The Great Pit of Abu-Rawash

A layman's Guide

Keith Hamilton 02 May 2018

This early depiction of Abu-Rawash, above (S.W.angle) is from Perring's *'Pyramids of Gizeh, part III, 1842.*

It could be said that Perring was the first to make some observations on the ruins of Abu-Rawash, and in his report he gives a brief description along with some further drawings. Petrie would later visit the site and add a few notes; but more detailed excavations would wait till the start of the twentieth century, when Chassinat excavated part of the temple on the ruins eastern side. About a decade later Lacau would resume excavation in the temple area, though according to Verner, *"Apart from brief reports, however, neither of these researchers published a comprehensive account of the results of their investigations."*[1]

A more detailed view of the site would have to wait until the arrival of Maragioglio and Rinaldi (M&R)[2] in the 1960's.

[1] The Pyramids, Miroslav Verner, pg 218
[2] L'Architettura Delle Piramidi Menfite, part 4, 1966

M&R's work would be the most detailed guide on the site, for some considerable time; neither were they equipped to do any major excavation of the site. The site was also under military control with access restricted: M&R had done an earlier reconnaissance of the site in 1957, of which they say;

"Subsequent events have shown that it was an excellent thing to have carried out even such a summary investigation. In fact the area was the theatre of military manoeuvres which, together with the violent rains that have fallen in recent times, have damaged and destroyed some of the remains which in 1957 were still visible."

Thankfully the military have not destroyed the site to the extent that we see at the great pit of Zawiyet el-Aryan.

M&R's work would only be partly superseded by the Franco-Swiss team lead by Michel Valloggia, with thirteen seasons of excavation on site (each season approximately one month duration) from 1995 to 2007. Here for the first time, significant resources and debris clearance of the site have given us the most detailed view of the site to date. Valloggia's work was published in two volumes, *Abou Rawash I, Le Complexe Funéraire Royal De Rêdjedef*. Published in 2011 in French, volume 1 is mostly text and volume 2 is mostly plates and drawings.

It is to the work of the aforementioned authors that this Layman's guide is based on. It is probably apt to first give a brief history of the views of the Abu-Rawash site, up to the time of M&R, before we look at the more up to date findings of the Franco-Swiss team.

Like the great pit of Zawiyet el-Aryan the Abu-Rawash site from very early times has been attributed as a pyramid, indeed this is the firm conclusion also of the Franco-Swiss team; however having read the publications available to me, I am somewhat reluctant to use this term and hence have opted to use the term *Great pit* instead as the title of this paper.

The Earlier Investigations

Perring was one of the earliest authors to describe the site, and in his 1842 publication, he calls the structure the *'The Pyramid of Abou Roash'* (there are variant spellings for this location). He gives a brief description, a part of which is shown below;

THIS Pyramid is situated about five miles to the north-westward of those at Gizeh. The base (320 feet square) alone remains. The defective places have been made good with masonry, but the bulk of it is formed of the mountain (composed of a hard chalk), which has been reduced to a level around it. No part of the external casing is to be found; indeed the edifice was not probably ever completed, or even raised to a considerable height, for scarcely any materials, and very little rubbish, are to be seen, although the situation is difficult of access.

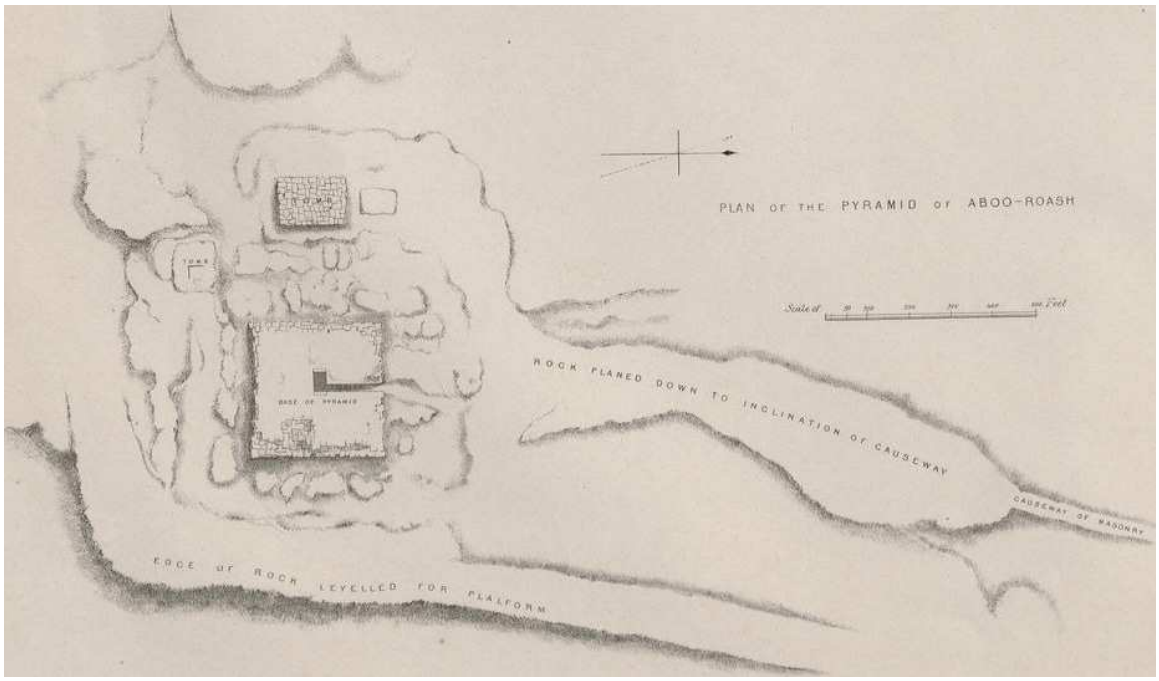
An inclined entrance-passage, and an apartment, lying east and west, have been constructed in an excavation, and have been lined with fine calcareous stone from the Tourah Quarries.

The passage (about 160 feet in length) is in the centre of the northern front, and descends at an angle of 22° 35'. The dimensions of the apartment are about 40 feet by 15, and above it smaller chambers appear to have been constructed, similar to those over the King's Chamber in the Great Pyramid of Gizeh. Hieroglyphics have been inscribed with red ochre on some of the blocks at the western end, but they cannot be distinctly made out.

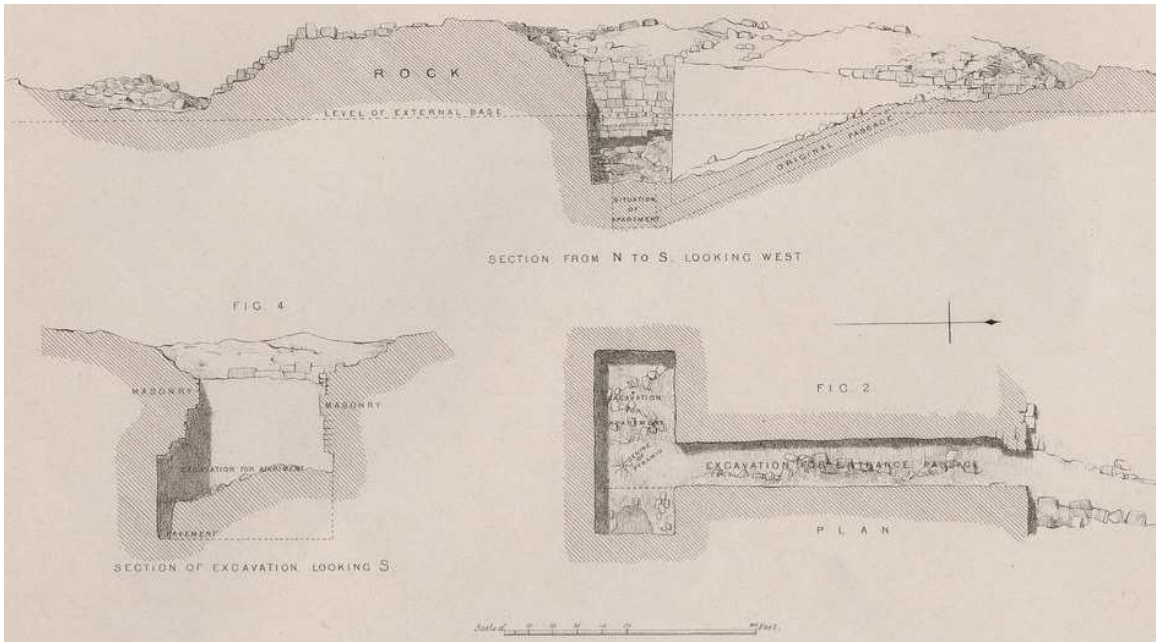
Upon the adjacent ground are heaps of broken granite, which may possibly be the chippings of the blocks, originally intended for an external casing, but afterwards broken up, and carried away for other purposes. The fragments crumble to pieces upon being handled, and are much decomposed and covered with moss, either from great antiquity, or from an exposure, not only to the corroding air of the desert, but also to the moist winds of the Delta.

Some other foundations are upon the same height, which has been already described to be composed of chalk, and which appears to have been worked in very early times (as at present) for the sake of the flints imbedded in it. The levelled space around the Pyramid is about 510 feet above the plain. The eastern and southern sides of the mountain are nearly perpendicular, and beneath it to the southward are antient remains. The northern side has been sloped away, and an inclined causeway has been constructed from the plain below (as is shewn in Fig. 1). It is 4950 feet in length, 30 feet in breadth, and in some places nearly 40 feet high. About half of it is constructed with masonry.

From Perring's report above, he suggests that the structure was probably never completed; this would be a view that many subsequent authors would hold, up to fairly recent times. Other points to note in his report, is that both the pit and entrance passage had been lined by fine Tura limestone; he was also under the impression that small chambers similar to those above the Kings chamber in the Great pyramid may have been built. The causeway unlike at Giza, Dahshur, and Meidum headed in a north easterly direction, (this route is thought to follow a natural spur in the landscape; the option of an eastern causeway was probably not an option due to the high cliff on the eastern side.)



Above we have Perring's fig 1, general plan of the site



Perring's sectional drawings of the site

Above we have a Google Earth image of the site, with the pit in the bottom left corner, with the causeway heading north east. The site chosen was on a prominent hill and it has been calculated that the structure, being a similar size to Menkaure's pyramid, would have an apex at a higher elevation than the Great pyramid (though whether this was a driving factor for site selection is debatable).

Though it appears a somewhat remote location, the area itself was clearly not unknown to the ancient Egyptians, the highlighted area in the top right above, contains cemeteries ranging from the archaic first dynasty to the VI dynasty. Also close by is a mud brick structure, described by Lepsius as a pyramid; excavated in the 1980's by Nabil Swelim, who thought it dated to the end of the IIIrd dynasty (though there are disagreements about this site).

The causeway, longest of the old kingdom causeways is thought to extend further northwards, to the edge of the wadi Qaren, and then take a turn eastwards towards a possible valley temple/harbour.

In Perring's time the owner of the pit was not known, matters were not much improved during Petrie's visit[3]. Like Perring, Petrie would only give a brief account; he describes the location as,

[3] The Pyramids and Temples of Gizeh 1883, pg 140.

"It is situated on the top of a striking hill of white limestone, a culminating point of the Libyan desert, which is seen from far in the Nile valley. This is deeply scored by watercourses which wind through it; and its Nile face rises at a steep slope of 35°. The wild and desolate valleys of it were used for interment by the ancient Egyptians; as outside a cave, now partly fallen in, I found fragments of bronze, and of a very large, thin, translucent alabaster bowl."

In his time, Petrie reported about ten courses of limestone around the pit, with a great quantity of broken blocks heaped about it, creating a mass some 300 feet square and 40 feet high. He also noticed heaps of granite lying in a line all around the pyramid, and most abundant in front of the entrance.

Of the pit, Petrie states; *"The rock-cut pit and passage were originally lined with fine Mokattam limestone, which it is said, was stripped out in the time of Mohammed Ali by a mudir. Since Vyse's time some more masonry is gone; and this Pyramid (perhaps the most ancient in existence) is being quarried during high Nile at the rate of 300 camel-loads a day, I was told."* (Mohammed Ali, Pasha died in 1848; mudir is a local governor)

The rock cut trench leading to the bottom of the pit, was measured by Petrie as 20′ west of north. Petrie was of the opinion that the pyramid was completed, he states;

"The great heaps of granite all round the Pyramid show that it has been cased with granite; and as it is always believed that no casing was put on a Pyramid until the core was entirely finished, this is evidence of the completion of the pyramid."

Petrie found what he believed to be pieces of granite coffer and diorite statue in the rubbish, which he thought had been carried out from the inside of the structure; of the coffer he found two pieces, one plane piece 10.2 inches thick and a curved piece 8.1 thick (the similar pit of Zawiyet el-Aryan had an oval recess cut out of a monolithic granite block, and covered with an oval lid). The pieces of the statue, included several pieces of the figure and one piece of the throne; the throne piece had part of an inscription showing the kings name as MEN…?....RA. This piece with the cartouche on it he describes as having a groove cut around it which contained a cord, allowing it to be swung as a hammer. Petrie's view on the structure, he says;

"The work of this Pyramid suggests that of the fourth dynasty. The Pyramid of Khufu at Gizeh had no granite outside it; that of Khafra had one or two courses of granite; that of Menkaura had nearly half its surface covered with granite casing; thus there is a progressive use of granite by these successive kings; and at Abu Roash the pyramid was entirely cased with granite, and therefore next in order of work after that of Menkaura of Gizeh."

