of the upper temple and the change in route of the causeway<sup>29</sup> (fig. 6) possibly carried out in connection with a change in Khufu's cult. Until recently, it was assumed that no ritual pyramid was ever built for Khufu.

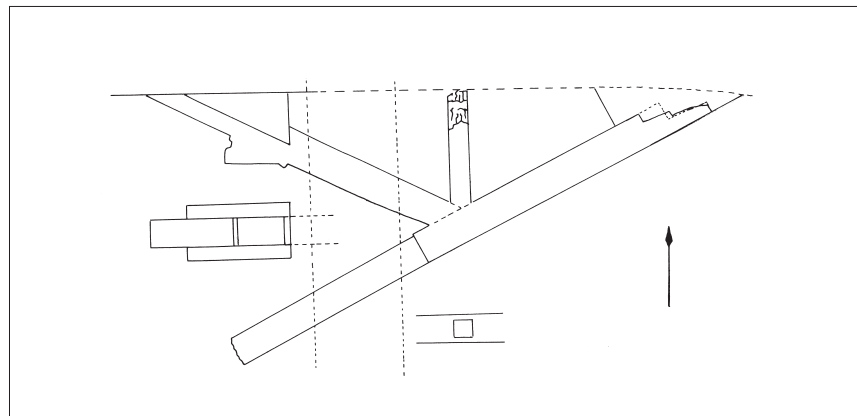


Fig. 6. Trial passages.

However, in 1991, clearance at the southeast corner of the Great Pyramid uncovered the remains of a small satellite pyramid. The ruins of this little ritual pyramid cover over an area of roughly 24 meters square. The remains include fine Tura-quality limestone blocks from the pyramid's outer casing and perimeter foundation, some of which remain *in situ*<sup>30</sup>. What remained of the core of the superstructure as we found it, were two courses of

26. See M. Jones, A. Milward, «Survey of the Temple of Isis. Mistress of the Pyramid at Giza 1980 Season, Main Temple Area», *JSSEA* 12, 1982, 139-151.

27. See the discussion in: Hawass, *Funerary Establishments* I, 47-49.

28. Lehner, *Hetep-heres*, 36.

29. *Ib.*, 39; see discussion on the narrow trench and G I-d in: Hawass, *Funerary Establishments* I, 86-100.

30. Z. Hawass, «The Discovery of the Satellite Pyramid of Khufu (GI-d)», in: *Studies in Honor of William Kelly Simpson*, vol. I (ed. by Peter Der Manuelian), Boston 1996, 379-398.

irregular blocks of crude masonry open to the north and full of debris. The east and south sides had the most preserved foundation slabs and casing blocks of fine Tura-quality limestone.

On the south side of the satellite pyramid was found a large limestone block which had three sloping sides. This block was part of the base of the pyramidion. In 1993, we found the pyramidion that had once topped this base lying on the north side of the pyramid<sup>31</sup> (pl. I.3).

The substructure of the pyramid consisted of an entrance corridor from the north leading to an east-west chamber, too small for a burial. All that was found inside this chamber were several small boulders.

### 4.3. THE RAMP AND THE QUARRY

Lehner hypothesized that the quarry for the core blocks of Khufu's pyramid lay to the south, at a lower level of the plateau<sup>32</sup>. This is indeed where it has been found. This quarry was capable of supplying nicely layered stones suitable for the pyramid's large building blocks. As the pyramid rose, the quarry basin grew deeper.

While relocating the cables of the Sound and Light Show at Giza, we cleared sand north of the paved road leading along the south side of the Great Pyramid to the Sphinx. During this work, we were able to excavate along the courses of the trenches for the cables, and found a large part of the ramp used to carry stones from the quarry to the pyramid base. This part of the ramp consisted of two walls built of stone rubble with *tafla*-mortar. The area in between was filled with sand and gypsum, forming the bulk of the ramp. The length of the west wall is 1.40 m and the existing height is 60 cm.

On the south side of the paved road, south of Khufu's pyramid and at a lower level, we excavated down about 2.50 m and found another part of the ramp. This section is in line with the previously discovered section and is similar in construction. This discovery proves that the ramp led from the quarry to the southwest corner of the pyramid and was made of stone rubble and *tafla*. The ramp rises at an angle of about 65° for about 300 m to the southwest corner of the pyramid, which lies about 30 m above the quarry floor. Ramps would have leaned against the pyramid sides as they rose, rather like accretion layers wrapped around the pyramid with a slipway on top<sup>33</sup> (pl. I.4).

## 5. THE BOATS

(fig. 4)

Five boat-pits have been discovered in the pyramid complex of Khufu. Two of these lie to the south of the pyramid and face east-west, parallel to its southern face. Three are east of the pyramid; two of these lie north-south, parallel to its face and the third lies parallel

31. See Z. Hawass, «The Discovery of the Pyramidion of the Satellite Pyramid of Khufu [GI-d]». With an Appendix by J. Dorner, in: *Iubilae Conlegae. Studies in Memory of Abdel Aziz Sadek*, VA 10/2-3, 1995, 105-121.

32. M. Lehner, «Giza», *AfO* 32, 1985, 136-158.

33. Z. Hawass, «Pyramid Construction. New Evidence Discovered at Giza», in: *Stationen. Beiträge zur Kulturgeschichte Ägyptens*. Rainer Stadelmann gewidmet (ed. by H. Guksch and D. Polz), Mainz 1998, 53-62.

to the causeway at a point several meters from the eastern wall of the upper temple. These pits are cut into the rock of the plateau. The easternmost of the southern pits was found to contain a dismantled full-size wooden boat<sup>34</sup>, which has now been reconstructed; the western of the southern pits also contains a dismantled boat which has yet to be excavated.

There are many theories about the function of these boats pits. J. Černý thought that four of them held ritual boats for carrying the king to the four cardinal points and that the fifth was the boat in which the body of the king was ferried to Giza<sup>35</sup>. A second theory postulated by W.B. Emery and then adopted by S. Hassan suggests that the pits contained solar vessels that carried the king across the heavens<sup>36</sup>.

It is also believed that the boats placed in the pits would have originally been used in the king's afterlife for pilgrimages and other ceremonies<sup>37</sup>. Lehner believes that the southern boats would have been used in the funeral, and that the eastern boat-pits could have held fully assembled barks that were buried for use in the king's chthonic and celestial afterlife. He adds that the cabin of the reconstructed southern boat has no ventilation, whereas travelling boats for the living would have had canopied but open seating areas. Water could have been poured over the mat-covered wooden frame that shielded the cabin to keep the royal body cool. In his opinion, the reed shroud and shrine are similar to those simulated by elaborate niching and painting on archaic mastabas and funerary enclosures. The specialized function of funerary transport for the southern boats fits the evidence that the boat had been used, albeit not very often<sup>38</sup>.

I believe that the boats which would once have been in the two pits which flank the funerary temple were boats used by the king to control the north and the south of Egypt, while the boat parallel to the causeway was linked to the cult of the goddess Hathor. The southern pits contained solar vessels that the king, as the sun-god, used in his daily trips across the sky; this theory is based on the Pyramid Texts, which state that the god Re had two boats in which to travel east and west<sup>39</sup>. There is no evidence that the boat which is now in the museum had ever been used at all, and the shape is not suitable for a funeral.

The southern boat pits may provide additional evidence that Khufu became the sun-god in his lifetime and modified his pyramid complex to accommodate his new cult. The two southern pits are separated by a wall of living rock which is on the north-south axis of the Great Pyramid. The southern shaft in the King's Chamber is located at the central axis of the south face of the pyramid and faces the east-west axis of the two boats<sup>40</sup>. It is widely believed that the air shafts were model corridors through which the soul of the king or the god could travel. The king's soul could have traveled through the northern airshaft to join the northern stars. However, in my opinion, the southern shaft in the king's chamber was provided for Khufu as Re to travel to the day and night boats located to the south of the pyramid. These airshafts occur only in the pyramid of Khufu which is also the only

34. M.Z. Nour, Z. Iskander, M.S. Osman, A.Y. Moustafa, *The Cheops Boats*. Pt. I, Cairo 1960, 7-10; Maragioglio, Rinaldi, *L'Architettura* IV, 70; S. Hassan, *Excavations at Giza*. Vol. X, Cairo 1960, 38; Hawass, *Funerary Establishments* I, 53-85.

35. J. Černý, «A Note on the Recently Discovered Boat of Cheops», *JEA* 41, 1955, 77-78.

36. Hassan, *Giza* VI, 40-55.

37. A.M. Abubaker, A.Y. Mustafa, «The Funerary Boat of Khufu», in: *Aufsätze zum 70. Geb. von Herbert Ricke, BeitrBf.* 12, 1971, 12-16.