It is interesting to note Petrie's view that the entire pyramid was cased with granite. As regards the statue fragments Lehner says; *"Petrie found a fragmant of a throne of a diorite statue, with the hieroglyphs for* Men..Ra, *most probably Menkaure. Stadelmann suggests that he undertook restoration work on the uncompleted pyramid."*[4]

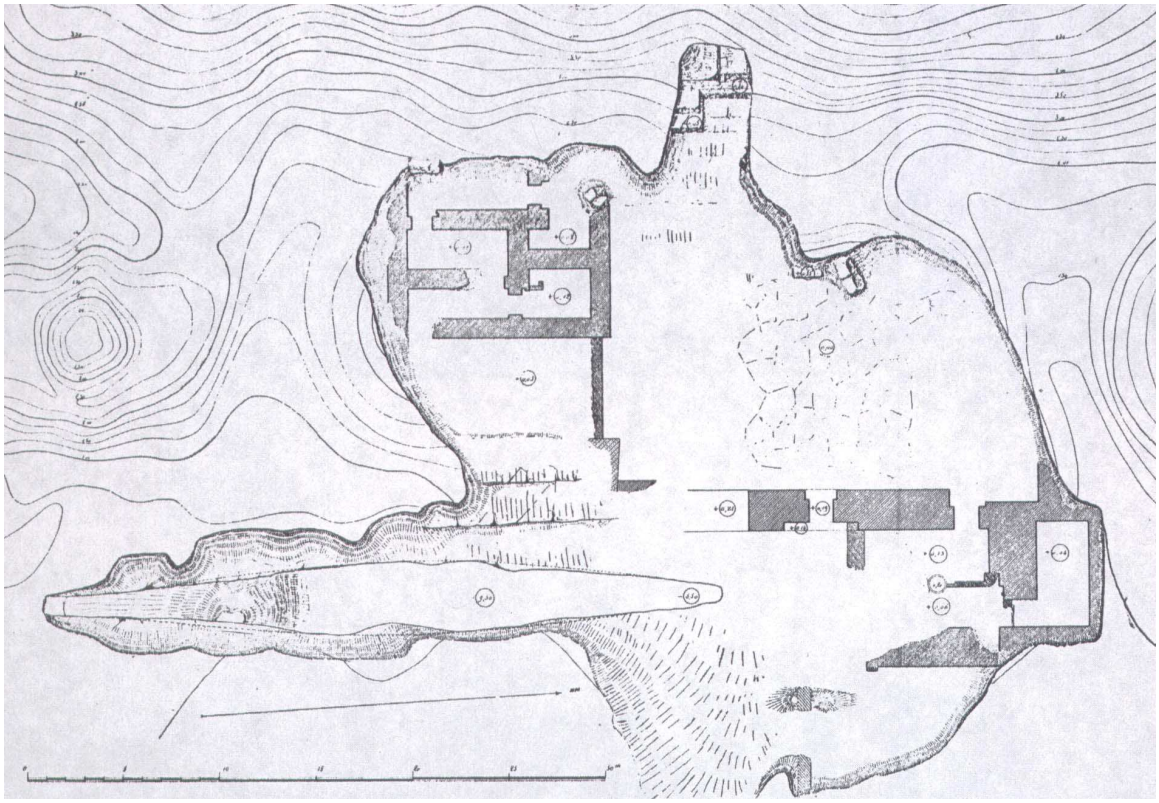
This would be amended by Valloggia some years later, as he says; *"The existence of such a statue in the name of this ruler to Abu Rawash would thus support a continuity of funerary worship celebrated on the site at the end of the Fourth Dynasty."*[5]

Towards the end of the 19th century, our knowledge of the site was limited to cursory observations by the likes of Perring and Petrie with no firm evidence of site ownership. It was not until 1900 that the French Institute of Oriental Archaeology intervened and ended quarrying activities at the site, and instigated excavations. This first season from December 1900 to April 1901 was to involve the partial clearing of the east face of the structure, where it was hoped that a more detailed plan of the pyramid temple could be made. These excavations by Émile Chassinat, would soon unearth clues to the sites owner, he says;

"Only a few days after the opening of the first trench, I was already cutting up numerous fragments of red sandstone, similar to that extracted from Gebel Ahmar; some had engraved hieroglyphs, highlighted in blue or green.[. ..]. Soon the inscriptions were more complete, and I finally discovered, still on a fragment of sandstone, the name of Didoufrî one of the oldest kings of the IVth dynasty."[6]

[4] The Complete Pyramids 1997, pg 121.
[5] Le Complexe Funeraire Royal De Redjedef, volume 1, pg 10.
[6] Le Complexe Funeraire Royal De Redjedef, volume 1, pg 11

This find would soon be added to by the discovery, of statue fragments in the boat pit south of the temple; here Chassinat would find a life size head and lower part of the statuette of the king, bearing the name of *Didoufrî* (commonly spelled today as Djedefre). He would also discover in one of the temple rooms five engraved limestone pedestals that held the statues of five of the king's children; only one was intact and still standing, the rest had been badly mutilated: in the same room was found a painted limestone sphinx.

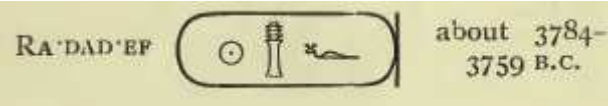


Above, we have a drawing of Chassinat's excavations, which concentrated around the east-west axis of the structure. Pierre Lacau, would take over excavations during 1912-1913; however the First World War would curtail any further excavations and in reality the site was largely forgotten until the work recommenced in 1995 by Valloggia.

According to Miroslav Verner, *"Apart from brief reports, however, neither of these researchers published a comprehensive account of the results of their investigations."*[7]

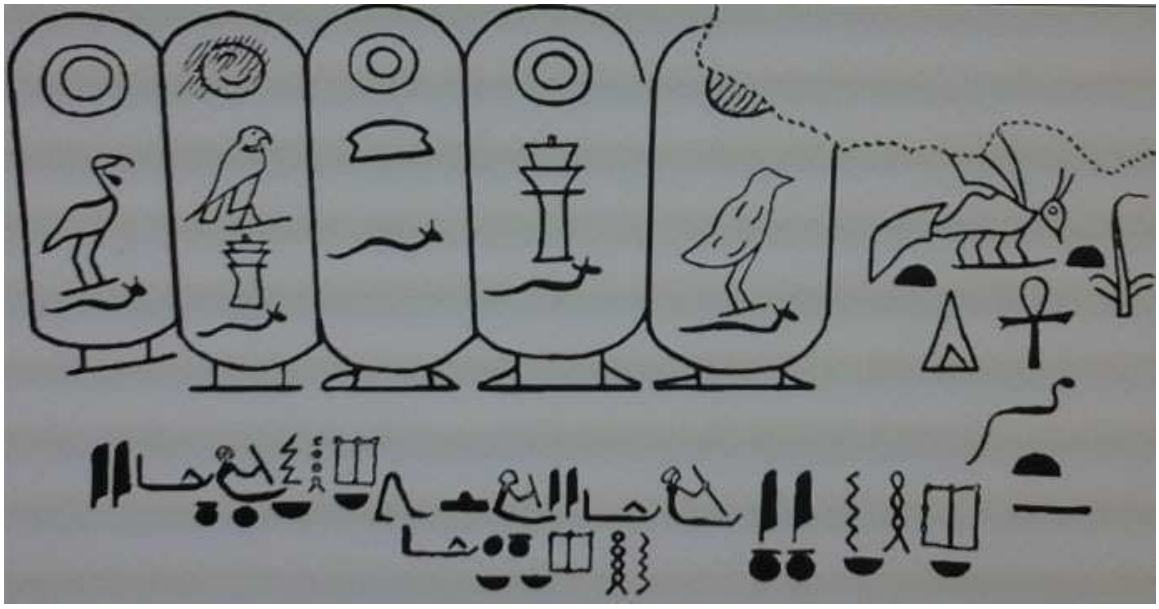
[7] The Pyramids, Their Archaaeology and History, pg 218

The findings of Chassinat, seemed to finally settle the ownership of this complex to the IVth dynasty king Djedefre, successor to Khufu, and this attribution would be added to by the findings of Valloggia's later excavations.



Djedefre's cartouche above, comes from Petrie's *A History of Egypt 1897* (it is interesting to note the dates attached to his reign, in these early days of Egyptology). In Petrie's above history, he has Djedefre placed between Menkaure and Shepseskaf; however today Egyptology place Djedefre immediately after Khufu, in part, because of Djedefre's name being found inside one of the boat pits that surround Khufu's pyramid.

Other king's lists, such as the Abydos and Saqqara kings list, seem to confirm that Djedefre succeeded khufu. In 1949 a list of five IVth dynasty kings was discovered on a cliff at Wadi Hammamat, that appear to suggest a sequence of Khufu, Djedfre, khafre, Hordjedef and Bauefre.



Wadi Hammamat kings list

Ahmed Fakhry, states that the above inscription does not predate the Twelfth Dynasty, he says;

"it must be based on reliable information because it agrees with our knowledge gained from the Turin Papyrus, Manetho, and other sources. Hordedef was a son of Khufu and was buried in a large mastaba east of the Great pyramid. As for Bauefre, no monuments of his are preserved. However, we know of two sons of Khufu called Khnumbaef and Horbaef. One of them may have assumed the name "Bauefre" upon his accession to the throne. In the Westcar Papyrus, as we have seen, the story told by Prince Bauefre follows that of Khafre and precedes Prince Hordedef's. It is difficult to say whether these men really occupied the throne, each of them as sole ruler of the land. There was unrest in the country, and they may have ruled only during the latter years of Khafre or the early years of Menkure. They were, however, recognized as legitimate kings by the compiler of the Turin Papyrus and by the writer of the Wadi el-Hammamat inscription, and their names also occur in Manetho's work."[8]

Clearly, much mystery remains to be resolved on the IVth dynasty kings, not least, who built the superior pit at Zawiyet el-Aryan?

Scarcely anything is known about this king, and even his historic position is not certain. On the one hand, his name appears in the lists of Abydos and Sakkara, between Khufu and Khafra. But, on the other hand, he is omitted by Mertitefs, who recites her successive connection with Sneferu, Khufu, and Khafra (R.S.D. 37). Psamtek·menkh and Psamtek, his priests in the XXVIth dynasty, give the sequence in both cases as Khufu, Khafra, and Ra·dad·ef (R.S.D. 53). We can hardly refuse to recognise the Rhatoises of Manetho as Ra·ded·f; and here again the name appears after Khafra, and after Menkaura. There is a bronze cylinder of this king in the Poignon Collection (W.G. 187); but there are no other traces of him, except a priest Ptah·du·aau (R.E. 62) at Gizeh, a slab of another priest of his (G. Mus.), and a farm named after him in the tomb of Persen (R.S.D. 53, 54) at Sakkara. His pyramid is unknown.

In the above paragraph from Petrie's *A History of Egypt* he gives examples were Djedefre appears out of sequence.

[8] The Pyramids, second addition, pg 126-127

We would have a long wait till the 1960's before M&R would arrive at the Abu Rawash site and give us the most detailed description of the site[9], which would not be surpassed until Valloggia's excavations that began in 1995. Before we look into Valloggia's report, it is best to examine M&R's first, to enable a better comparison between the two.

M&R describe the site as, *"To the south and especially to the east the hill is very steep: a rocky spur jutting out north-eastwards from the summit was adapted, with the help of considerable masonry work, to form the processional causeway……The top of the hill, which is of coarse limestone with strata sloping steeply from east to west, numerous fossils and large chalky veins, was cut into and levelled, leaving however in the centre an outcrop of rock which was later incorporated in the nucleus of the monument. The level ground adjoining the pyramid covers a wide area, especially to north and east, so as to include both the upper temple and the outer wall, but the nature of the ground suggests that the work carried out on the preparation of the site was not very extensive."*

The large rock outcrop was incorporated into the structure; in much the same way, we see the natural rock outcrops being absorbed into Khufu's and Khafre's pyramids at Giza. It's fair to say that the rock of the plateau is not the finest, the various strata's of rock are clearly visible, sloping about 12 degrees east to west. Into this outcrop, steps were cut to receive large limestone backing blocks, thought to come from a quarry near the cemeteries further to the east. Areas exist where the natural outcrop was of such poor quality that it had to be replaced with the quarried limestone blocks.

M&R report that there were 10 courses of these blocks laid horizontally, not following the strata inclination, and that they were only summarily squared. The rock outcrop was at its greatest in the southern part of the structure, M&R say;

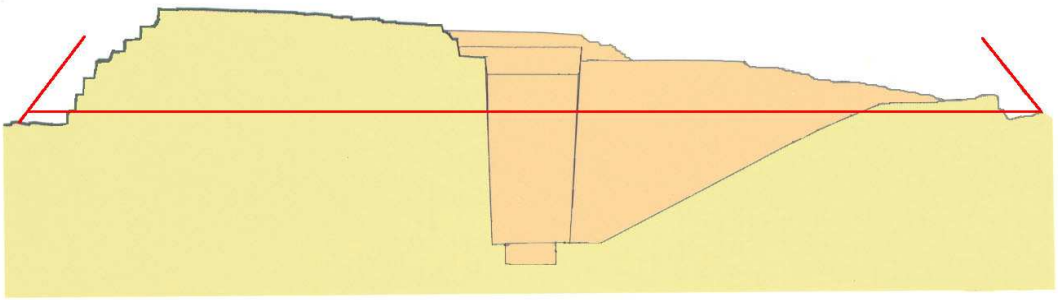
"Before the work was begun the hill of Abu Rauwash had at the top a not very pronounced slope towards the north. As we have said, it was partly levelled, but the rocky core thus isolated was not large enough. At the foot of

[9] L'Architettura Delle Piramidi Menfite, Parte V, 1966

the rough northern face now visible, the rock was insufficient and was integrated with large blocks of coarse masonry to a considerable depth, as may be seen on the sides of the sloping trench leading to the central pit and the northern part of the east and west sides of the nucleus.

Further south, after a certain way, the rock reappears into steps to receive the integrating masonry. Along the south side of the nucleus, and in the south-central part of the east and west sides, it is easy to see that the integrating masonry was not very deep."

Once again I am most grateful to Olga Kozlova and the Isida-Project.org for the use of their images. In the view above looking south, we can see the inclination of the rock strata on the south wall of the pit, and on top of the entrance trench walls, we can see the large limestone blocks. The greater portion of the rock outcrop is to be seen south of the pit; the U shaped depression visible on top of the outcrop to the south, appears to be Valloggia's clearance through the debris to observe the top of the outcrop. The reduction of the natural rock, north of the pit can be seen in Perring's sectional drawing on page 4.



The sectional image above, gives an idea of the form of the rock outcrop inside the structure; the red line denotes base level and exterior casing.

M&R describe the top of this rock outcrop/nucleus;

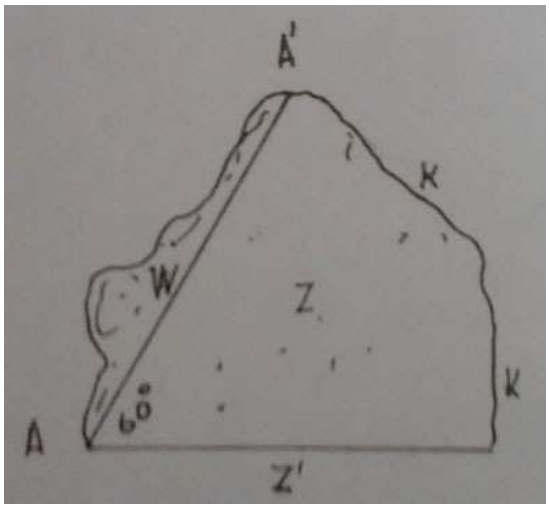
"The upper part of the nucleus is now fairly flat and levelled, and covered with a not very thick layer of sand, earth and chippings. No projecting blocks of local limestone are visible, so that it is very likely that the height of the edifice was never greater than it is now, that is to say 12 metres. Only along the edges may be seen blocks of local limestone, evidently from those used to integrate the rock."

M&R did not find any granite casing fitted in situ, and commented on the distinct lack of any casing of Turah limestone, when compared to the numerous hills of granite chippings displayed on site. These hills of granite chips varied from 1.8m to 5m high, and it was their opinion *"that the edifice was destroyed systematically and the blocks reworked on the site"*

M&R noted how these granite heaps appeared to form small hills and banks that were aligned in two parallel rows along the sides of the pyramid, the best being preserved along the west and south sides. They describe the first row nearest the structure as roundish mounds with a central crater, the bottom of which as well as displaying granite, was also found to contain chippings of local limestone: these mounds they considered as the areas were the blocks were reworked. The outer row of banks predominately of granite was thought to be a tipping area from the waste created by the mounds of the first row.