38. M. Lehner's theory in Z. Hawass, M. Lehner, *Giza and the Pyramids*, London (forthcoming).

39. Hawass, *Funerary Establishments* I, 81.

40. *Ib.*, 82.

pyramid – along with that of Khafre – to be associated with five boat-pits, thereby strengthening the link between the shafts and the cult of Khufu.

The two boats that flank the upper temple were cut before the change in Khufu's cult in year 5 of his reign (see above). Since the ramp from the southern quarry to the pyramid site blocked the south side of the pyramid during its construction period<sup>41</sup>, the southern boat-pits could either have been begun by Khufu after the ramp had been removed and finished off by Djedefre after his father's death, or have been built completely during the reign of Djedefre. The theory that the pits had been planned and started by Khufu and completed by his son may be preferable, since Khufu was the one responsible for designing his own cult.

The Abusir Papyri refer specifically to two boats connected with the upper temple of Neferirkare: *wjḥ mḥt*, the northern boat, and *wjḥ rśj*, the southern boat<sup>42</sup>. It is not clear whether these terms refer to the northern and southern boats of the temple or to the northern and southern boats for the king as ruler of Upper and Lower Egypt. However, it seems that these two boats had the same function as the two eastern boats of Khufu because the latter have a north-south alignment. The papyri refer to the inspection of the boats and mention damage that was incurred by one of them<sup>43</sup>. The report implies that the boats in the funerary establishments were inspected daily during the 5th Dynasty, perhaps to assure that they were there so that the king could use them. These inspections were carried out by the temple staff<sup>44</sup>.

It is likely that the fifth boat-pit located to the north of the causeway is connected with the cult of Hathor, as referred to in the Abusir Papyri, especially since Hathor<sup>45</sup> was one of the goddesses in the triad worshipped within the pyramid complex (pls. II.5-6).

## 6. THE WORKSHOPS

(fig. 7)

The workshops associated with each pyramid complex would first have been used to produce tools for pyramid-building. After this phase, they would have manufactured implements for the cult of the king and fed the people in charge of the cult.

Lehner suggests that the mortuary workshops in the Khufu complex were located next to his putative palace (see below), attached to its south and west sides<sup>46</sup>. It is hard to imagine that bustling, noisy workshops would be located so close to the place where the king and his retinue lived.

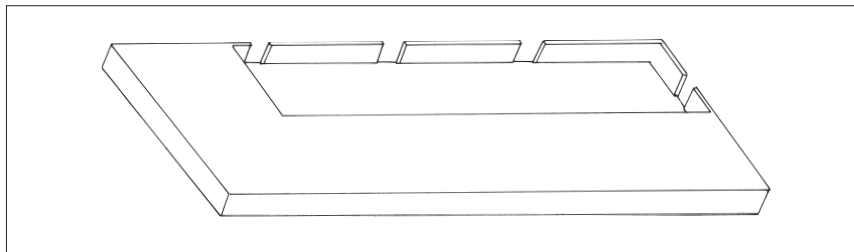


Fig. 7.

41. Lehner, *MDAIK* 41, 1985, 108.

42. P. Posener-Kriéger, *Les archives du temple funéraire de Néferirkare-Kakai*. Les papyrus d'Abousir. Traduction et commentaire. Vol. II, *BdE* 65/2, 1976, 430, 437, 509.

43. *Ib.*, 509.

44. *Ib.*, 512–514.

45. See discussion in Hawass, *Funerary Establishments* II, 424–557.

46. Lehner, *MDAIK* 41, 1985, 120, figs. 32 and 33.

Recent excavations carried out by myself and Lehner in the galleries west of the second pyramid (called by Petrie the "workmen's barracks") indicate that Khafre's workshops were located in this area. The workshops of Menkaure are most likely to be identified with an area south of the causeway of Menkaure excavated by A.-A. Saleh; this has been convincingly identified as an industrial community<sup>47</sup>.

The remains of embankments similar to those found by Saleh around the pyramid of Menkaure have been uncovered by the Department of Antiquities east of the pyramid, south of Reisner's G 7000 in the Eastern Cemetery, and north of the modern paved road that runs from Khufu's pyramid down to the valley<sup>48</sup>. These are probably the traces of the workshop community of Khufu. The embankments run north-south, parallel to each other, for a distance of 80 m and over an area of 5.40 to 5.70 m. They are built of stone blocks and mud mortar; each of the two main walls is about 2.50 m wide and 2.30 m high. A cross wall, about 10-21 m in length, was built against these embankments; mud seals inscribed with the name of Khufu were found in the debris around the walls<sup>49</sup>. Mudbrick remains, probably belonging to this complex, were also found during the construction of the paved road which runs north of the Sphinx. These remains were never recorded or published.

## 7. THE CAUSEWAY

(fig. 8)

The only visible remains of Khufu's causeway which survive today consist of blocks of fine Tura limestone lying at the foot of the Giza plateau, about 250-270 m from the upper temple of Khufu. Over the years, a number of scholars have carried out studies attempting to reconstruct the course of this causeway. G. Goyon began his work at the foot of the cliff that limits the Giza Plateau where a spur, known as the Senn el-Agouz, runs out into the valley. He continued into an area within the village that was free of houses, about 20 m from the highest stone visible at the end of the plateau<sup>50</sup>.

In the course of his work, Goyon found part of the original foundations of the causeway, consisting of twenty-two courses of limestone blocks of various sizes from Tura<sup>51</sup> (pl. II.7). He calculated the length of the causeway from the foot of the Great Pyramid to the lower temple to be 658.60 m and believed that it ran in one direction (150° north of east) from beginning to end<sup>52</sup>.

J.-Ph. Lauer also attempted to trace the remains of the causeway and produced a plan which shows it starting at the east face of the upper temple at an angle of 40° north of east, running for about 80 m, disappearing for about 130 m, then reappearing. According to Lauer, the causeway changes direction at the Senn el-Agouz<sup>53</sup>.

47. See discussion in Hawass, *Funerary Establishments* I, 391-398; A.A. Saleh, «Excavations Around Mycerinus Pyramid Complex», *MDAIK* 30, 1974, 137.

48. Saleh, *MDAIK* 30, 1974, 138.

49. *Ib.*, 137.

50. G. Goyon, «La chaussée monumentale et le tem-

ple de la vallée de la pyramide de Khéops», *BIFAO* 67, 1969, 49-69.

51. *Ib.*, 55-63.

52. *Ib.*, 61-62.

53. Lauer, *ASAE* 46, 1947, 246-248.

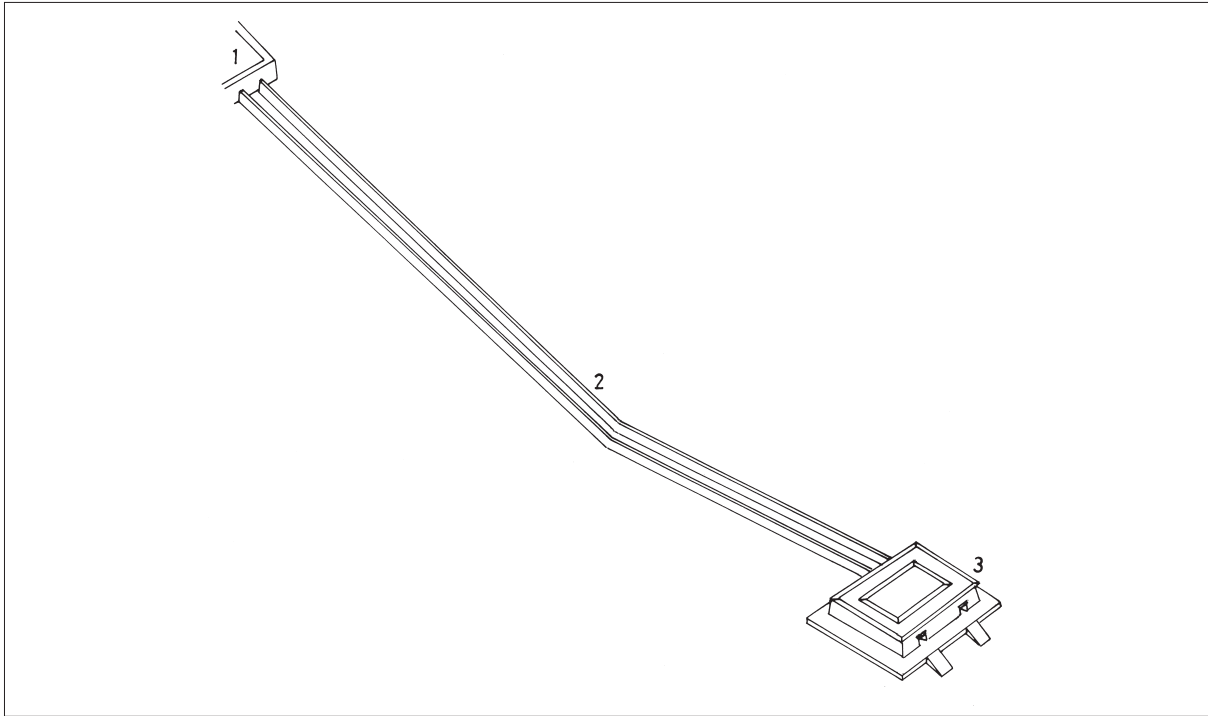


Fig. 8. Legend: 1: upper temple, 2: causeway, 3: lower temple.

A new sewage system was installed in Nazlet el-Semman in the early 1990s, this work was carried out by a British-American consortium, AMBRIC, and monitored by archaeologists from the Giza Pyramids Inspectorate in co-operation with Michael Jones. We recorded the *in situ* blocks of the causeway that turned up in the course of the trenching for the sewage construction and were able to plot the route of the causeway for its entire length (pl. II.8).

We found that the causeway leads off from the upper temple in a straight line at an angle of  $14^{\circ}$  north of east. The major discovery regarding the causeway was that in what is now Abdel-Hamid el-Wastani Street, the causeway turns  $32^{\circ}$  to the north of its original direction and from there continues an additional 125 m to the lower temple. Based on this, it was possible to estimate that the overall length of Khufu's causeway from the upper temple was approximately 825 m.

While this work was in progress, a fragment of the south wall of the massive limestone embankment constructed to support the causeway east of the Senn el-Agouz came to light on Khaled Ibn el-Walid Street. This is the first time that a clear view of the south side of the embankment had been drawn and photographed, although a considerable part of the north side remains exposed at the end of the Senn el-Agouz. Khufu's causeway was originally roofed and depicted many scenes that show the king smiting his enemies, processions of his estates, and offering scenes<sup>54</sup> (pl. III.9).

54. Z. Hawass, «The Programs of the Royal Funerary Complexes of the Fourth Dynasty», in: *Ancient Egyptian Kingship* (ed. by D. O'Connor and D.P. Silverman), *PA* 9, 1995, 226-227.

## 7.1 THE TUNNEL UNDER THE CAUSEWAY (fig. 4)

At a point 135 m away from the upper temple, a tunnel, 1.57 m wide, passes under the causeway. This leaves a ceiling of bedrock 1.20 m thick for a distance of 10.15 m. Including the open trenches that lead down under the causeway, the tunnel is 33.85 m long. There are two pairs of holes about 25 cm square in the walls of the southern trench; those on the west have cuttings that allowed wooden beams to be slid into place. These features suggest stones may have been dragged through the tunnel under the causeway after its construction made it impossible to carry material across it<sup>55</sup>. It is believed that this passage would also have been used by funerary personnel to cross from one side to the other without having to walk all the way around the causeway<sup>56</sup>.

To the north of the causeway, facing this tunnel, are unshaped blocks of limestone, resembling stairs, which go down the cliff from the top of the plateau. No one has tried to understand the relationship between this "stairway" and the tunnel under the causeway. Perhaps these were connected with the nobles' tombs in the eastern field, located to the immediate south of the causeway. This cemetery was inaugurated in year 12 of Khufu's reign and continued after Khufu's death. Therefore, I believe that the stones came across from Tura via the harbor and were then carried up to the plateau via these stairs (pl. III.10).

## 8. THE LOWER TEMPLE (fig. 8)

The location of the lower temple of the Great Pyramid of Khufu has been a matter of speculation ever since serious interest in the Giza pyramids began<sup>57</sup>. The early maps produced of this area from the eighteenth and nineteenth centuries show traces of the lower part of the causeway still clearly visible on the contemporary ground surface, with a conspicuous change in direction toward the eastern end.

However, there had never been any sign of the site of the lower temple. The assumption was that by the modern era, anything that survived had been buried and its location lost to posterity. In more recent times, the expansion of Nazlet el-Semman and surrounding villages from small hamlets at the edge of the Nile Valley to the suburbs of Cairo has made it increasingly apparent that whatever was left of these monuments was irretrievably lost beneath the urban sprawl<sup>58</sup>.

During March 1990, a black-green basalt pavement was discovered during the construction of the sewage system of the village located at the foot of Khufu's pyramid. The excavation trenches opened for this drainage project in the streets of Nazlet el-Semman provided an unprecedented opportunity to examine the remains of monuments belonging

55. Hawass, Lehner, *Giza and the Pyramids* (forthcoming).

56. A. Fakhry, *The Pyramids*, Chicago/London 1961, 104.

57. See discussion on the previous work in Hassan, *Giza* X, 17; Maragioglio, Rinaldi, *L'Architettura* IV, 68; Lauer, *ASAE* 46, 1947, 259; Goyon, *BIFAO* 67,

1969, 50; H. Messihe, «The Valley Temple of Khufu (Cheops)», *ASAE* 55, 1983, 13; Fakhry, *Pyramids*, 135; A. Badawy, *A History of Egyptian Architecture*. Vol. I, Lawrence 1954, 97.

58. Hawass, in: *Kingship*, 224; see also Worden 1757, pl. XLIII; Perring 1839; Vyse 1842; Jacotin 1822, pl. 6; Lepsius 1849-1859, fig. 1, pl. 14.

to the lower level of Khufu's pyramid complex at a number of points comprising parts of the causeway, as well as the remains of a building that may be identified as his lower temple<sup>59</sup>.

The levels of the black-green blocks that were discovered ranged between 14.20-14 m above sea level and 4.50 m below the present ground level. The basalt pavement was neither continuous nor complete. Removal of blocks in antiquity had reduced the original layout, although some of the apparent gaps in the pavement may indicate the positions of dividing walls, either of mudbricks or stone, which in their turn were either destroyed or intentionally dismantled. The overlying strata of pure Nile alluvial silt sealed the basalt blocks in their current condition and extended as far as the foundation of modern Mansuriyah Street (pl. III.11).

There were no cultural inclusions noted in this material – only very rare specks of limestone (natural) and no indication that pits or trenches had been cut through the silt to extract blocks. This makes it safe to assume that the destruction was of ancient date. There was further evidence of this present in the form of one typically Roman amphora sherd.

At the southern edge of the basalt blocks, archaeological excavation revealed part of a mudbrick wall, possibly as much as 8 m wide. Five additional test trenches dug on the west side of the original trench gave further valuable details about the configuration of the basalt blocks<sup>60</sup>.

Additional confirmation of the mudbrick work at the southern end of the site was supplied by careful excavation in the southern test trench. The monumental building discovered here is certainly to be interpreted as the lower temple of Khufu's pyramid. Unfortunately, it is impossible to complete the plan of the temple because its eastern side is located under a modern house in the village, though at least the temple length has been recorded, as has its location<sup>61</sup>.

## 9. THE PYRAMID CITIES OF KHUFU AND KHAFA

The archaeological remains from the reign of Snefru indicate that his pyramid city was located at the foot of the lower temple. This is also the case for the pyramid cities of Menkaure and Khentkawes. Thus, the location of the pyramid cities of Khufu and Khafra should also be at the foot of their lower temples<sup>62</sup>. However, there are no archaeological remains that are directly identifiable as remnants of either Khufu's or Khafra's pyramid cities.

Reisner was the first to suggest that Khufu's pyramid city should be looked for under the modern village of Nazlet el-Semman, near the conjectural location of Khufu's lower

59. Hawass, *op.cit.*

60. *Ib.*, 225.

61. *Ib.* I would like to thank Michael Jones for his cooperation and work with us. The basalt blocks that were found in the trench were collected and saved in a square in the middle of the main street. People in the

future must know the location of the temple because it was impossible to stop the waste water project and excavate the whole site.

62. R. Stadelmann, «La ville de pyramide à l'Ancien Empire», *RdE* 33, 1981, 68-70.



temple<sup>63</sup>. Stadelmann agrees with this hypothesis, and suggests that the original settlement was located northeast of the lower temple<sup>64</sup>. This is indeed the likeliest location for the pyramid city, because of the evidence of the location of the pyramid cities during early and late Dynasty 4. The presence of a modern village currently makes excavation of this area impossible.