Though many authors describe the enormous heaps of granite chips, M&R seem less impressed, they say;

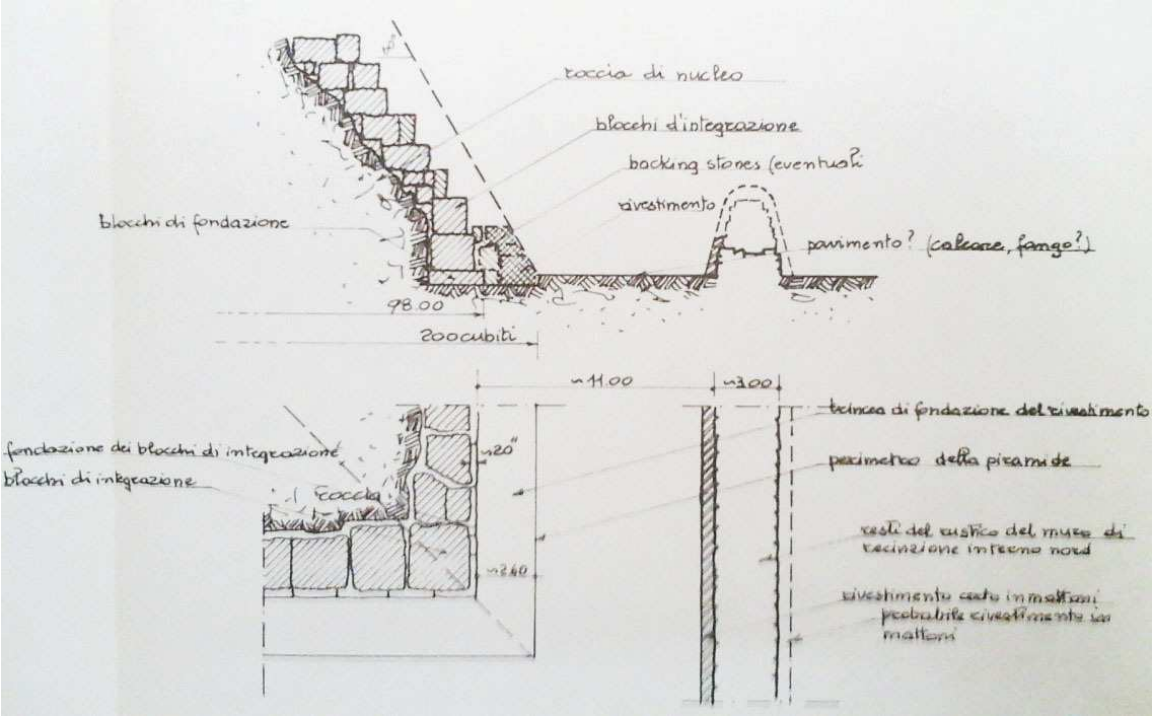
"From a careful examination of the site the term 'enormous quantity' does not seem to us apt. The chips are certainly abundant, but cannot be compared to the really imposing piles of rubble, certainly due to the demolition alone, which are to be seen by other pyramids: for example, and especially, along the sides not cleared by Jéquier at the pyramid of Pepi II at Saqqara. We therefore think that Chassinat is not wrong when he says that the granite casing had a height that it was impossible to estimate, but which must have been less than-or at the most equal to-that reached in the pyramid of Mycerinus (16 courses)."



M&R found several displaced blocks of granite, one of which is shown above, they found the rising and bedding face carefully dressed, but the outer face was left in the state so noticeable on the undressed blocks at Menkaure's pyramid. Such blocks led M&R to conclude that the pyramid was never completed. (Note the 60 degree angle, measured by M&R, which led them, along with many other authors, to conclude that the pyramid was intended to be a 60 degree pyramid. The Isida project, measured the inclination of the first coarse of limestone blocks as about 8 degrees; it follows therefore that a granite block above, set against such an incline would display an angle of 52 degrees. Valloggia has concluded in his work that the structure had a casing of about 52 degrees.)

Near the north-east corner of the nucleus M&R found amongst the rubble an enormous block of granite; rough-hewn, they thought this monolith was intended for the building of the temple and not for the casing (if their drawing is correct it appears to be 5m long!).

M&R's report is one more of observation, than excavation; the ruinous state of the site would require heavy lifting equipment and major clearance, which would have to wait until Valloggia's excavations. In their time only the N.E. corner had been excavated, and here they describe a foundation as *"a line of blocks of good greyish limestone, parallel to the rocky core and the masonry which integrated it, .."*. They also report a shallow trench about 2.6m wide along the sides of the corner, which they thought might have been the excavations for the casing.



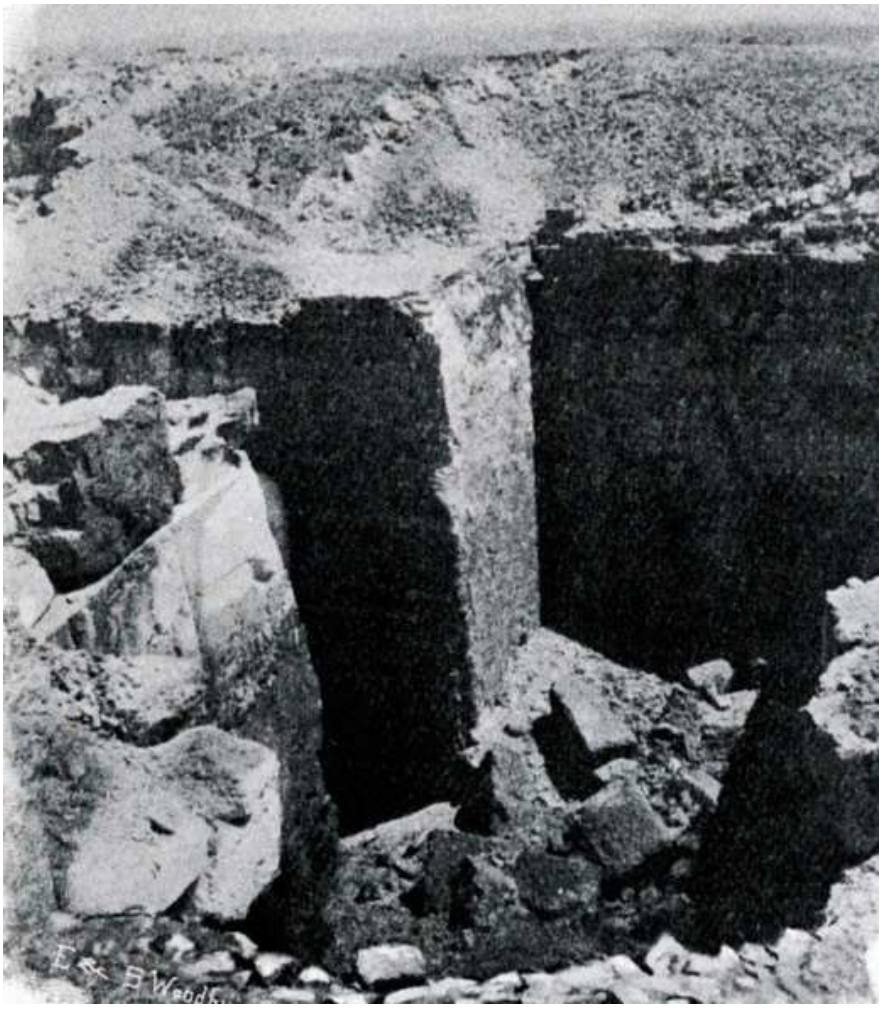
M&R's reconstruction of the N.E. corner

Due to the state of the structure M&R could only give an approximate figure for the base of the structure, which they give as 98m for the nucleus and 104.6m (200 cubits) for the finished pyramid.

The Entrance Trench

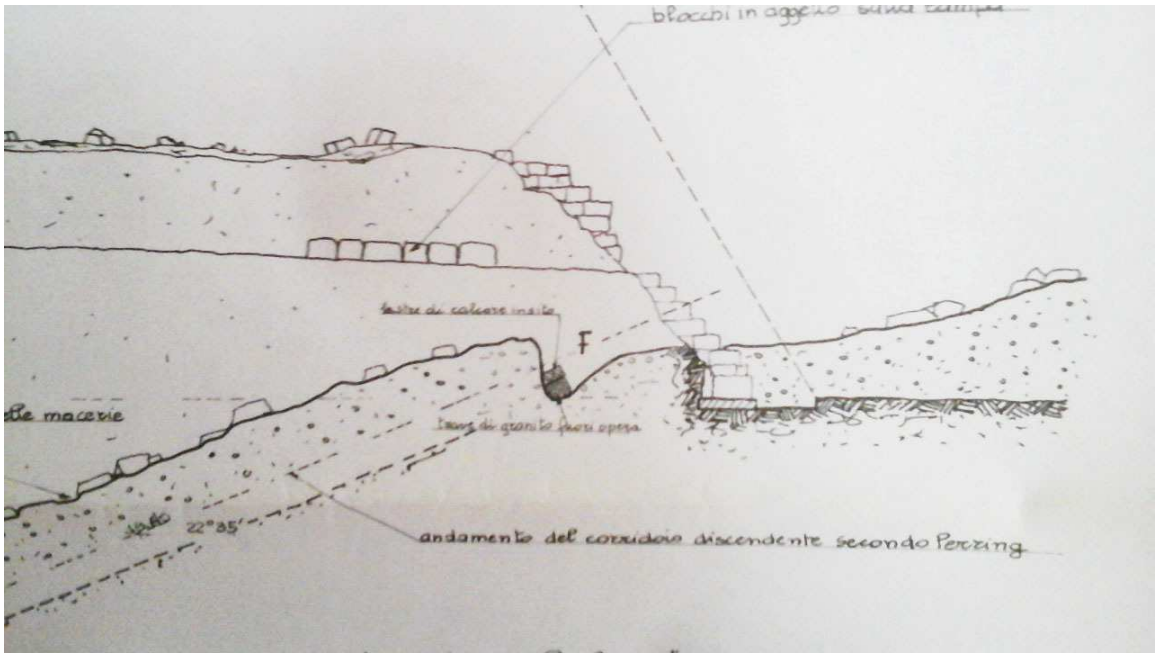
In the centre of the structures north face, we have a large trench descending down to the pit; both of which where substantially filled with debris in M&R's day. M&R repeat Perring's descending angle of 22°35′ (though on M&R's reconstruction, TAV 3, fig 6, they suggest 27/28 degrees). They say the width of the pit varies from 5.5 to 7 metres, their drawings suggest that

the trench is narrower at the north and gradually widening to the pit entrance; this is opposite to what we see at the Zawiyet el-Aryan pit. The 7.5m appears to be the width of the trench at its uppermost, and taking into account the batter of the trench sides, which Petrie describes as about 1 in 30: though M&R's drawing show am equal batter on both east and west walls of the trench, they say *"The east side of the excavation of the sloping trench is slightly inclined (about 1/30), while the west side is almost vertical."*



Petrie gives the width of the trench as about 18 feet (5.5m) which was probably taken on top of the rubble, which we see above. It appears therefore, that despite the variability of the batter present in the sides of the trench, it would seem that at floor level the trench is around a uniform width of 5.5m (10 cubits?) along its 49m length (M&R length).

Despite the debris M&R report; *"It was along this inclined passage that the descending corridor of the funerary apartments was built. In fact, some blocks of fine limestone placed side by side with their laying bed inclined may still be seen in situ at the bottom of a hole dug in the rubble at the north end of the trench and slightly further inside the face of the nucleus. There is no doubt that these blocks belonged to the floor of the descending corridor. Moreover, since their level is above the base level of the pyramid, it seems certain, as in Perring's drawing, that the orifice of the corridor opened on the north face at a certain height from the ground."*



In the above image of M&R's TAV 3, fig 1, we can see the hole described above (F). The image shows two blocks, the smaller upper one being the in situ limestone floor described in the text and below a larger granite block, of which they say; *"A large parallelepiped block of granite is to be found, in fact, at the bottom of the above mentioned hole at the northern entrance to the passage: it appears to be out of place and has one of the long sides carefully dressed and smoothed. It is probably one of the lintels which covered the descending corridor."*

Also in view above is a row of local limestone blocks, placed on top of the natural rock, which protrude inside the excavated trench. M&R along with other authors believed that a descending corridor was built inside the trench, of similar dimensions to contemporary pyramids; this passage would be 2 cubits wide, therefore leaving 4 cubits either side to be filled with masonry.

In the view above after clearance by Valloggia, we can see some of the protruding limestone blocks at the top; also in view are surviving fine limestone floor stones, along with some facing the walls of the trench (these remains would not be visible in M&R's time due to the debris)

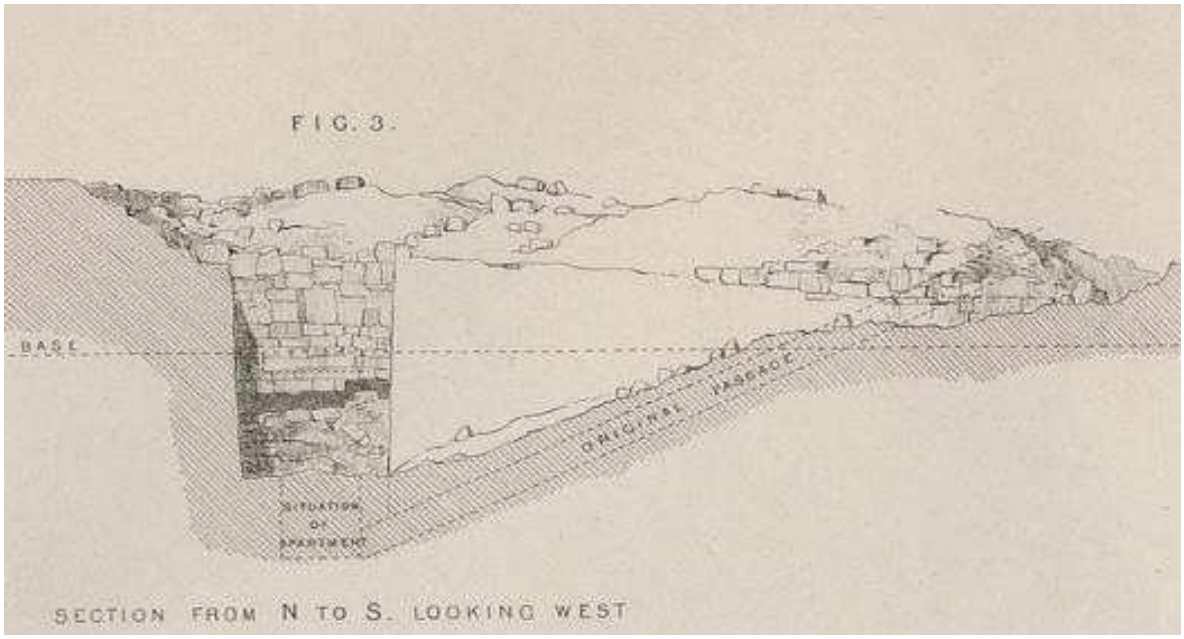
In this view we can see the large core stones resting on the natural rock; also visible is the fine limestone floor and wall facing stones, the floor consist of several courses. Note also what appears to be a vein of chalky rock, which appears quite eroded.

Apart from the fine limestone found in the hole at the north end of the trench, M&R omit what we can see above, because of the depth of debris; yet even though such debris must have existed in Perring's time, Perring states;

"An inclined entrance-passage, and an apartment, lying east and west, have been constructed in an excavation, and have been lined with fine calcareous stone from the Tourah Quarries."

This suggests that a substantial amount of this lining has been prised off the walls and carried away. Indeed Petrie states *"The rock cut pit and passage were originally lined with fine Mokattam limestone, which it is said, was stripped out in the time of Mohammed Ali by a mudir. Since Vyse's time*

some more masonry is gone;..” This suggests that in Petrie’s time, vestiges of this lining were still visible to him.