However, excavations in the only area that is empty of modern houses, on a mound located east of the cliff of the eastern field of Khufu's cemetery and south of the location of Khufu's lower temple, have uncovered remains of a Graeco-Roman settlement. It is possible that this is ancient Busiris and lies on top of part of the Old Kingdom pyramid city of Khufu. This is based on an excavation that was carried out in 1978 in the area of Nazlet el-Semman in an effort to locate settlement remains that might be linked with the pyramid cities of Khufu or Khafre or a palace belonging to either or both kings<sup>65</sup>. In this area, three squares were opened which went down about 12 m to solid rock. In these squares were found late Roman sherds, including many neck, handle, and conical base pieces of dull brown amphorae. Evidence from the two squares at the center of the mound points to the possible existence of the Graeco-Roman village, Busiris, that existed at Giza.

There is also evidence of a New Kingdom settlement nearby at el-Harania. This name may derive from the Canaanite name for the Sphinx, Haroun, and may indicate that Canaanites settled around here, near the Sphinx during the reign of Amenhotep II and gave their name to the location. The Greek and Roman settlement, as well as the New Kingdom settlements, open up the prospect that there was also Old and Middle Kingdom occupation in the area. It is here that vestiges of the pyramid city of Khufu, and other remnants of the little-known 4th Dynasty, are likely to be recovered. If the settlement existed in the New Kingdom and the Late Period, then the Old Kingdom pyramid city could have started at the foot of the lower temple and extended south in later periods.

There are many scholars who have tried to identify the location of Khafra's pyramid city. U. Hölscher found remains of a building in the vicinity of Khafra's lower temple and believed that this building represented part of the pyramid city<sup>66</sup>. This building and its location, directly south of the lower temple, can be identified with something else, and I do not see it as part of the pyramid city. Stadelmann suggests that the pyramid city of Khafra was located south of the causeway and the lower temple, based on the name of *tn ršj*<sup>67</sup>. Lehner follows Stadelmann and postulates a large-scale settlement located south of the boundary wall (the wall of the Crow); he also identified that with *tn ršj*<sup>68</sup>.

This identification by both scholars is implausible because *tn ršj* is identified with the funerary domain<sup>69</sup>. It is not possible that a settlement could have existed south of the boundary wall because the boundary was built in the time of Khafra to separate the pyramid city that lay to the north, near the lower temple, as indicated by the 4th Dynasty archaeological remains of the workmen's camp lying to the south.

63. Reisner, *Giza I*, 26.

64. Stadelmann, *RdE* 33, 1981, 71-72.

65. The results of this excavation will soon be published.

66. U. Hölscher, *Das Grabdenkmal des Königs*

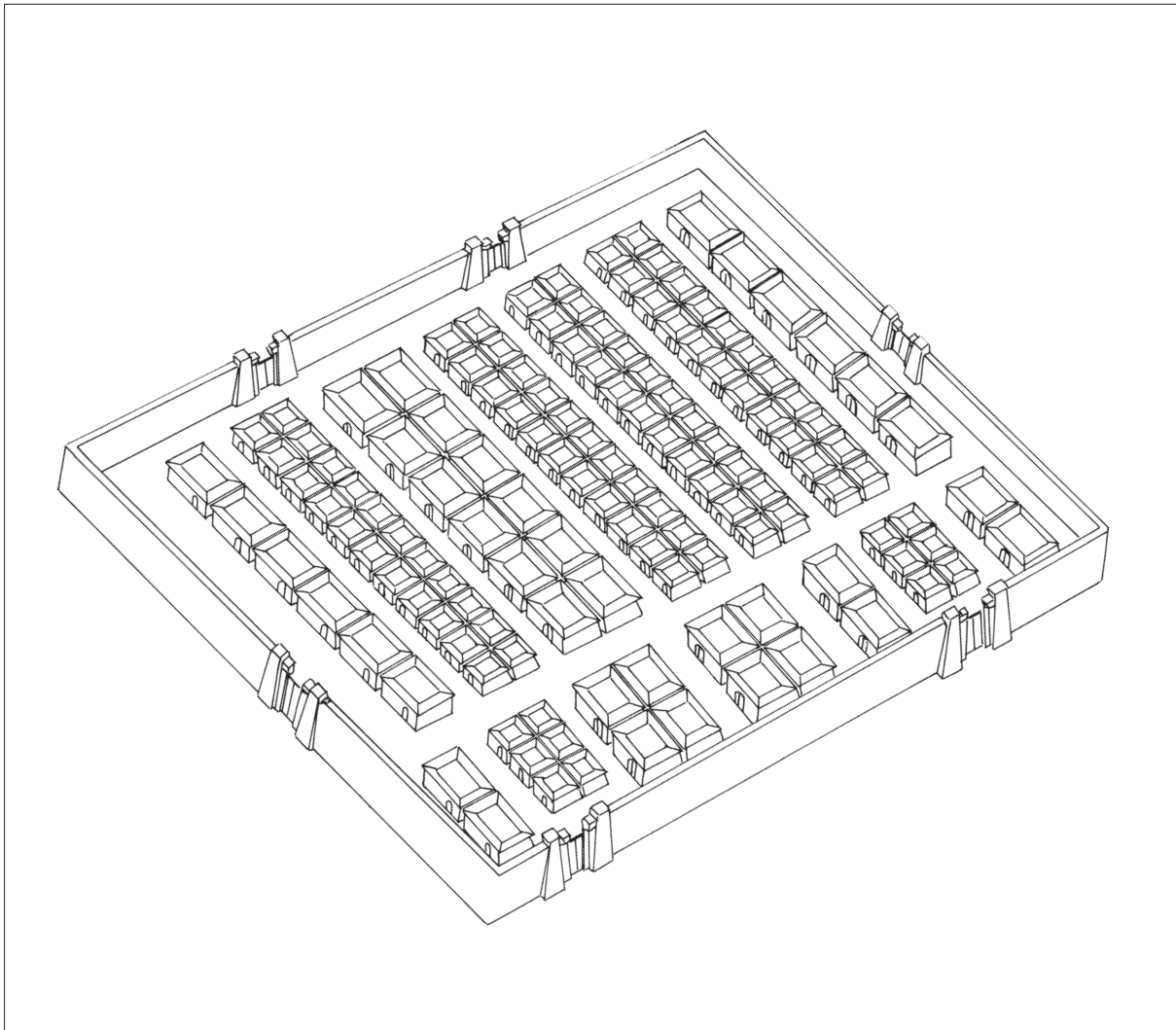
*Chephren. Sieglin Exp.* Vol. 1, 1912, 14-15.

67. Stadelmann, *RdE* 33, 1981, 72.

68. Lehner, *Hetep-heres*, 17.

69. Hawass, *Funerary Establishments I*, 326-328.

A stele found close to the lower temple near the site of the building excavated by Hölscher reads: “a gift that the king gives and Anubis who is upon this mountain, to the chief of the pyramid city ‘How Great is Khafra’”<sup>70</sup>. This stele shows that there was an overseer of the pyramid city of Khafra, separate from Khufu. The exact location of this original settlement was likeliest to have been in front of the east façade of the temple, east of the temple terrace and east of the hypothetical canal that fronted the two temple entrances. The plan of the Old Kingdom funerary city of Queen Khentkawes<sup>71</sup> is the best layout that can be used to project the plans of the city of Khafra and Khufu (figs. 9-10).



**Fig. 9.** *The pyramid city.*

The pyramid city has the same name as the Great Pyramid, and the title of the person who used to watch over the city was the *jmj-r³ njwt ³ht-Ḥwfw*. I believe that the city

<sup>70</sup>. G. Steindorff in: Hölscher, *Chephren*, 114, fig. 165. <sup>71</sup>. Hassan, *Giza IV*, pl.16.1.

functioned until the end of the Old Kingdom and part of this city doubled as the administration town of the government.

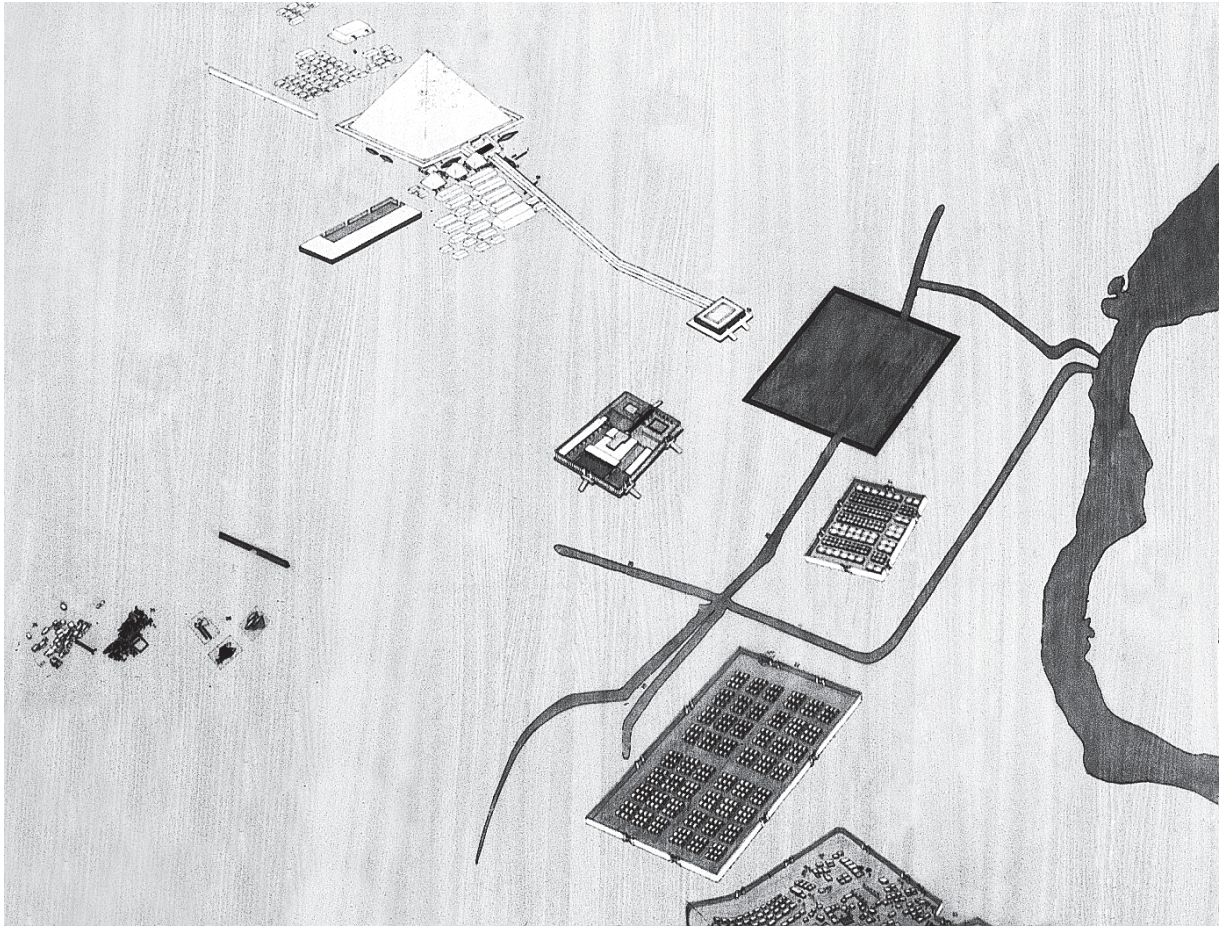


Fig. 10.

## 10. THE KING'S PALACE

(fig. 11)

There is little archaeological evidence found at Giza to prove the existence of the palace of Khufu. However, a few limestone blocks were found during the construction of the sewage system in the village of Nazlet el-Semman, and I believe that this could be the remains of the palace. The blocks were found south of the valley temple. There is much evidence to suggest that the king's residence was the pyramid site, and that Memphis (now Mit Rahina) was the primarily important as the location of the temple of the god Ptah; thus the palace of the king would have been at Giza, and this is a likely place for such a structure.

The excavation of the British expedition to Mit Rahina has not uncovered any settlement evidence from the Old Kingdom. They did, however, find evidence through their survey at North Saqqara of the Early Dynastic capital of Egypt, known as *inb-ḥd*. Thus the most ancient capital of a united land was close to an important necropolis of the period. The

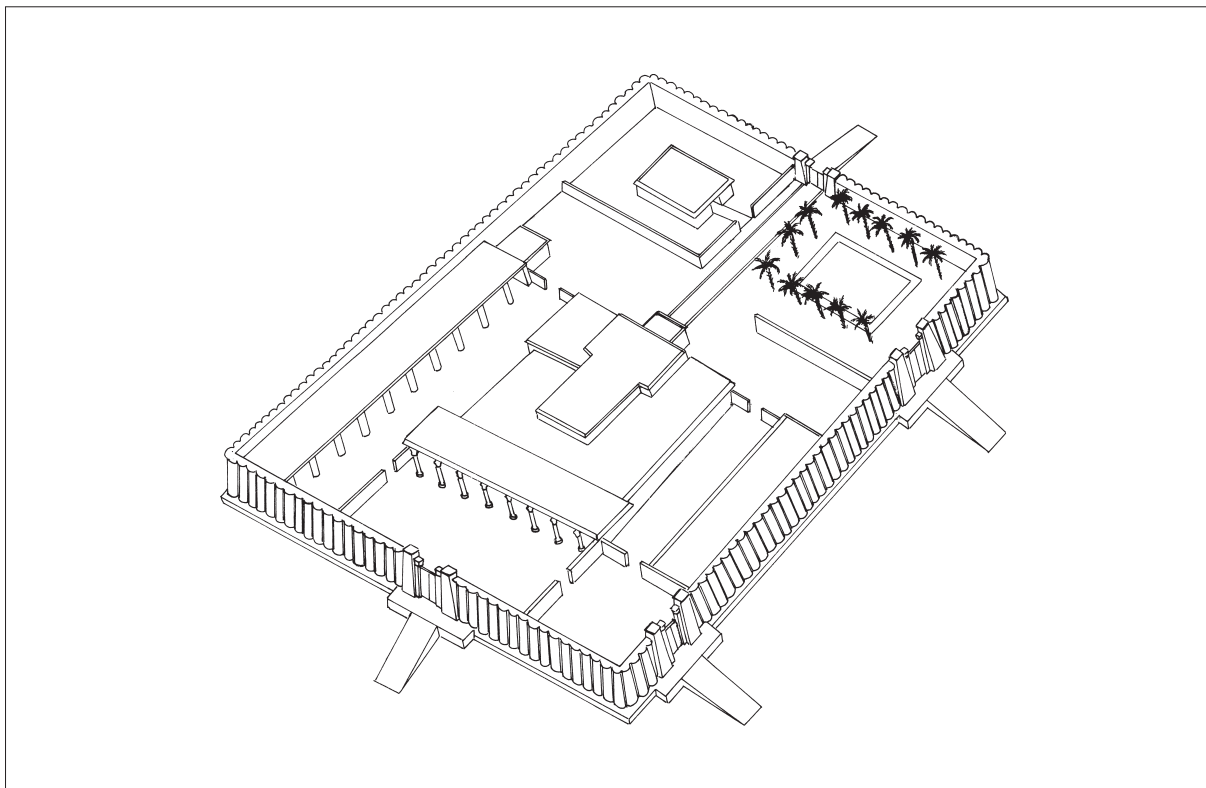


Fig. 11. The palace.

discovery of the large Old Kingdom settlement at the foot of the desert at Giza proves that the administrative city was located near the pyramid. In addition, an inscription in the tomb of Senedjemib at Giza mentions that King Djedkare-Issisi used to live in a palace at his pyramid site. In Dynasty 12, the capital of Egypt was moved to be near the pyramid of Amenemhet I at Lisht, further evidence that the location of the king's palace would have been near the pyramid, because the pyramid was the principal national project of each reign.

There are titles connected with the *ḥ*-palace in the Old Kingdom, such as *Nswt-nfr* who was the *jmj-r3 ḥj.f-rḥ*, and bore the title *hrp ḥ*, 'Director of the Palace'. The tomb of Nefer also contains the title *hrp ḥ*<sup>72</sup>.

Therefore, a palace should most likely be reconstructed near the lower temple, at the site where the limestone blocks were uncovered.