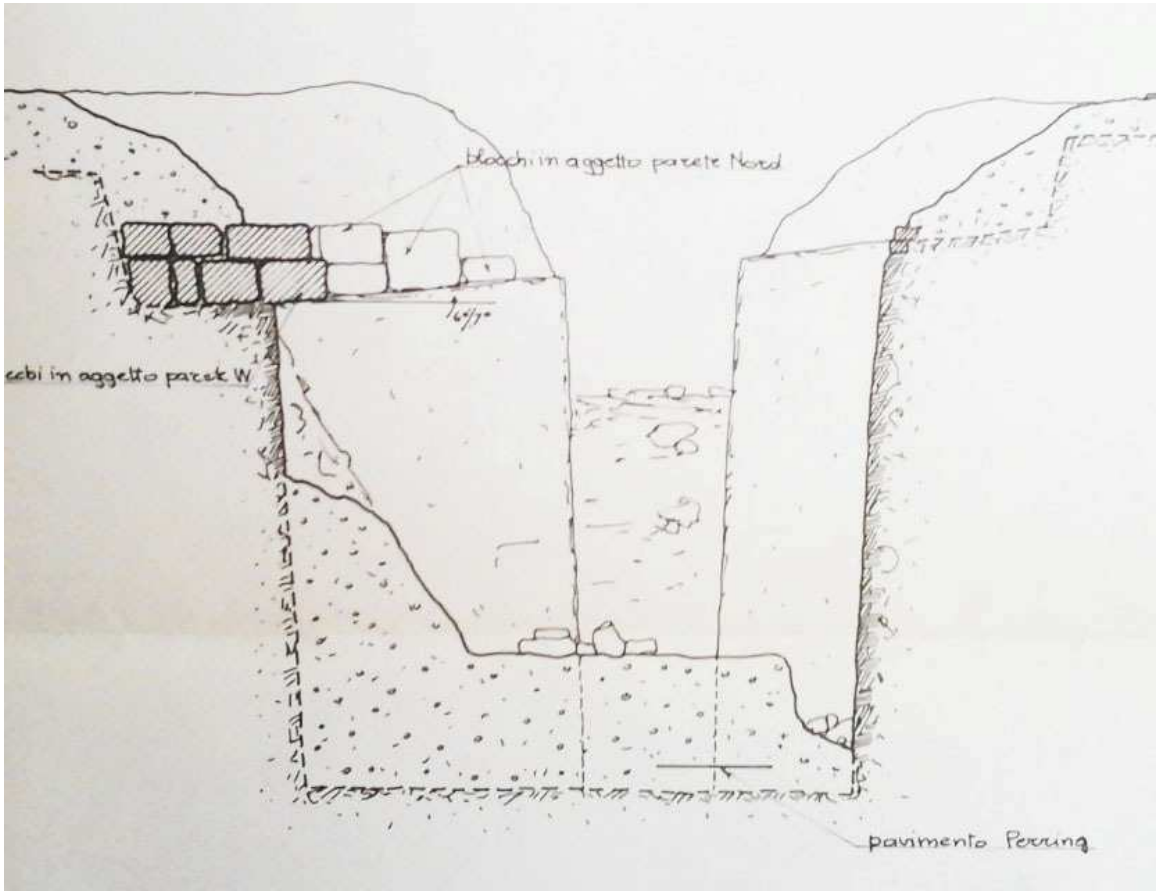


In Perring’s image above we can see that the debris is similar to that displayed in M&R’s drawing. The west wall of the trench is left blank, but the west wall of the pit appears to display substantial masonry lining (though we have to be careful with drawings and how much artistic licence is present).

The Pit

The pit walls, like the entrance trench walls display a distinct batter in the walls, with the pit having an east-west orientation. M&R say that it was roughly 22 metres (44 Cubits) by 9 metres (18 cubits), and due to debris, its bottom was about 20m below the top of the nucleus or about 8m below the structures base level. They say that according to Perring a paving is to be found at some 13.8m below base level, and that the excavation in the rock, continued beyond this (this information must have been taken from Perring’s drawing above, as Perring only gives a value of the apartment in his text as 40 feet by 15 feet (12.2 by 4.6m). As to M&R’s value of 22 x 9m, from their drawings it suggests this is the pit wall size at the level of debris in their time.

The lining described by Perring appears to have been all quarried away, as M&R could only observe abundant traces of typical 4th dynasty pink mortar, adhering to the walls of the pit; described as very hard and tenacious, they found chips of the limestone lining still adhering to this mortar. They found it especially prevalent on areas of the pit walls that were defective, possibly due to the poor quality of the rock; as regards the walls of the trench, they only observed mortar in the parts nearest the pit.



In the section above by M&R, looking north, we see an unusual feature at the top of the pit, in that the sides of the pit do not maintain a uniform section up to the top of the rock nucleus. Instead a wide offset surrounds the top of the pit, that varied in depth and height; M&R say this offset follows the rock strata and therefore inclines to the west, though the north-south direction is nearly horizontal. They also report that the east side of the pit was made regular by the insertion of small limestone blocks, that were flush with the sides of the pit; they supposed that this offset may have been cut around the pit, because bad rock may have been present that was unsuitable.

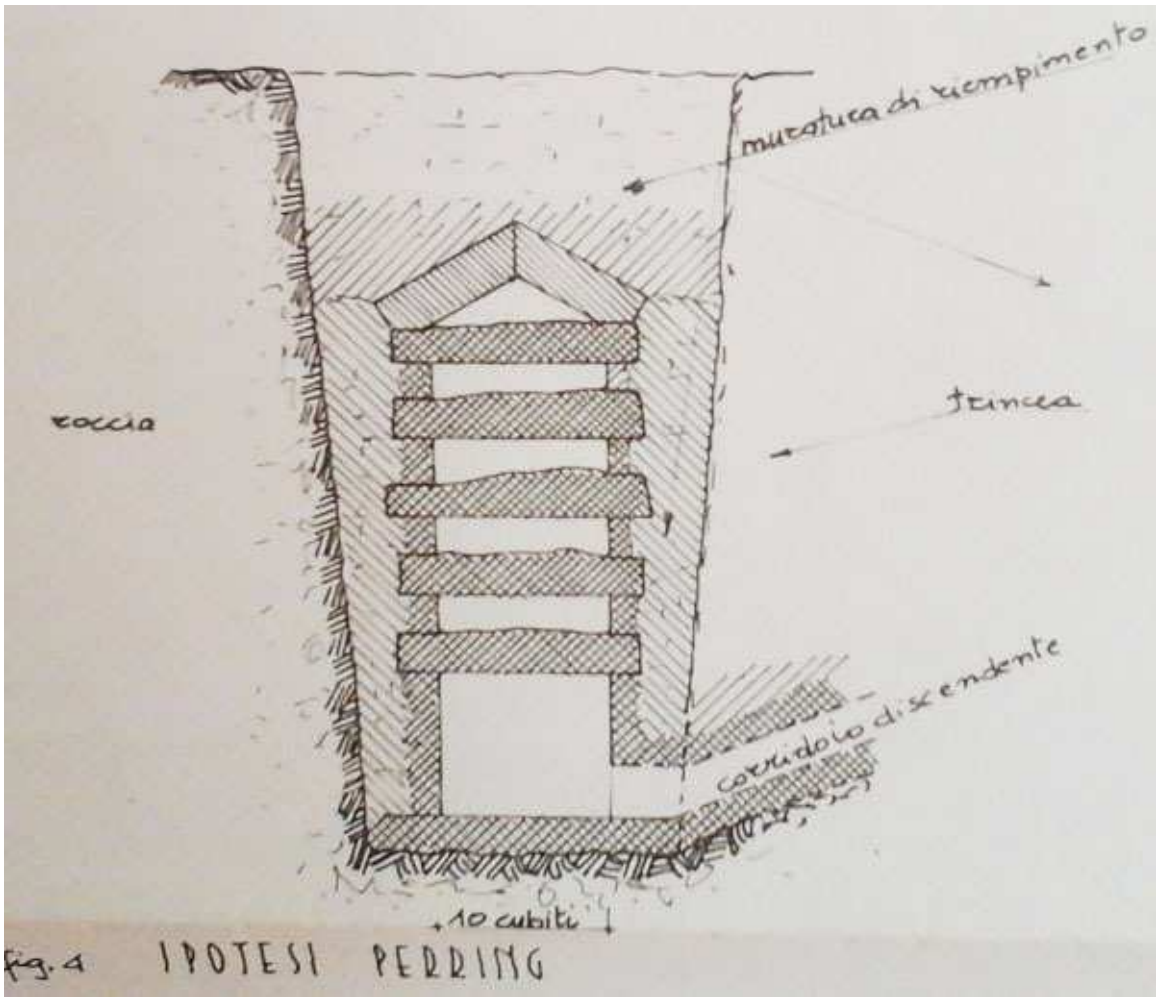
Found in this offset, M&R report large local blocks of limestone, more than a metre high and placed as headers, projecting into the pit.

Above, looking up at the north-west corner, we see the best preserved part of the blocks that were placed in the offset; M&R report two courses were clearly visible and part of a third, at this corner.

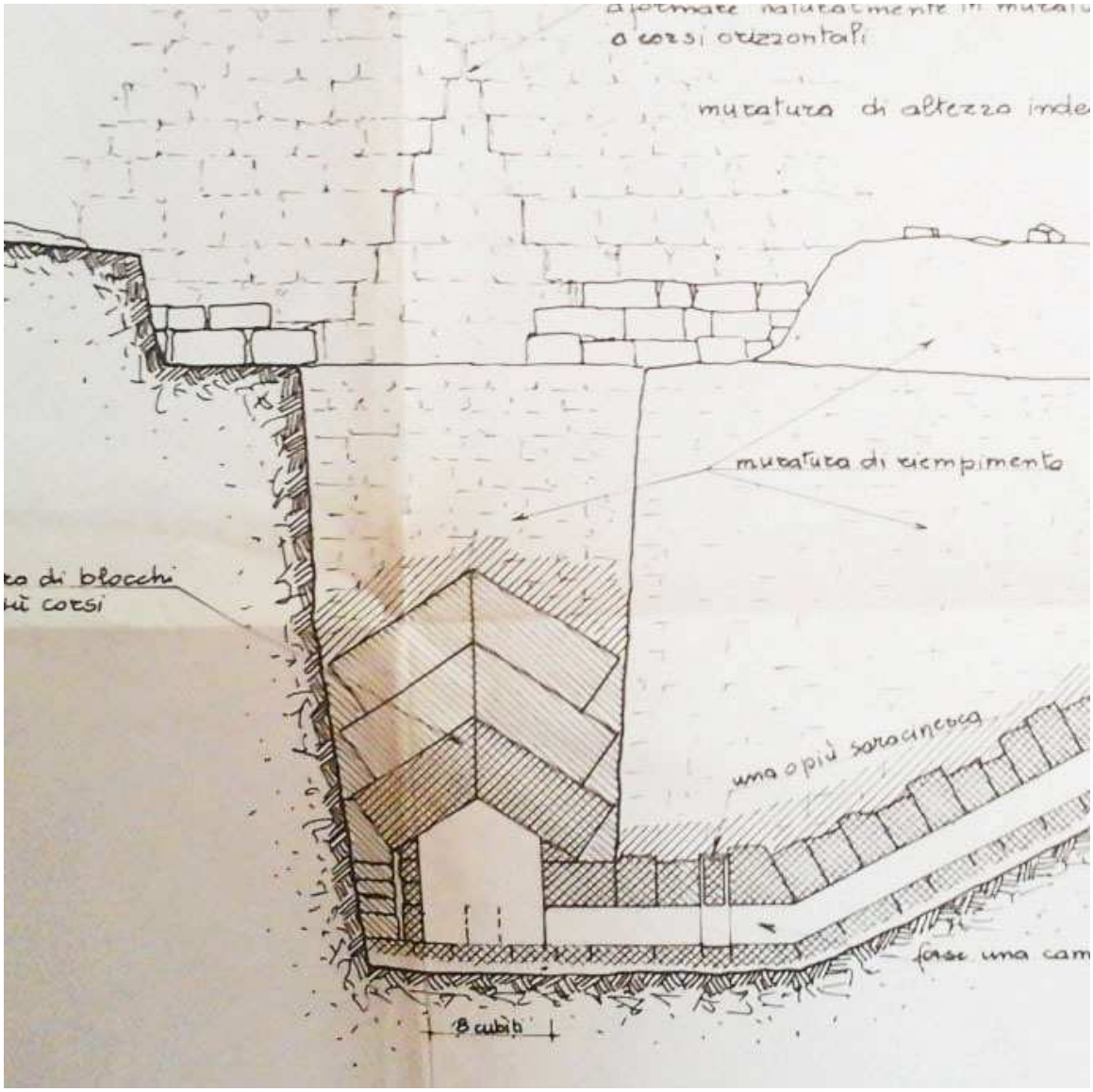
In the above image we can see the offset that surrounds the pit
(I am very grateful to Manna Nader, for the use of his images)

Perring's impression was that a chamber, with relieving chambers similar to the Kings chamber in the Great pyramid, may have been constructed in the pit; in connection with this, M&R suggest the offset may have held large overhanging blocks laid as headers and cantilevered to form a corbelled vault that would divert loads from the underlying funerary apartments.

M&R's hypothesis of the funerary apartments inside the pit is similar to their reconstruction at the great pit of Zawiyet el-Aryan; namely a design we will commonly see in later 5th and 6th dynasty pyramids. This would consist of a main burial chamber in the west, connected to a smaller antechamber, with a possible storeroom in the east; from the antechamber, a horizontal passage would connect to the descending passage, with at least one portcullis in the horizontal part. Valloggia will use a similar reconstruction.



Above we have Perring's suggestion drawn by M&R



In M&R's drawing above, we see their reconstruction of what possible chambers may have looked like. Here we see a series of butting beams; such a design would reduce the width of the chamber to around 8 cubits, compared to Perring's 10 cubits; this M&R say is to allow sufficient space in the pit for side masonry to support the beams. Also shown is a single vertical portcullis in the horizontal passage; also shown in outline at the top of the pit is the corbelled vault originating from the offset.

It has to be kept in mind that there exists no clear evidence in the remains presented today to support either of the two reconstructions, they are merely hypotheses presented by the authors. In the case of the butting beams shown

above, it is useful to examine their first use, found in the Queens chamber of the Great pyramid. Here Petrie describes them thus;

"These roof blocks are seen-where Howard Vyse excavated beneath one at the N.W. corner-to go back 121.6 on slope, behind the wall face; this, coupled with the thickness of these blocks (which is certain, by similar examples elsewhere, to be considerable), throws the centre of gravity of each of the slabs well behind the wall face, so that they could be placed in position without pressing one on another. Hence there is never any arch thrust so long as the blocks are intact; they act solely as cantilevers, with the capability of yielding arched support in case they should be broken."[10]

M&R disagree with Petrie, as regards the technical function of cantilevers, though they confirm Petrie's dimensions in that the beams length is 6.14m and that the greater half 3.09m extends beyond the faces of the north and south walls into the lateral masonry. We obviously do not known what was in the mind of the ancient builders and how they saw forces acting on masonry (one strange example is to be found in the horizontal passage leading to the upper chamber in the Red Pyramid, where we see the ceiling of the passage made of a series of two horizontal blocks, were it appears the greater portion extends into the surrounding masonry).

In M&R's reconstruction, it is clear that its does not match the precedent shown in the Queens chamber. In their Zawiyet el-Aryan reconstruction, even though we have a larger pit, they give a smaller chamber width of 6 cubits; it seems that to conform to the precedent found in the Queens chamber, the chamber width would need to be reduced.

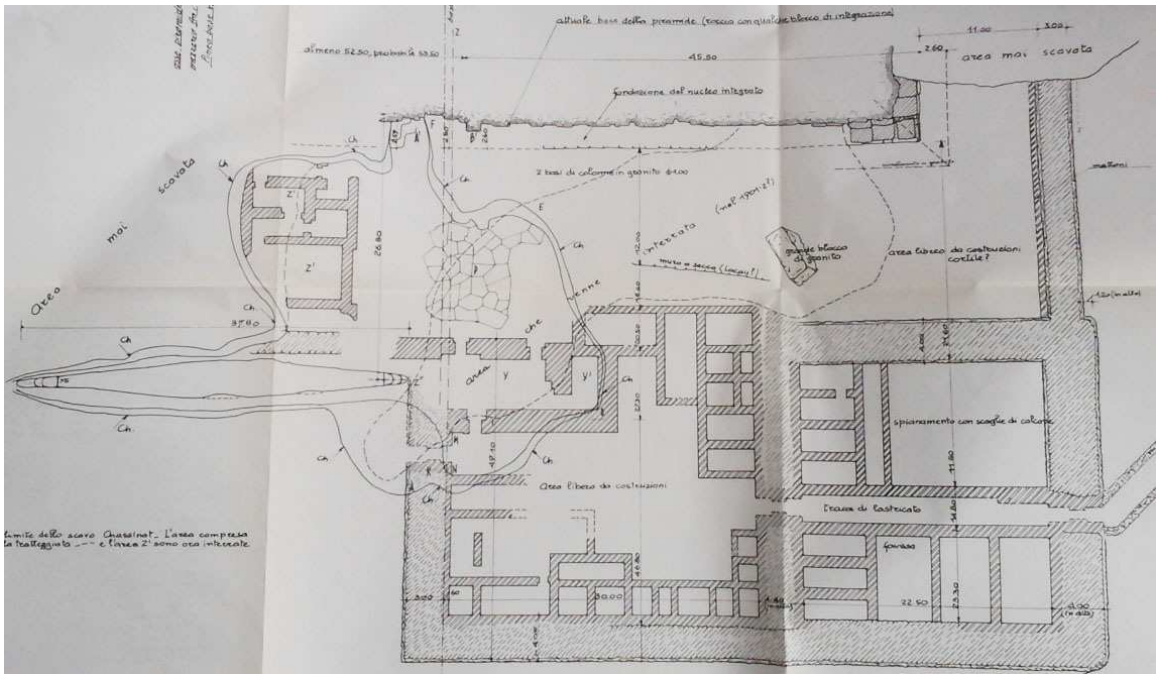
However in my paper on the Great Pit of Zaiyet el-Aryan, I suggested that it was quite possible that nothing was built on the floor of the pit; I suggest that such a scenario may also apply to the pit at Abu-Rawash.

[10] Pyramids and temples of Gizeh, 1883, pg 69.

The Temple

As previously mentioned Chassinat and Lacau had begun excavations of the temple; M&R would comment that Chassinat only published results of his first campaign and that they found his description of the architectural features to be confusing and uncertain. As for Lacau they say, *"as far as we know, has published nothing about his work"*

In their time M&R had the impression that someone had covered over some of the previously excavated areas, with debris from the excavations.



Above we have M&R's reconstruction of the Temple; at this stage we will not go into too much depth on the temple complex, as we will deal with this in more detail, during Valloggia's report. What was available to M&R was limited, but briefly from the above plan (this will be revised considerably during Valloggia's report) we see a complex somewhat different from Khufu's. The greater portion is mostly a rectangular mud brick structure of thick walls and various rooms; its south wall appears aligned to the E-W axis of the nucleus. South of this wall at its SW corner, we can see the boat pit, and to the west of it a small temple, which Valloggia would liken to the pyramid temple of Meidum, north of this temple, remnants of a paved courtyard were found.

Approximately in the centre of the east face of the nucleus, M&R mention what appears to be a breach; at the sides of this breach they report some granite blocks still in situ. They imagined that it may have been a sort of a niche, in their observation 16, they say;

"The blocks of granite placed as headers, which are visible in the centre of the east face of the nucleus, penetrate at least 5.5m inside the line of grey limestone blocks which evidently limits the perimeter of the nucleus itself. It is only on account of this great depth (it must be remembered that in addition, on the outside, there was also the casing) that we thought they formed part of a feature of the temple – the offering room with stele - which penetrated into the pyramid.

Nevertheless, the hypotheses cannot be excluded that, just because they were in the centre of the pyramid, the blocks constituted a bonding of the casing with the nucleus or were granite backing-stones behind the blocks-also of granite-of the casing"

There are several locations along the nucleus that we can see remnants of granite being absorbed into the limestone blocks of the nucleus or appearing to act as backing stones for the granite casing. They tend to show notches along one edge, which appear to be indications of wedges being used to split the granite apart; possibly granite casing blocks that could not be removed entire.

The next two images are two examples of granite to be found on the nucleus. In the first image we can make out the grey limestone blocks that M&R believed formed part of the foundation of the nucleus.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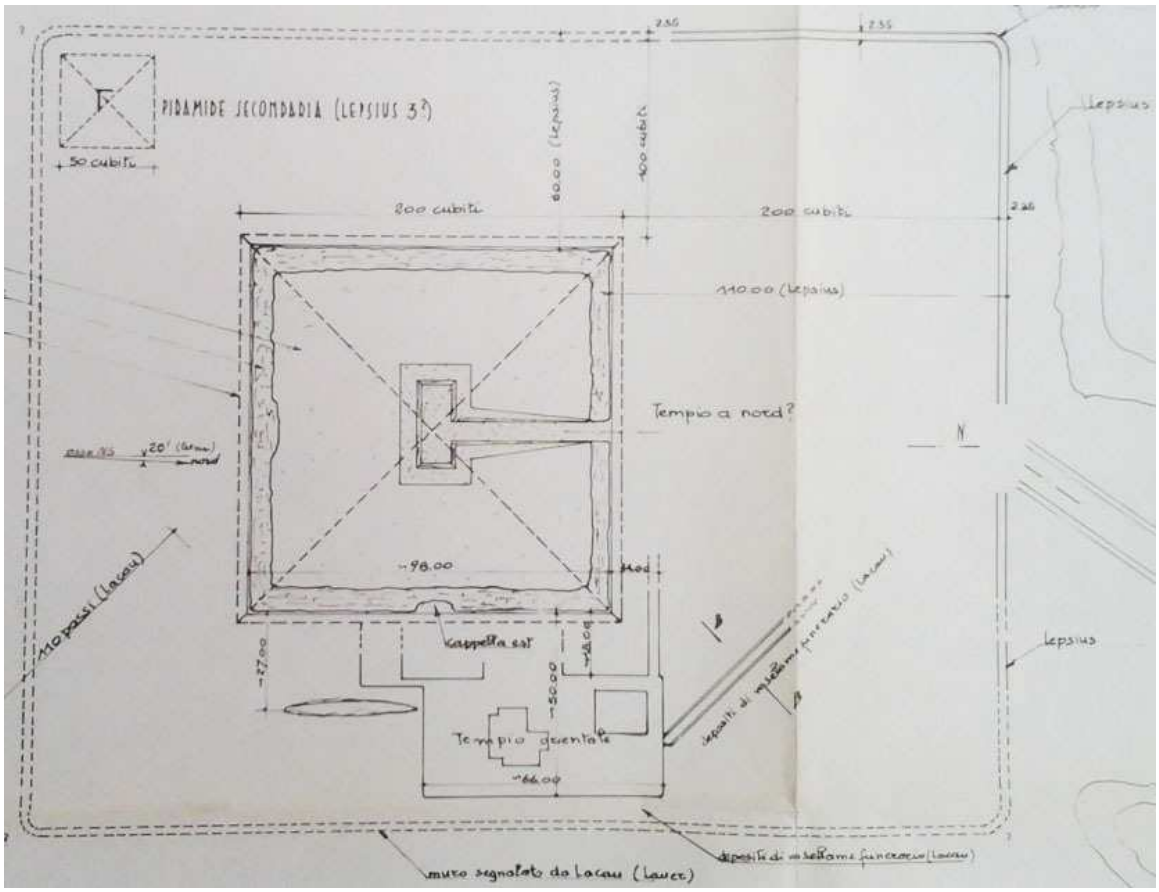
Enclosure Walls



Above, we see M&R's reconstruction of the enclosure wall (which will be heavily revised in Valloggia's work) M&R could only observe portions of the NW corner of the outer wall; likewise the inner enclosure wall, traces could only be observed near the temple. Lepsuis 3, at the S-W corner, thought by many authors to be a subsidiary pyramid, would later turn out to be no such thing. M&R report a diagonal road from the entrance of the temple to the breach in the north enclosure wall, were the causeway connected. The diagonal road consisted of two small stone side walls about 0.7m thick, with the road between being about 2.4m wide.

The Boat Pit

The Boat pit discovered by Chassinat, M&R report as more than 37m long and 9.5m deep. Filled with debris, the pit was cleared, however no boat fragments were found, what was found, M&R say;

"All around, and especially near the north end and inside the trench, were fragments of very beautiful red quartzite, originating from royal statues now completely destroyed. The famous head of Zedefrâ, now at the Louvre, and other notable pieces of sculpture were found here. It may be supposed that the statues were in rooms situated in the neighbourhood of the paved courtyard and in the courtyard itself that exists not more than 5 metres north-west of the trench. They were removed and taken near the trench to be destroyed, so that many fragments fell into the excavation. The destruction was complete and radical: the statues, many of which were of life-size, were reduced to minute fragments. Only three heads, two of which are in the Louvre and one in the Cairo Museum and all damaged, some hands and feet and a very few torsos escaped the annihilation".

At the north and south ends of the pit M&R report that steps were cut into the rock, and were the rock was lacking, the steps were made of masonry. Around the edges of the boat pit we have a similar offset to the main pit, and here it is thought large limestone blocks, laid edgewise, would have originally covered the boat pit. We will return to the Boat pit in more detail later.

The Causeway

Unfortunately our knowledge of the causeway is limited; sadly geographic limits to the concession, meant that Valloggia was unable to undertake any archaeological work on the causeway or the area of a possible valley temple.

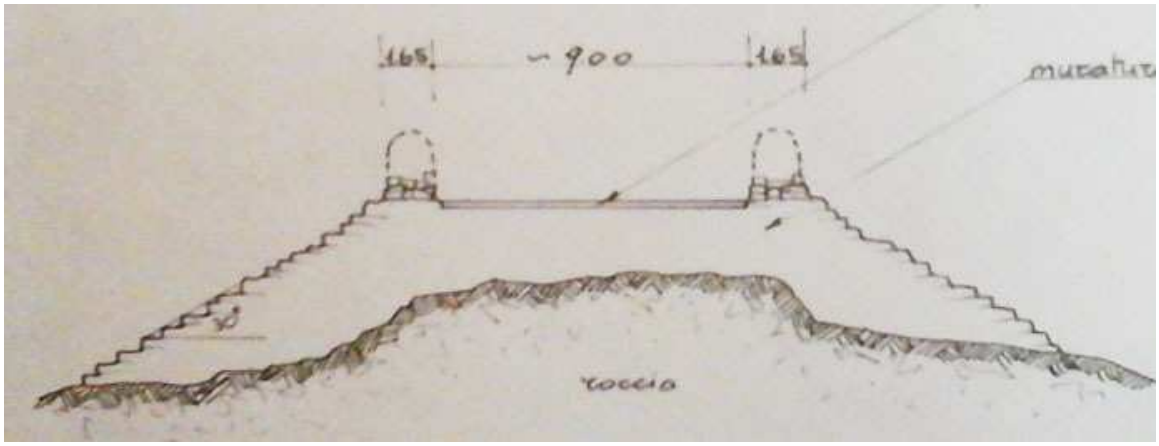
Perring describes the causeway as, *"It is 4950 feet* (1.5km) *in length, 30 feet in breadth, and in some places nearly 40 feet high. About half of it is constructed with masonry."*

Leslie Grinsell[11] says, *"From the vicinity of a few scattered blocks of limestone west of Abu Rauwâsh village, which doubtless form the visible*

[11] Egyptian Pyramids 1947, pg 97.

remnant of the lower temple, there extends w.s.w. a magnificent causeway for about 1 ½ kilometres to the pyramid. It is the finest of all pyramid causeways, and as it gradually ascends the plateau of the pyramid it reaches a height of some 12 metres above its surroundings."

M&R were of the opinion, that as the work on the pyramid was halted early on, it was probable that the valley temple was not even begun; they observed no traces of any valley temple at the end of the causeway.



Above we have a sectional view of the causeway by M&R; here we see the roadway around 9m wide, flanked by two side walls of 1.65m. These side walls M&R describe as "*dry walls formed of two faces of unsquared blocks with a filling of loose stones."* As might be expected, such a lengthy causeway would have many undulations along its course, which would be required to be either built up or cut through. In the section above, we see the causeway being built up upon the natural rock, slightly further north of this section the causeway is cut through a higher rock projection that narrows the road to 8m.

Though Perring suggests half of the causeway is constructed of masonry, M&R thought a large portion of it was *"constructed of chippings, fragments, discarded material and earth."*

Hopefully in the future, the causeway will eventually be given a more thorough investigation.

The Early Views

Before we take a look at the latest findings by Valloggia, it is probably apt to remind ourselves of the views and reasons of various authors on the state of the complex before Valloggia.

Perring's view, *"No part of the external casing is to be found; indeed the edifice was not probably ever completed, or even raised to a considerable height, for scarcely any materials, and very little rubbish, are to be seen, although the situation is difficult of access."* We can also recall M&R's view on the opinions of several authors as to the 'enormous' piles of debris, *"From a careful examination of the site the term 'enormous' does not seem apt to us."*

Petrie's view, *"An important question about this Pyramid is, whether it was ever finished. It has been often written of by Vyse and others as being unfinished; and the rude stone hammers met with here have been classed as implements left by the workmen. We now know; and the rough stone hammers are of exactly the types belonging to the rude remains of Ptolemaic times. These, therefore, more probably tell of destruction rather than of construction. The great heaps of granite all round the Pyramid show that it has been cased with granite; and as it is always believed that no casing was put on a Pyramid until the core was entirely finished, this is evidence of the completion of the Pyramid."* Indeed Petrie thought that; *"and at Abu Roash the pyramid was entirely cased with granite, and therefore next in order of work after that of Menkaura of Gizeh."*

Why might Petrie think that the entire structure was cased in granite? It might be the distinct lack of limestone casing that brought him to this conclusion. M&R state;

"Perring had already stated that he did not find any traces of white limestone, and even today, after the excavations of Chassinat and Lacau, such traces are visible only in very small quantities. We therefore do not know how Lepsius could suppose there to have been a casing of Turah Limestone. The few apparent blocks of this material are found in the sloping ramp leading to the underground passages."

We will return to this limestone issue later, but for the moment, I feel Petrie has a valid point on the granite casing being laid after the completion of the core; however the core need not necessarily be that of a pyramid, but possibly of a low mound that surrounded the pit, like I suggested at the Zawiyet el-Aryan pit[12]. It is also to be noted that those granite casing blocks that have been found, appear to have undressed outer faces, such as we see at Menkaure's pyramid.

We know look at some of the views of I.E.S. Edwards[13]. He states;

"It is surprising that Djedefre should have reverted to a design of substructure which was discarded when the true pyramid superseded the step pyramid in the reign of Sneferu. While it is not impossible that it was due to the poor quality of the rock and the architect's unwillingness to trust that a tunnel would not cave in, the size of the trench, which varies in width from 18 to 23 feet, seems unnecessarily large to contain a constructed corridor, at least of normal dimensions."

"The building on the east side of the pyramid, insofar as its plan can be understood, does not conform in its design with that of any known mortuary temple."

Fakhry's view;[14]

"It is frequently suggested that the pyramid was never completed, because Rededef reigned only eight years. However, several blocks of red granite are still in situ on the eastern face, which would suggest that the monument was cased with granite for at least three courses. The work must have been well advanced to have reached this stage. The extremely dilapidated condition of the pyramid is probably due to its well-documented use as a quarry, and not the inability of the king to finish it."