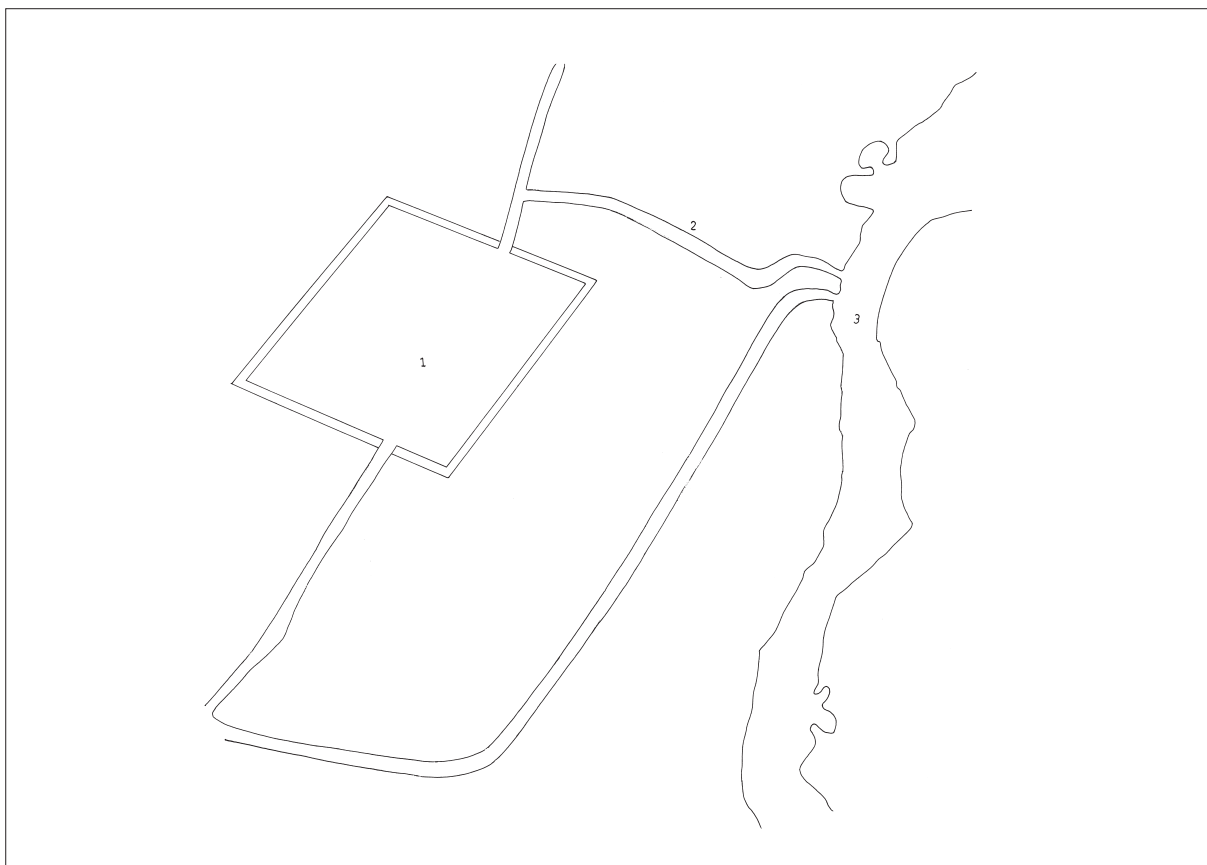
## 11. THE HARBOR

(figs. 10-12)

During the construction of modern houses on Saad Zaghloul Street in Nazlet el-Sessi, a wall constructed of limestone and topped by basalt was found. It is located about 450 m to the east of the Bahr el-Lebini and about 550 m from the causeway; it lies about 2 m

72. See the discussion in Hawass, *Funerary Establishments* I, 352-366, and for the palace: Hawass in: *Stationen*, 61-62; see also H.S. Smith, D.G. Jeffreys, «The North Saqqâra Temple-Town Survey: Preliminary Report for 1976/77», *JEA* 64, 1978, 10-21; H.S. Smith, D.G. Jeffreys, J. Malek, «The Survey of Memphis, 1981», *JEA* 69, 1983, 30-42; *ead.*, «The Survey of Memphis, 1982», *JEA* 70, 1984, 23-32.

below the surface at about 15 m above sea level. This general level matches the level of the basalt blocks that probably mark the location of Khufu's lower temple and the level of the bottom of the boundary wall, the Wall of the Crow, or Heit el-Ghourab, south of the Sphinx. The entire width of this basalt wall has been uncovered across a modern lot that measure about 65 m in a north-south direction. The basalt blocks found are irregular trapezoidal shapes, varying in size, about 60 cm wide and more than a meter in length<sup>73</sup>.



**Fig. 12.** Legend: 1: Harbor, 2: Canal, 3: Bahr el-Lebini

The wall is located east of a subtle-yet-wide-depression that extends from the location where the basalt blocks of Khufu's lower temple were discovered beside the Mansoureyah Canal. This broad low area is defined by a contour line 18 m above sea level. We should note that the floor within this area is 17.80 m to 17.90 m above sea level, higher than the valley floor where the wall was found. The drop of 60 m to 70 m corresponds to the level on Zaghoul Street. The area in question could be a residual depression from a harbor excavated out of land that was still low desert in Dynasty 4. This hypothetical harbor might have filled with drift sand, leaving a slight telltale depression, more inclined than the floodplain, just to the east of where the wall was found. While certainly not a breakwater wall, this ancient construction could have been used to delimit the Khufu harbor on the east<sup>74</sup>.

73. Z. Hawass, «The Discovery of the Harbors of Khufu and Khafre at Giza», in: *Etudes sur l'Ancien Empire et la nécropole des Saqqâra dédiées à Jean-*

*Philippe Lauer* (ed. by C. Berger and B. Mathieu), *OrMonsp IX*, 1997, 245-256.

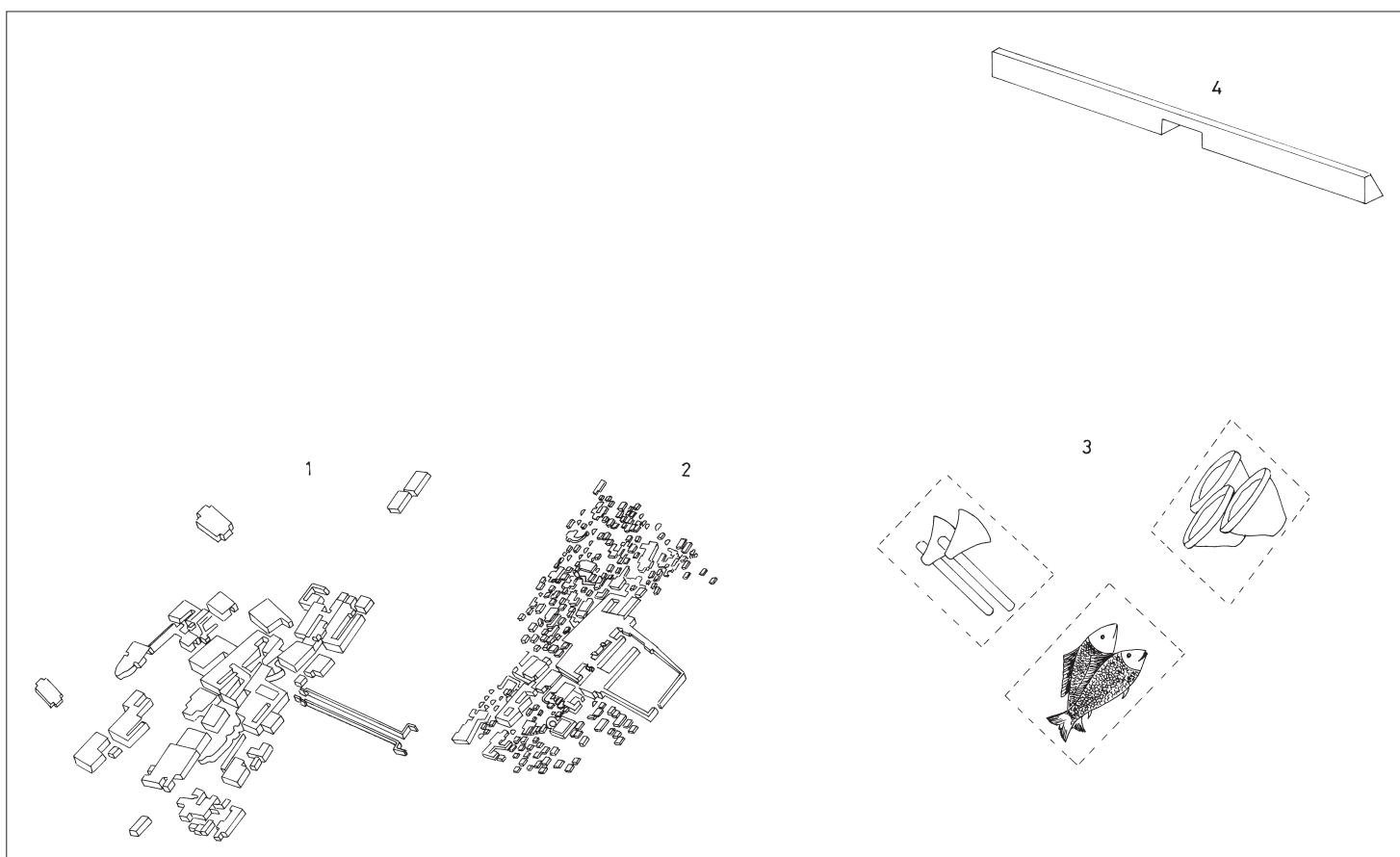
74 *Ib.*, 245-256.