Fakhry's source for granite in situ is unknown, as other authors including Valloggia have not found in situ granite casing; it is likely he is referring to granite backing blocks or fragments discarded on a step.

[12] https://www.academia.edu/35033512/The_Grest_Pit_of_Zawiyet_el-Aryan
[13] The Pyramids of Egypt 1986
[14] The Pyramids, 2nd Edition

Fakhry also states, *"Rededef's Valley Temple has never been examined, although its position is known,"* this certainty is slightly tempered by him stating, *"A few scattered blocks of limestone slightly west of the modern village of Abu Rawwash probably indicate the still unexcavated site of the Vallet Temple."* Currently, the location of any Valley Temple is unknown.

Miroslav Verner's views;[15]

"The pyramid was probably never completed. It simply had the bad luck to become a favourite target for later stone thieves."

On the temple he says, *"The layout of the latter differs significantly from that of other known Old Kingdom mortuary temples. --- In the middle of one of the spaces in the north-eastern part of the structure stood a row of columns. In the courtyard, Chassinat even found a fragment of a column with Djedefre's cartouche, a significant and somewhat strange discovery, because-if we set aside the specific case of the columns and half-columns in the Djoser complex- columns don't appear in pyramid complexes until the beginning of the Fifth Dynasty.*

"On the basis of the available information, we can already infer that Djedefre's pyramid complex was built in haste and probably remained incomplete in some respects." This view is probably due to the extensive use of mud-brick and rough stone enclosure walls.

"The destruction began during the New Kingdom at the latest, and was particularly intense in the Roman and Early Christian eras, when a Coptic monastery was built in nearby Wadi Karin. It has been proven, moreover, that at the end of the nineteenth century, stone was still being hauled away from the ruins of the pyramid at the rate of three hundred camel loads a day."

This last quote of three hundred camels a day, is often quoted by various authors, but care has to be taken on its use; Petrie states, *"is being quarried during high Nile at the rate of 300 camel-loads a day, I was told."* Firstly, Petrie saw no quarrying, he was told it and only in flood season when the Nile was high. The camel quantity may have been exaggerated to impress Petrie; in short, while quarrying undoubtedly took place on the site, we are

[15] The Pyramids, 2002

unable to know the full extent of it. However it may have been restricted to high Nile only, allowing stone to be transported down the causeway to awaiting boats of the Wadi Karin.

Based on Chassinat's work, Reisner suggested some intrigue at court involving murder, which laid to Djedefre usurping the throne; only for him to be murdered in turn by Khafre. Reisner thought this bloodletting could account for the short reign of Djedefre (8 years, Turin list) and the ruinous state of the site, including the smashed statues; a sort of *damnatio memoriae*. Today most authors dismiss this view of events.

The above views give us a rough idea of the uncertainty that surrounds the site, which is not surprising, given that we would have to wait until 1995 for proper excavations to be done and hopefully clear up this uncertainty. Before we move onto Valloggia's work, I feel it is important to give M&R's views on why they feel the monument was never completed; as I feel that Valloggia's work has not fully addressed them. M&R state;

"We have seen that at the foot of the east face are loose blocks of granite obviously belonging to the casing. One of theses has the sloping side, which must have formed part of the visible face of the pyramid, not yet finished and resembling the blocks of granite in situ in the pyramid of Mycerinus. Everything leads one to think that Zedefra's monument was never completed. In fact:

1)-in the pyramid area only a very few remains of blocks of local, very inferior limestone are to be seen. Now, while it is certain that the valuable materials were removed and used elsewhere, it is not so likely that the same thing happened with the coarse limestone blocks of the nucleus. The nucleus of the large western mastaba is in good condition, while it would have been destroyed if the coarse limestone too had been considered fit to be used again. If the blocks of the nucleus had been put in position, they should be still there. It therefore seems to us very likely that in its most advanced state, the pyramid was not higher than a dozen metres.

2)-As already said, the casing put in position was not smoothed.

3)-The funerary apartments were completely destroyed and the blocks of fine stone which face them were mostly removed and reworked, as is indicated by the higher piles of chips along the north side. It is inconceivable that to

recover the casing materials of the burial-chamber and underground rooms, steps were taken to demolish all the rough masonry of the nucleus of a pyramid with sides measuring 200 cubits and that this demolition work has left no trace. Moreover, it would have required an immense labour completely out of proportion to the results to be obtained. We therefore think that the recovery of the material from the underground rooms was decided on because the material itself could be easily reached from above and could be extracted by the same route that was used to get it to the place of use, that is to say by the partly cleared sloping trench. The blocks of local limestone to be removed were few and this indicates that the pyramid was not finished. Moreover, the block of granite described in the text seems to us a proof that in this pyramid too the laying of the casing proceeded pari passu *with the erection of the nucleus."*

M&R bring up some valid observations, that I feel need to be addressed, especially by those who advocate that the pyramid was completed. The question therefore, is where has all the rough core stone gone? Generally there is not a large market for this material, one only has to look to Giza for example, to see the masses of it still left untouched, even small structures like the mastaba's and queens pyramids are relatively unscathed. What was in demand was fine stones, like the Turah limestone casing, of which a portion still remains on top of Khafre's pyramid; granites and basalts etc, to a lesser degree would also be sought (why waste a long journey to Aswan, when there was plenty of granite to be found at Giza).

Yet in this remote hill at Abu-Rawash, we are lead to believe that an entire pyramid was quarried away and most of that, poor local core stone. In Valloggia's reconstruction of Abu Rawash, he shows Abu-Rawash to be like Menkaure's pyramid, in that a lower portion would be cased in granite, with the greater height cased in fine limestone; yet as some authors have mentioned, the evidence of this fine limestone is lacking. This fine limestone has a couple of uses, it can be reused as building stone for some other construction, or broken up to be fed to hungry lime kilns and converted to slaked lime.

As mentioned by M&R the easily accessible mastaba, west of the structure was untouched, indeed there are the cemeteries to the east, which also could have been exhausted of their stone.

Above we see the north face of Menkaure's pyramid, which is practically the same size as Abu-Rawash, the large gash in the face, shows the difficulty in trying to deconstruct a pyramid; according to Wikipedia,

"At the end of the twelfth century al-Malek al-Aziz Othman ben Yusuf, Saladin's son and heir, attempted to demolish the pyramids, starting with Menkaure's. The workman whom Al-Aziz had recruited to demolish the pyramid found it almost as expensive to destroy as to build. They stayed at their job for eight months. They were not able to remove more than one or two stones each day at a cost of tiring themselves out utterly. Some used wedges and levers to move the stones, while others used ropes to pull them down. When a stone fell, it would bury itself in the sand, requiring extraordinary efforts to free it. Wedges were used to split the stones into several pieces, and a cart was used to carry it to the foot of the escarpment, where it was left. Far from accomplishing what they intended to do, they merely spoiled the pyramid by leaving a large vertical gash in its north face."

Such a demolishing effort if carried out at Abu-Rawash would surely leave traces; such traces M&R did not find. On the often quoted 300 camels a day, I did a rough calculation on how long such transport would take to remove a

pyramid volume, whose base started above the natural rock, (Valloggia states this natural rock takes up 44% of the pyramid Volume, though as we will see, this appears generous). A comfortable load for a camel is 150kg, if we take this load, 300 camels could transport 45 metric tonnes a day, or about 17 cubic metres (cubic metre of solid limestone is around 2.6 tonnes). I calculated that the pyramid volume above the 12m height of the natural rock is roughly 141337 cubic metres; meaning our hard working camels, working 365 days a year would take around 23 years to move this amount.

The above is just a rough calculation, but it gives an idea of the task. I find myself agreeing more with M&R's view and that we do not have a complete pyramid at this site; but I would go further, and as I suggested at the Zawiyet el-Aryan pit, I believe we may instead be looking at a low platform that surrounded the pit, and that the construction may never have been conceived as a pyramid.

Though it has always being conceived as a pyramid by the early explorer's and today is accepted as fact by most Egyptologists; some such as Vassil Dobrev have suggested that the structure may have been a solar temple, while author Robert temple believed it to be a meridianal astronomical observatory[16]. As to the undressed faces of granite, this need not necessarily mean an unfinished pyramid; it may have been intentional to leave a rusticated finish. Menkaure's pyramid is assumed to have unfinished casing, due to the smooth finished patches at the entrance and the temple, but again this may have been intentional for these areas alone; even though the highlighting of the entrance would appear strange to us.

We will now take a look at the findings of Vallogia's campaign.

[16] Egyptian Dawn 2011, pg 92

Valloggia's Findings

Modern excavations as previously mentioned began under Valloggia in 1995 and ended in 2007; he would publish his findings in a two volume work in 2011[17]; however, he also published some findings of the site in a smaller publication in 2001[18]. These publications I found at times somewhat lacking in detail when compared to other authors. Both publications are in French, so any quotes given are my translation.

It is Valloggia's conclusion that this was a completed pyramid, somewhat along the lines of Menkaure, with a portion of granite casing to be found at its lower reaches. Previously several authors would use the Turin Kings list, (which gives Djedefre a reign of 8 years) as evidence to suggest that the site was uncompleted; however, at Khufu's boat pit, Djedefre's name was found suggesting he was responsible for the burial of Khufu's boat: also found in the pit was graffiti, that was not attached to any name, that says;

"year after the eleventh time (census), the first month of peret, the twenty-fourth day"

Valloggia thought, that this graffiti could well belong to Djedefre, and thus relate to his 23rd year (assuming the count was biennial); he did not think that it could be related to Khufu, as more recent evidence suggests that Khufu's reign is at least 27 years. He concludes therefore that Djedefre had ample time to complete his pyramid. In comparison it is thought that Menkaure's reign could be 18 or 22 years, though it has to be kept in mind that the chronology of the old kingdom is often as clear as mud. Why Djedefre would bury a boat, some 23 years after Khufu's death is not made clear; Valloggia merely suggests that the major event of Djedefre's reign was his own complex and that it was at the end of this undertaking that he began the work on the southern boat pits at Khufu's pyramid.

The attribution of the structure to Djedefre also appears to be support the earlier finds; at the end of the descending passage Valloggia found a block in situ, with graffiti in the name of Djedefre, he says; *"This discovery has thus definitively confirmed the identification of the owner of the pyramid, hitherto only known from inscriptions on his statues."*

[17] Abou Rawash I, Le Complexe Funéraire Royal de Rêdjedef, 2011
[18] Au cœur d'une pyramide, une mission archéologique en Egypte. 2001

As to the name of the structure Valloggia gives 'The Firmament of Djedefre'; other suggestions include Aidan Dodson's 'Djedefre is a shining star'[19]; and M&R suggest 'Djedefre is a sehed star', though they do not know the star in question. The structures name has the pyramid determinative, indeed Valloggia mentions the 5th dynasty tomb of Akhethotep at Saqqarah, were among his titles, he describes himself as chief of the pyramid city of Djedefre; here the pyramid determinative is painted showing granite at its bottom like Menkaure's pyramid. Though I would suggest a note of caution; on Shepseskaf's structure, Fakhry states,

"It is curious that in writing the name of this royal tomb, the determinative was usually shown as a pyramid, as in all the other pyramid names. In only a few is the determinative written in its correct form of a sarcophagus, the true shape of the monument."[20]

The natural rock core

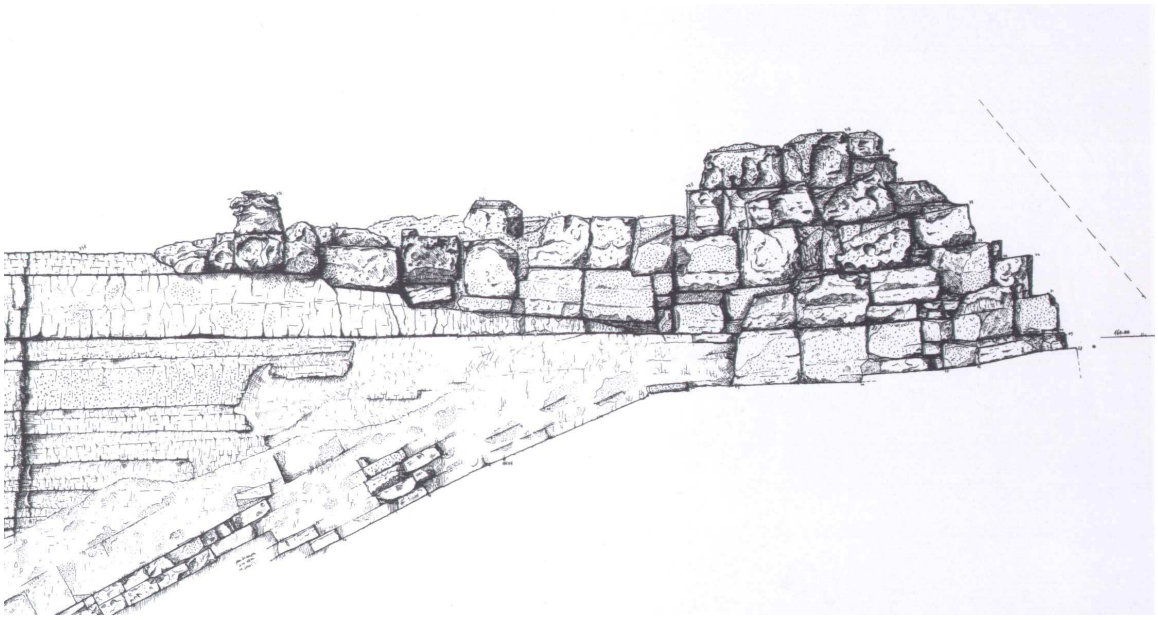
In his work Valloggia comments on how this sizeable rock core accounts for some 44% of the pyramids volume; however on checking his calculations, I believe he is being somewhat over generous. His calculations are based on his mean length of 106.20m and an average height of 12m for the rock core and a height of 68.0m.

To test this I used the case angle believed to be present at Khufu's structure, 14/11 or seked 5 ½. This will give a height of 67.58m, and a total volume of 254066 cubic metres. Using the 12m height, the volume of the truncated pyramid will be 112729 cubic metres, or 44.37% of the total pyramid volume. However, it appears Valloggia's calculations have not taken into account, any backing stones, casing stones, as well as material for the entrance trench and pit; further the slope of the natural rock appears not to be taken into account. In Short, his calculations are based on a homogenous truncated pyramid of 12m height; other factors appear not to be taken into account in his calculations.

[19] The Pyramids of Ancient Egypt, pg 59.
[20] The Pyramids, second edition, pg 152.

The above image will hopefully make things clear. The area bounded by the red lines, is the truncated part of the pyramid, this homogenous area will account for 44% of total pyramid. The pink areas are areas that have to be made up of core, backing and casing stones; also to be taken into consideration are the areas of the trench and pit that encroach into the natural rock.

The natural rock level above, by the entrance is just over 1m below the 160 alt level, (the north face foundation is given as alt 157.93m). We can also see were the natural rock ends and abuts against laid masonry. This junction is around 13m from the face of the casing.



The above sectional drawing by Valloggia shows the area in the last photograph. Here we see the natural rock rising to the south and were the masonry runs out, it levels somewhat to join the offset that surrounds the pit.

Looking south from the masonry entrance

Offset can be seen running around the pit and continuing along the trench

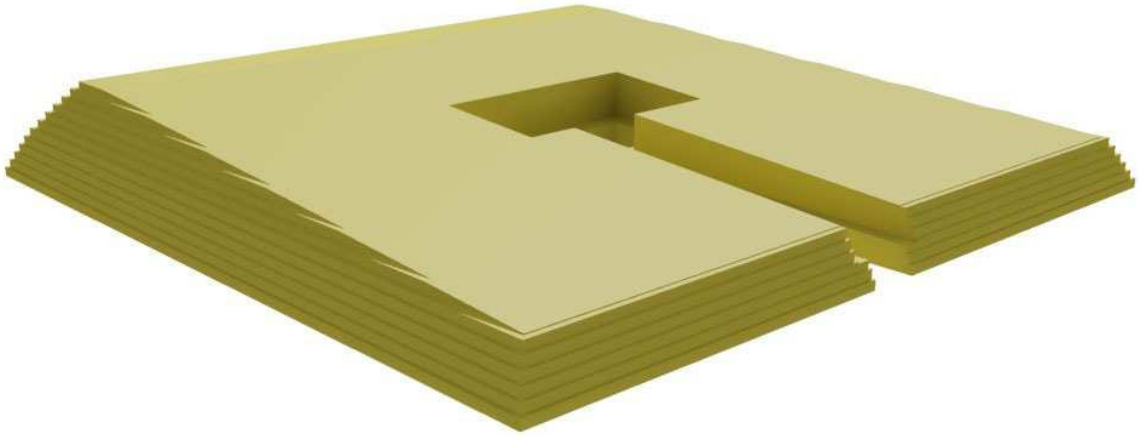
View of east side, rock core and masonry visible

South side view

West side (This side was not fully cleared, hence the trenches)

South-west corner (Giza in background)

North side masonry



The image above is a basic 3D reconstruction I made to try and calculate the volume of the natural rock. Based on information from M&R and Valloggia's work; though ultimately a more detailed survey of the natural rock is required for a more accurate estimate. Based on a rock base of 98m, height of 12m at south end, reducing to 6m at north end, and including pit and trench cut out from base level, it amounts to 30% of theoretical pyramid volume. Though I suspect this is a conservative estimate, looking at the

photographs available to me, I suspect this rock volume could be less; also to be kept in mind, is the volume of the pit and trench, that would need to be refilled.

My previous pyramid model, based on a 14/11 slope, gave a total pyramid volume of 254066 cubic metres; 30% of this is 76220 cubic metres, leaving 177846 cubic metres of stone to be quarried, from local and other quarries, such as Aswan and Turah. If we allow 20000 cubic metres for fine casing, we are roughly looking for 157846 cubic metres of local stone.

In Valloggia's report he mentions a visit to an old quarry, located south of the mastaba fields (though on his map he has the quarry marked immediately west of the mastaba fields). Here he gives the exploited stone mass at around 195000 to 215000 cubic metres of stone, which he suggests would perfectly meet the needs of the pyramid. How he arrives at this figure is not clear, no detail is given to enable one to check; in the *Lost pyramid of Djedefre* documentary, this quarry was reported to be still in use today. Whether any consideration has been taken into account as to later quarrying activities, by later dynasties etc is unknown.

Quarrying is not an efficient operation, much waste can be generated in the extraction of material; I have seen some estimates ranging from 30 to 50% waste during the quarrying process. These blocks, such as casing blocks for example are further processed on site, by significant removal of material left to protect their faces, resulting in yet more waste (one can only imagine the huge amount of waste if Menkaure's granite was all dressed)

Above, I suggested 157846 cubic metres of local stone was required, if we add 30% for waste, this increase's to 205200 cubic metres needing to be extracted, which on its own, is nearly exhausting the quarry (50 percent would exhaust it, being 236768 cubic metres needed). To this total, has to be added the unknown amount required for the mastaba fields, adjacent to the quarry, which appears to be considerable; and let us not forget the huge causeway that Perring says was 50% constructed out of masonry. There might even be a harbour, valley temple etc that might place demands on this quarry.

As a layperson, I feel more research is required, to accurately determine the stone requirements for Djedefre's complex and the mastaba fields; as it stands, it would appear the quarry is not large enough, or other quarries are

yet to be discovered. If no other quarries are to be discovered, it might suggest an unfinished pyramid; yet given Djedefre's long reign, that would appear unlikely, but then we have the extensive use of mud brick and poor quality temple/court, enclosure walls etc; in short, compared to Khufu's complex, its fairly poor quality. The manpower and wherewithal must surely have still been available to Djedefre to do a better job than what we see at Abu-Rawash; Khafre's complex is surely proof of that. How is this anomaly to be explained? It maybe that what we see at Abu-Rawash was not a pyramid but rather a temple along the lines as I described at the Great Pit of Zawiyet el-Aryan.

The Superstructure

Valloggia after clearing the debris down to bedrock, and looking at mortar traces and block impressions, gives the following lengths for the pyramid as,

N 106.220. **E** 106.132. **S** 106.006. **W** 106.007m.

This provides a mean of 106.09m; though Valloggia generally accepts a mean of 106.20m, which he uses in his volume calculation, and in his 2001 book, he also gives a value of 106.20m. He believed the error on the above dimensions should not exceed 10cm. The mean offset, relative to the cardinal points is -0.812 degrees.

Valloggia would suggest that the base was 203 cubits and that this was matched by the distance from the pyramids north face to the outer face of the enclosure wall, being 203 cubits (he gives 106.60m). It would seem an odd number and one wonders why it was not a simple 200 cubits, this is what M&R suggest in their drawing, with a further 200 cubits to the wall. There appears to be no limestone pavement fitted against the structure that might help in determining base level, we only have remnants of variable sloping foundations cut in the rock; such that the foundation level varies constantly. As we see in other structures the top of the first course would probably be accurately levelled. Despite this variability in the sloping foundation he states that there was a difference of 17cm between the north face at alt 157.93m and the south face at alt 157.76m.

Above and below, looking at the south-east corner, we can see the sloping foundations running along the south side; though the slope of these foundations diminishes towards the corners to become horizontal.

East side view

North side view

These rock cut sloping foundations Valloggia states as having an average slope of about 12 degrees, how he arrives at this figure is not made clear in his report; though we know that at the corners they diminish to horizontal. The Isida Project in their report was measuring up to 18 degrees.

It is thought these sloping foundations were to add stability to the casing; though not always used in every construction, we have examples to be found at Giza.

In the image above we can see a portion of a sloping foundation trench at the north side of G1B at Giza. A similar sloping trench is also present in G1A, of which M&R state;

"The bottom of the trench is inclined inwards about 17°-18° so as to fix the casing to the rock firmly. In a longitudinal sense, the bottom of the trench is not continuous but presents steps and cuttings which follow the general slanting of the rock and are really only a regularizing of it."

At Giza, it is thought that wedge shaped blocks may have been fitted to the first course with subsequent casing being laid horizontal; something similar may have happened here. Valloggia suggests that the preserved granite casings were around 3 cubits wide (1.57m) by 2 cubits high (1.05m) and 6 cubits long (3.14m)

As to the casing angle of the structure, Valloggia mentions M&R's 60 degree casing block, but goes on to say;

"In fact, the monoliths on the north side of the pyramid show a slope angle of 64°; but, given the inclination of the foundation bed measured at 12°, the actual slope of this face must be reduced to 52°. This corresponds perfectly to the slope angle of the Meidum and Giza pyramids."

However, the Isida-Project was finding foundation angles up to 18 degrees on all sides measured, so we might expect a great variety of granite casing angles. M&R's 60 degree block, could have been fitted to a limestone block of the first course, as Isida were finding some of these limestone blocks inclining at 8 degrees, which would bring M&R's block down to 52 degrees. Not much detail is given about the granite casing monoliths that Valloggia reports as 64 degrees, they don't even warrant a picture in his volume 2, he just provides a drawing showing two blocks, one 3.1m long the other 3.6m, the heights being 1.05m and widths unknown. The original location of where they believed these blocks to have originated, is not given, apart from the north side.

The two granite casing blocks unearthed by Valloggia, exhibit undressed front faces, like M&R's block. In all the reports I have read, I have not come across a casing block with a dressed front face. Valloggia was unable to determine the initial height of the granite casing, though he reports a fragmentary block still in place on the 6th course, some 6.70m above the foundations of the north face.

Found cut into the sloping foundations were many notches and cavities which Valloggia states was intended to accommodate levers to help manoeuvre the final monoliths into position. In his volume 2, fig 128, he provides a drawing of the S.E. corner, were we can see many of these cavities, and to the outside of them he draws a dotted line, which I can only assume is his outline for the casing, which provides him with his 106.20m mean base length (M&R suggested an approximate nucleus of 98m and a casing base of 104.6m (200 cubits). Some notches/cavities, appear at the side of a cutting as if to assist a sideway manoeuvre, but most appear in a line to assist in pushing back the casing stones against the nucleus. However, if this is the case, might we not expect these notches/cavities to be outside of the dotted line; indeed many appear to be up to .6m inside the dotted line. Further, we need to take into account the undressed front faces of the granite blocks, which can be considerable. The edges of the sloping foundation cuts do not necessarily denote the edge of the casing stones, as from other sites we can see the outer edge of the sloping cut extending past the casing.

As previously mentioned there is not much detail in Valloggia's report, to enable one to obtain a clearer picture of how he arrives at his conclusions.

In M&R's report they mention the good greyish limestone blocks that form the foundation for the nucleus stones; in their time, they could only observe this foundation at the N.E. corner and for a small distance on the east side, north of the structures east-west axis. Unfortunately Valloggia provides no detailed information on this greyish foundation stone for the nucleus, so we know no more than in M&R's day; it would be interesting to locate the quarry for this stone, and examine these foundation stones in more detail, to enable us to have a clearer idea of why this limestone was selected and its use by the masons, though it is appears to be finer quality limestone than the core nucleus stones.

Sloping foundations east side, with possible notches/cavities

In the above image, we can see the greyish foundation platform for the nucleus blocks, and from the images I have, it appears that they are also slightly inclined; above the foundation blocks by the descending trench entrance, we appear to have a few more courses of the same stone, running a short distance by the entrance; indeed looking at the course levels either side of the entrance, the impression is one of a lower threshold by the entrance. Several pieces of granite are visible, a part of a column, and by the make shift steps, a piece of granite, that might be one of the casing stones that Valloggia mentions with a face angle of 64 degrees.

In the view above looking in the other direction, we can make out what appears to be a faint line on the granite block, denoting casing angle, with the rough excess left on its front face. These granite fragments obscure the easternmost limit of the grey limestone above the foundation platform that we see in the previous image, but left of the granite block above it appears to revert back to the colour of the standard core blocks.

Above we can see the grey limestone, with notches filled with a pinkish mortar. These fine blocks Valloggia suggest were placed behind the backing stones and were close to a height of 2 cubits; he says, *"These monoliths of limestone, which have retained the traces of the corners allowing to detach them from their bed in the quarry, were fitted upside down, with their notches at the top, to be bound by mortar with the blocks of the next course."*

From the images I have, it appears this fine limestone is only visible at the entrance.

View of masonry, N.E. corner

Close up view of core masonry, traces of pink mortar still visible

M&R's Niche above, in the middle of the east face

Close up view of the niche, and large granite block

M&R comment on the niche;

"In the centre (at least approximate) of the east face of the pyramid is clearly seen a breach made in the nucleus. Here the outermost blocks of the core are about 2.6m. (at the bottom of the excavation they are as much as 3.4m) to the west of the above –mentioned foundation line in blocks of grey limestone. At the sides of the breach some blocks of granite, the only ones still in their original position, are embedded in the limestone masonry. The blocks are broken and have their laying bed inclined to the west. To the south a granite block is over a block of limestone, while to the north it is the contrary: a block of limestone is laid over one of granite. These stones seem to determine the position of two walls at right angles to the nucleus, but the thickness of the walls is not ascertainable, as the sides of the granite show no dressed faces. Moreover, the axis of the breach almost coincides with the axis of the main door of the paved courtyard in front of it and with the axis of the pyramid. Opposite this kind of a niche we can imagine a room, with a stele adherent to the nucleus and having the larger dimension oriented west-east: in fact in the immediate vicinity there are many loose blocks of granite which do not seem to have formed part of the pyramid casing but of normal walls."

They comment that these granite blocks penetrate at least 5.5m inside the line of the grey limestone foundation blocks. They did not dismiss the possibility that these blocks constituted a bonding of the casing with the nucleus, or even granite backing stones.

Valloggia does not comment on M&R's view of this niche in his report, but from Verner's book, he says; *Valloggia disagreed, maintaining that the remains of the mortuary temple could have been located instead on the large and as yet unexamined area north of the pyramid."*

Searches of the northern area, would fail to find any temple.

On the north side of the N.E. corner Valloggia would discover a large limestone slab (2.0m x 0.78m x 0.28m) which was sealed with plaster; on removal of the slab, he discovered that a handful of sand had been thrown in, which he took as a ritual gesture, and that the sand may perhaps have come from the primordial mound of Heliopolis. Aligned on the western side of the N.W. corner, a second smaller slab (0.85m x 0.75m x 0.17m) was found; unfortunately illegal activity at the site caused the removal of this slab, though Valloggia thought it may have held a similar ritual gesture.

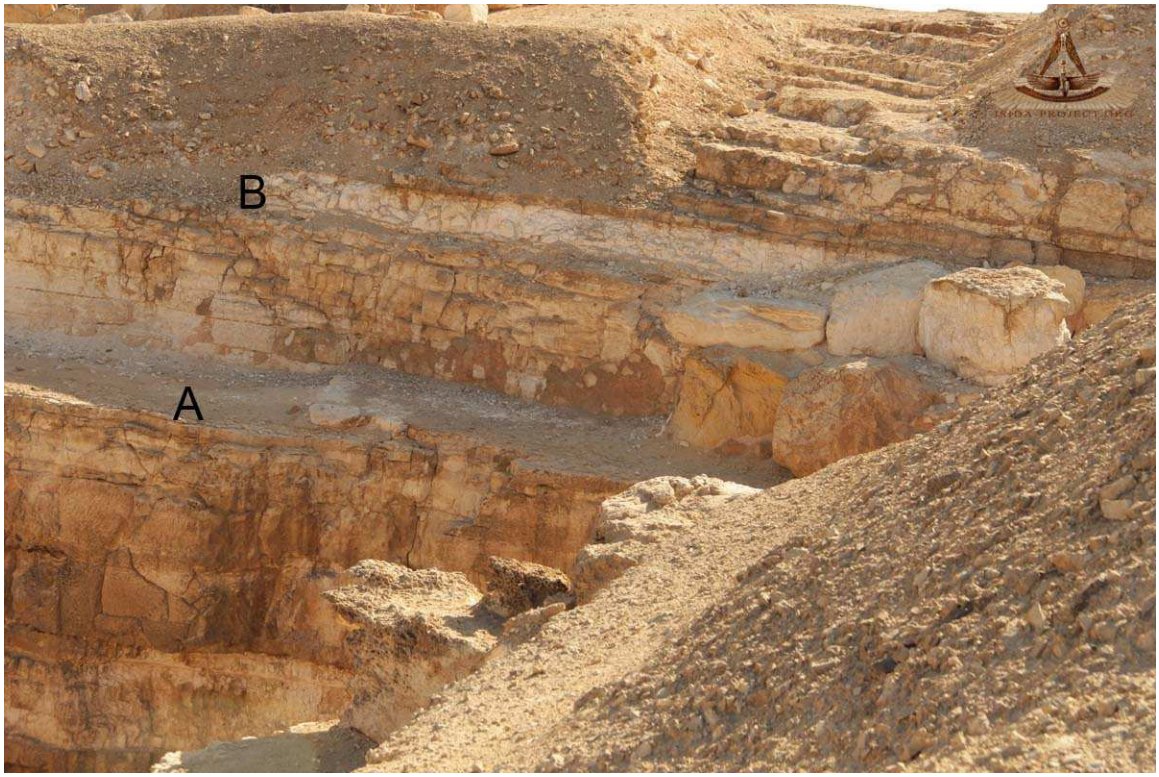
Apart from the previously mentioned notches/cavities found on the sloping foundations, other holes were found outside the dashed lines at the corners; their function is not clear, though it is thought they may have played a part in the alignment of the structure.