The harbor was connected to the east by a canal to Bahr el-Lebini, the location of the old canal that was cut to the west and parallel to the river Nile. The old canal had been dug from Meidum in the south to Abu Rawash in the north. There was also a canal dug to the west of the harbor to be connected with the lower temple (pl. III.12).

## 12. THE WORKMEN'S COMMUNITY

The ancient Egyptians designated a workmen's area before the beginning of the construction of the pyramid. The 'overseer of all the king's work' would have ordered a wall built to partition off the area between the royal pyramids and the workmen's community. This wall, which survives to a height of about 10 m and is about 200 m long, is known nowadays as the Heit el-Ghourab. The available evidence suggests that this wall was built during the reign of Khufu.

To the south of the wall, many important archaeological discoveries were made, including two cemeteries containing tombs of the workmen. The lower cemetery was for the workmen who moved the stones. Their tombs were built of mudbrick supplemented by stones left over from the construction of the pyramids and are in various shapes and styles. The upper cemetery was for the artisans, people bearing titles such as draftsmen, tomb-builder, sculptors, overseer of the side of the pyramid, overseer of the one who stands behind the officials, overseer of the craftsmen, overseer of the workmen who drag the stones, overseer of the linen, overseer of the harbor and, the most recently discovered, overseer of the administrative district. These tombs were built of mudbrick and stone but are larger and more complex than those in the lower cemetery (fig. 13).



**Fig. 13.** Legend: 1: Artisans' tombs, 2: Workmen's tomb, 3: Workmen's installation, 4: Heit-el Ghourab.

We also found tombs in this cemetery which mirror the pyramid complex. We discovered one tomb which is fronted by a “causeway” on the east, built of stone rubble and mud, which bends as it reaches its lower end, echoing the causeway in the complex of Khufu. At the end of this causeway was found a basin which could correspond to the lower temple of the royal complex. A number of interesting and unusual sculptures representing some of the owners of these tombs have been discovered in this necropolis<sup>75</sup> (pl. IV.13-14).

To the east of these tombs, Lehner has found an institutional area, where he has discovered bakeries, copper-making workshops, an area for sorting salted fish or cafeteria<sup>76</sup>, galleries for the accommodation of the workmen, houses for the overseers and evidence that approximately eleven cattle and thirty-three goats were slaughtered each day (yielding 200-300 pounds), suggesting that 10,000 workmen could have been provided with meat daily (pl. IV.15).

During the construction of the sewage system under Nazlet el-Samman, evidence for a settlement extending along the desert fringe for about 6 km was recorded. I believe that this settlement consisted of a camp for the workmen who were buried in the lower cemetery and those workmen who lived at Giza on a temporary basis, having been sent by their households to participate in building the pyramids. The second village was a settlement for artisans who were employed by the king<sup>77</sup> (fig. 14).

### 13. THE ESTATE

The funerary estate, also known as the funerary domain or farm, was set up by the king before his death. The funerary domain would have been located on the floodplain; therefore it is impossible to find any archaeological record of it. The estate produced agricultural and animal products. My study of the titles of the personnel of the cults of the Giza kings suggests that the funerary estates were known as *grgt* and *tn*, and that both terms refer to agricultural estates connected with the royal cult. Their products, and those of more remote estates, were delivered to the *r-š* (see below), which allocated them to the funerary establishment or to the palace<sup>78</sup>.

### 14. THE *r-š*

The area between the harbor and the lower temple can tentatively be identified as the site of the *r-š*<sup>79</sup>. H. Goedicke discusses this term in his analysis of the text of the decree of Pepi I at Dahshur, which mentions that the personnel of the *r-š* of Ikauhor's pyramid were

75. See Z. Hawass, *Archaeology* 50, 1997, 39-43; *id.*, «A Group of Unique Statues Discovered at Giza. I. Statues of the Overseers of the Pyramid Builders», in: *Kunst des Alten Reiches*. Symposium Kairo 1991, *SDAIK* 28, 1995, 91-95, and *id.*, «A Group of Unique Statues Discovered at Giza. II. An Unfinished Reserve

Head and a Statuette of an Overseer», *op.cit.*, 97-101.

76. A. Chazan, M. Lehner, *Paléorient* 1612, 1990, 21-35. Hawass, *Archaeology* 50, 1997, 31-38.

77. Hawass, in: *Stationen*, 60-62.

78. Hawass, *Funerary Establishments* I, 323-336.

79. *Ib.*

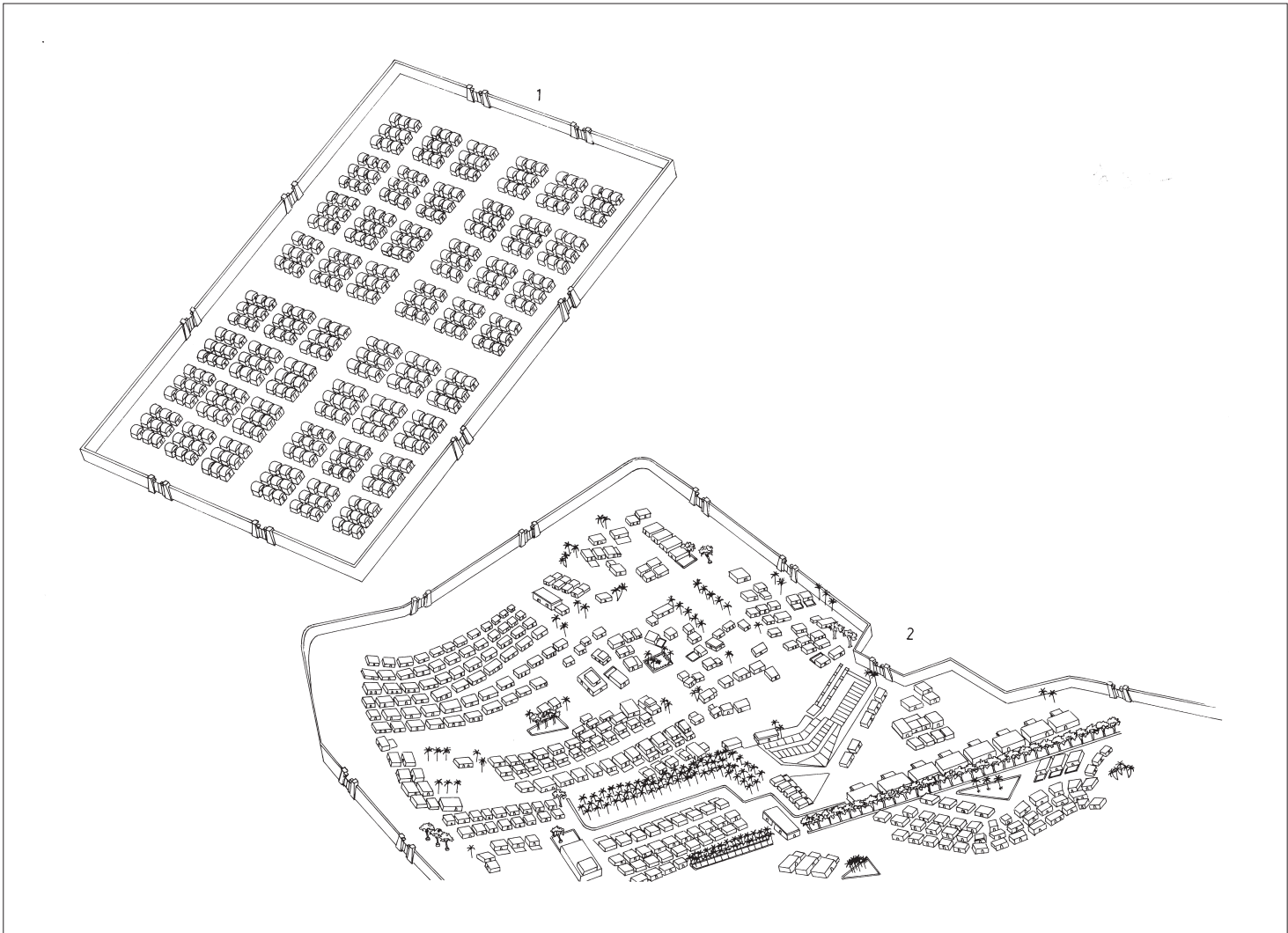


Fig. 14. 1: Artisans' village; 2: Workmens' Carro.

brought to the city of these two pyramids to do irrigation work<sup>80</sup>. The hypothesis that the *r-š* could have been the lower temple area seems to have developed through the meaning of *r-š* as “the mouth of the pool”. Since the lower temple lies near the harbor, this seems a reasonable hypothesis.

P. Posener-Kriéger does not agree with this identification because her study of the Abusir papyri indicated that *r-š* had been the only major economic unit for king Neferirkare, and that this economic unit had a link with both the solar temple and the residence<sup>81</sup>. The *r-š* Khufu is mentioned in the papyri as a domain unit because of the delivery of goods from it<sup>82</sup>. This point is very important as it clarifies the function of the *r-š* of Khufu. Stadelmann also believes that this term might refer to the entire pyramid complex, because

80. H. Goedicke, *Königliche Dokumente aus dem Alten Reich.*, *ÄA* 14, 1967, 56-59.

81. Posener-Kriéger, *Archives* II, 618.

82. *Ib.*, 304-305



it is located before the harbor and canal<sup>83</sup>. Therefore, I believe that the area in front of the valley temple is the *r-š*<sup>84</sup>.

## CONCLUSION

There are 12 architectural components in Khufu's pyramid complex that have been identified based on archaeological evidence. The only two components whose locations are hypothetical are the estate and the *r-š*. These components helped maintain the cult of the king and each component had its own function. The foregoing discussion elucidates the form and function of Khufu's pyramid complex, and the way Giza looked upon Khufu's death in the year 2528 B.C. (fig. 10). It also shows that the complete repertoire of architectural components of the pyramid complex underwent considerable development during the reign of Khufu.

**83.** R. Stadelmann, «Die *hntjw-š*, der Königsbezirk *š n pr-š* und die Namen der Grabanlagen der Frühzeit», *Bulletin du Centenaire* (= Suppl. au *BIFAO* 81, 1981), 1981, 153-164.

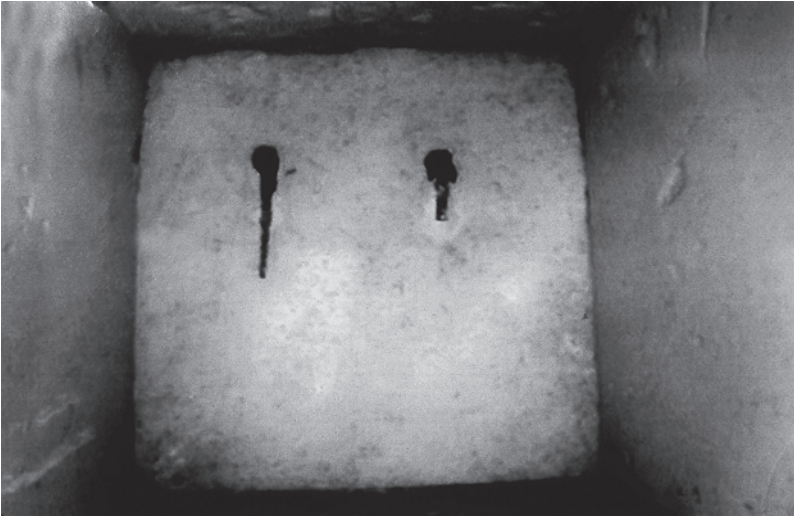
**84.** The excavation in front of the valley temple of Khafre showed that this area is the *r-š*; this work will

be published soon; Z. Hawass, *Funerary Establishments* I, 84-85. For more evidence on this theory, see *id.*, «The Great Sphinx: Date and Function», in: *Proceedings of the Sixth International Congress of Egyptologists*. Vol. II, Turin, 1993, 177-195.

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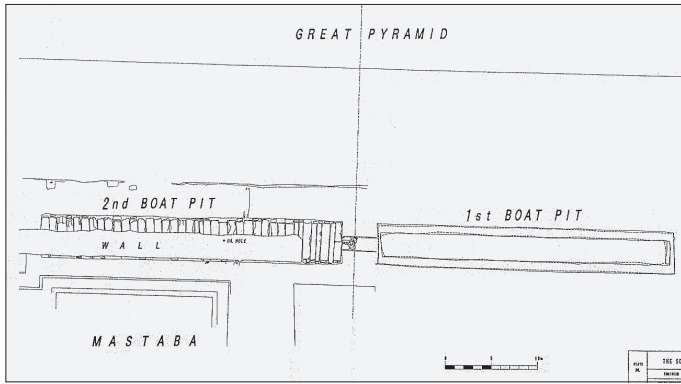


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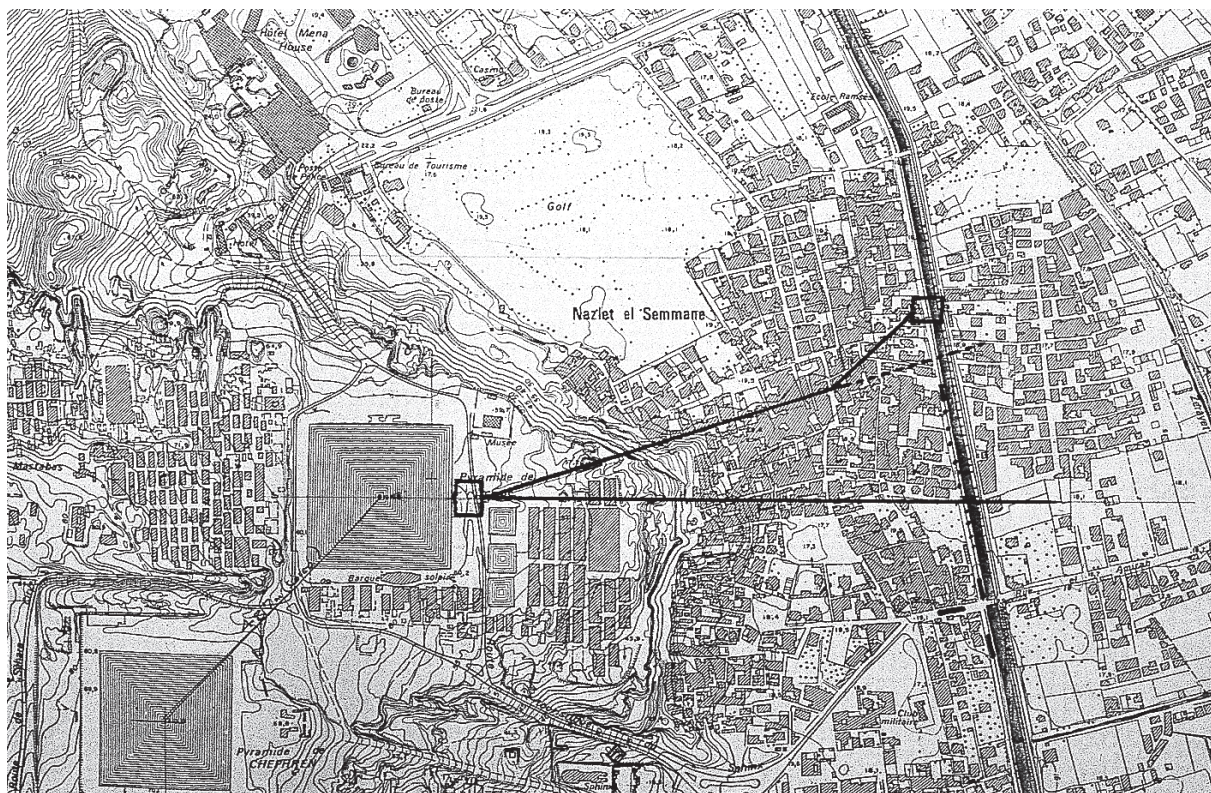
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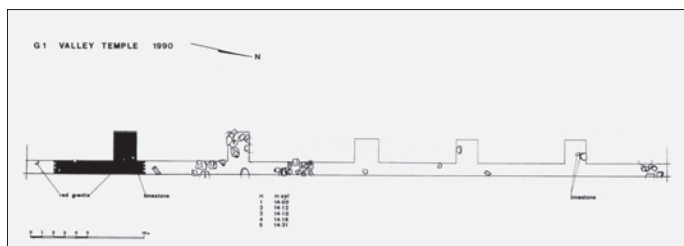


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