As to the intended base dimensions of the structure, it is hard to determine from the available evidence and the limited information that Valloggia provides; the site is badly damaged and other factors such as undressed faces and pavement level will all play a part. There appears to be no stone pavement present around the structure, though a compacted clay path that leads to the entrance from the east was found. The base could be as simple as 200 cubits; values for the cubit can vary, but if we took for example 20.70 inches as an example, it would provide a base length of 105.16m, only .93m short of Valloggia's mean (pg 49). As to the inclination of the courses, Valloggia provides little detail, but from the images, the first two courses may have been inclined somewhat, before becoming horizontal.

Finally to end on the superstructure, we will examine the top of the natural rock outcrop, which slopes down towards the north, previously M&R stated that: *"At the foot of the rough northern face now visible, the rock was insufficient and was integrated with large blocks of coarse masonry to a considerable depth, as may be seen on the sides of the sloping trench leading to the central pit and the northern part of the east and west sides of the nucleus.*

Further south, after a certain way, the rock reappears into steps to receive the integrating masonry. Along the south side of the nucleus, and in the south-central part of the east and west sides, it is easy to see that the integrating masonry was not very deep." (In my 3D reconstruction, page 47, I have maintained a uniform slope to the north face, in order to be conservative; as I feel more research is required to provide a more detailed view of the rock core.)

Valloggia, at the higher south end of the rock out crop, made a trench along the debris ending at the south side of the pit; in order to provide a profile for his section drawings.



In the image above we can see Valloggia's trench across the debris south of the pit and the stratification of the rock. Valloggia says *"The dipping of the limestone layers showed that the pyramid nucleus, at a height of about 12.30m, consisted of a natural rock spur"*. In this image we can see the inclined layers falling to the west, along with the south-north slope of the rock out crop. Were the 12.30m is taken from is not clear, but from his sectional drawing (fig 160 in his Vol 2, and level of ground at alt 158.60m) we will find that the top of the pit at **A** is about 5.7m above ground level, and level **B** is about 7.2m above ground level.

The end of the trench from the image appears to be of a similar height as the offset wall, between levels A&B, suggesting that the natural rock has sloped southwards to a height of 8.7m above ground level, a fall of some 3.6m. (In my 3D reconstruction I had this height at 10m, to allow for uncertainties; but it seems apparent from the images that my conservative model, which accounted for some 30% of total pyramid volume, is somewhat generous)

Valloggia provides some black & white images of this trench across the rock, which again shows the rock layers; from these images I would have expected maybe some levelling cuts across the inclined strata for the laying of core masonry, but none appear visible.

M&R reported that the top of the rock nucleus was covered with a not very thick layer of sand, earth and chippings and that there was no projecting blocks of local limestone visible. Indeed they say, *"it is very likely that the height of the edifice was never greater than it is now, that is to say about 12metres."*

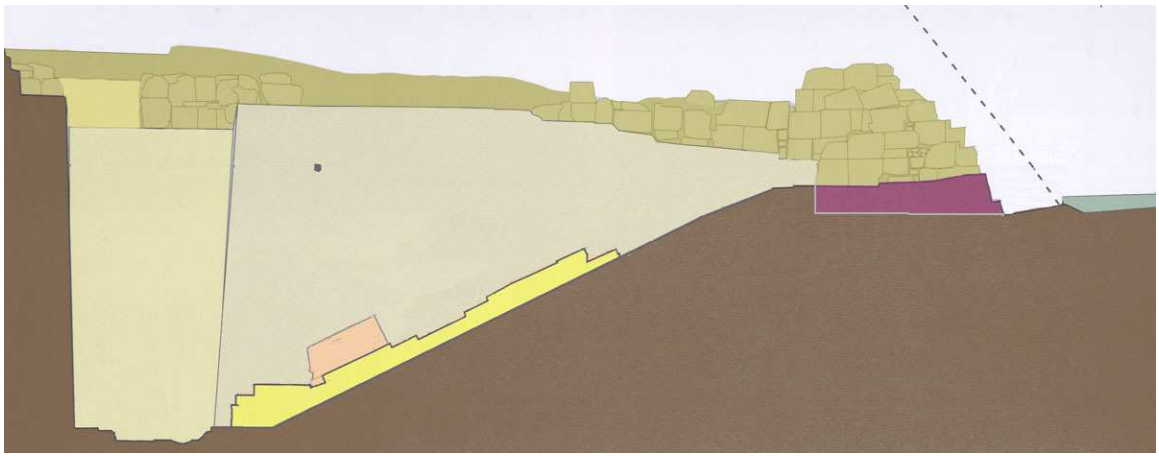
Greater clearance of the debris, present at the top, would give us more information as to whether the structure was carried much higher. From what information we have, I would tend to agree with M&R and that the structure was probably not much higher than we see today; one only has to look at sites such as the Medium pyramid (also used to quarry stone) to see the huge amount of debris along its flanks, and this from a structure that retains the greater bulk of its masonry, yet at Abu Rawash, we are told a complete pyramid has been quarried away, with hardly any debris in comparison.

This leads me to think that we have a similar structure to that of the Great Pit of Zawiyet el-Aryan; here I suggested an open pit and trench open to the skies and surrounded by a low platform, that may have been used as some observatory/temple complex.

The Entrance Trench

Valloggia calculated the theoretical height of the reconstructed pyramid entrance as about 8.2m above the level of the ground which he determined as alt 158.60m and that this entrance was made on the north-south axis of the pyramid.

The entrance floor is said to be made of 4 sections, starting from north we have a fairly level section of around 12.35m, with a slight incline of about 4°; next is a section of 8.50m, sloping at around 23°; then the largest section of 18.0m, sloping at around 27°; ending in a short horizontal section, which leads to the pit of 6.0m.



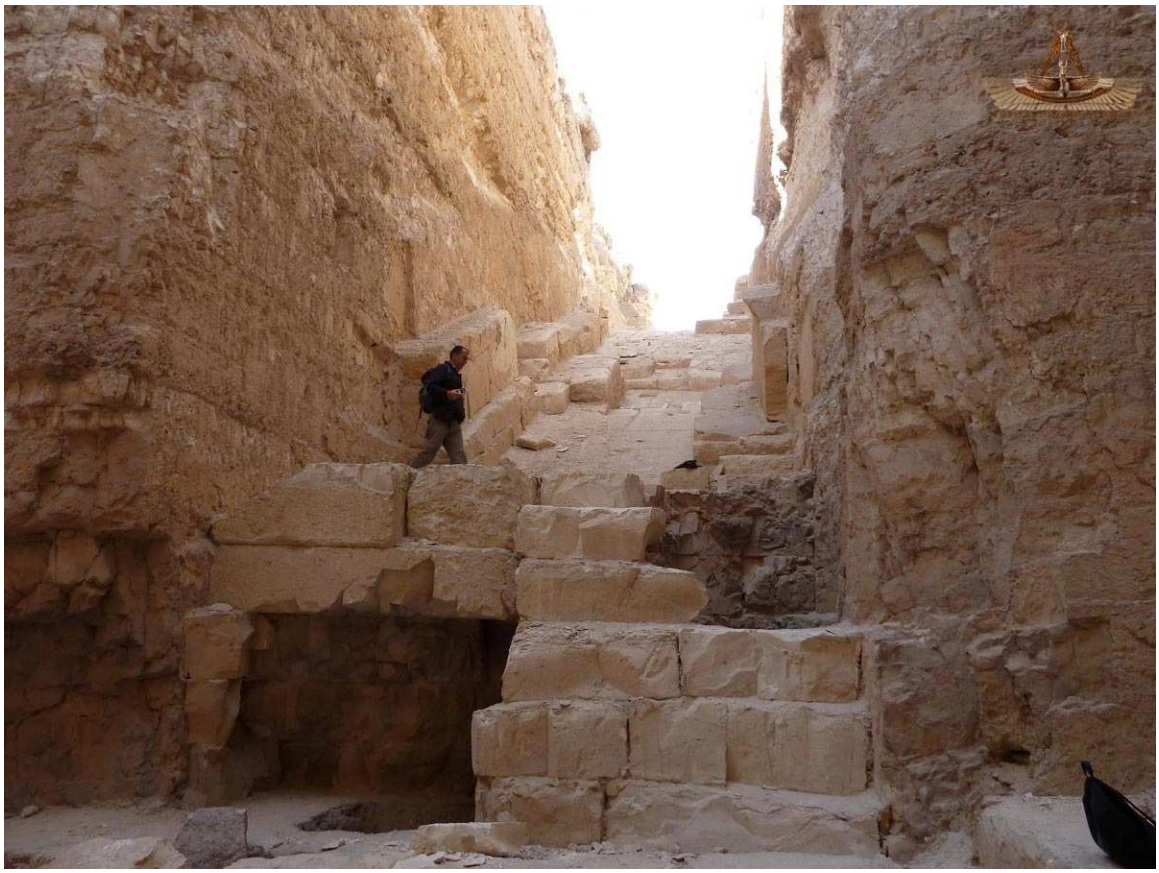
Above, we have a section of the entrance trench and pit, based on Valloggia's drawings. The pit and trench are excavated out of the natural rock; the purple region by the entrance is possibly a mixture of masonry and natural rock (it is hard to determine the makeup from the reports). The yellow area is the surviving fine limestone pavement, with the stone immediately above it the surviving limestone wall cladding.

On the west wall of the trench Valloggia, noticed a rectangular hole, at alt 160.0m, or 1.50m above the ground of the entrance descent. He suggested a plumb line could be dropped from this to denote the southern end of the slope in the natural rock, and that its horizontal distance from the origin of the slope is twice its height, and in effect 2 base on 1 rise, or 26°34′. The Isida project measured angles between 26 & 27 degrees, from the surviving fine limestone.

Though Valloggia has this passage extending at this angle to exit on the pyramid casing, I feel that it is also possible that at the end of the slope at around alt 160.0m, it could have took a horizontal course towards the casing. At the Great Pit of Zawiyet el-Aryan, the sloping entrance had a grand staircase leading to the pit; it is possible that a masonry staircase was present at Abu Rawash, unfortunately the upper course of pavement has mostly been quarried away.

The width of the trench is variable due to the batter present in the sides, he states a maximum width of 5.50m (10 cubits), which from his scale drawings would suggest a measure closer to passage floor level, as the top of the trench looks closer to 6.5m.

Above we start to see some of the surviving fine limestone that formed the passage floor and cladding for the walls. The limestone floor blocks that M&R found in the pit at the north end of the entrance, seem to have disappeared, as they are not mentioned by Valloggia. The fine limestone floor on the trench consists of 5 courses.



Looking up the trench, we see the short horizontal section that leads to the pit, and like the inclined section consists of several courses of fine limestone. Also in this image is the start of what is believed to be a robber's tunnel, at the end of the trench against the east wall.

These five courses seem excessive; Valloggia thought that they were probably to make up for uneven slopes and to obtain a uniform inclined plane. Whatever the reason, it does appear over engineered; indeed we see something similar at Mastaba17 at Meidum, where an excessive number of courses appear to have been used on the limestone façade.

Section of trench floor and five courses of fine limestone

In the second slope section of the entrance trench a cavity was discovered, containing a copper axe blade in a layer of plaster (alt 157.10m). Valloggia believed this to be a foundation deposit and linked to the two cavities previously mentioned in the N.E & N.W corners (alt 157.10 & 158.65m).

In the course of this discovery he mentions several similar cavities/mortises found in other sections, which he says was used during the setting up of the foundations of the limestone flooring blocks; unfortunately he provides no more detail. Though it might be that cavities were left in some blocks, for tenons to engage from an overlaying block to help restrain any sliding forces.

Above we can see some surviving cladding stones mortared to the wall and resting on the fine limestone of the floor. Against the east wall we can see a piece of what looks like a bevelled stone resting on one of the cladding stones. In the foreground, also on the east wall we can see a smooth patch of what appears to be mortar, left after one of the cladding stones was prised away.

Another view of surviving cladding stones on east wall, patches of pink mortar can be seen adhering to the trench walls.

Above we have remaining cladding stones on the west wall, directly opposite those of the east in the previous image; here we appear to have a grouping of smaller blocks, and showing many mortar patches remaining on their faces; suggesting that other masonry was adhering to this face.

Also visible are two patches were the rock appears to have been cut back; whether this is an attempt to key in a limestone block to help restrain the sliding mass of masonry, or an adjustment to align a thicker block of masonry is unclear. There are a few examples of these patches in the trench, though they do not seem to be especially prevalent.

Further up the passage, we see another example of a shallow patch

It is suggested that between these clad walls of the trench, a passage was built; in the *Lost Pyramid of Djedefre* documentary, Salima Ikram suggested that the passage was of granite; however Valloggia states, "*During the excavation, many granite chips were removed from the descent, however, no evidence in situ currently allows to assume that the final corridor was made in this rock."*[21]

Indeed, I would go further and suggest that there is no evidence for any passage built between this cladding; all we have is a fine limestone floor of up to 5 courses, with the 5th course being only visible at the sides of the descent, the middle being quarried away, and a few remaining cladding stones in situ on top of the 5th course. Perring himself states. *"An inclined entrance-passage, and an apartment, lying east and west, have been constructed in an excavation, and have been lined with fine calcareous stone from the Tourah Quarries.* Given that the few pieces of remaining cladding

[21] Au Cœur d'une pyramide 2001

we see today would not be visible in Perring's day due to Debris; it suggests that a considerable amount of cladding remained in his day above the debris.

Valloggia provides a reconstruction of how a passage may have looked in the trench, along with relieving spaces that were found above the Meidum descending passage. In his basic reconstruction, the cladding is omitted; we just see singular blocks forming the passage walls and filling the space to the trench walls. Given the standard pyramid passage width of 2 cubits, and assuming a trench width of 10 cubits, that would leave 4 cubits (2.1m) of masonry either side of the passage.

In the scheme of things, this 2.1m space is not huge, for example, the wall stones by the Bent pyramids north entrance extend to 3m[22], and the roofing block above Khufu's 2 cubit wide passage is 3.65m long by 2.60m high.
In short what need is there, for this cladding? Would it not be more logical to use single stones and key them into the trench walls at variable depths, to help restrain any sliding forces? Instead we have fine limestone clad walls, and given Perring's description, possibly covering the entire natural rock surface of the trench and pit. I find this illogical, cladding and tiling can be found in the Meidum Pyramids main chamber, and in the Bent Pyramids Lower chamber, were it appears to be mortared to the natural rock to form the walls of the chamber, with the corbel roof resting on the natural rock.

I suggest therefore that there may not have been any pyramid style passage built between the trench walls, but rather a processional way, with steps, similar to what we see at the Great Pit of Zawiyet el-Aryan (though at Zawiyet, the better quality rock appears to have no tiling requirement).

[22] Tav 11, fig 7

Looking down at the end of the descending trench, at the bottom of the picture we can see the opening of the robber's tunnel, which was sunk through the fine limestone floor slabs and against the trench wall. In the *Lost pyramid* documentary Salima Ikram suggested that the route to this hole could be traced along the east wall of the trench, and along a white gash visible in the rock; though I have not found any mention of this possible route in Valloggia report.

In the above image, we can see the white gash mentioned in the documentary; however this may just be a poor vein of chalky rock that has eroded away, for if we look to the west wall, we can see a similar eroded vein of rock.

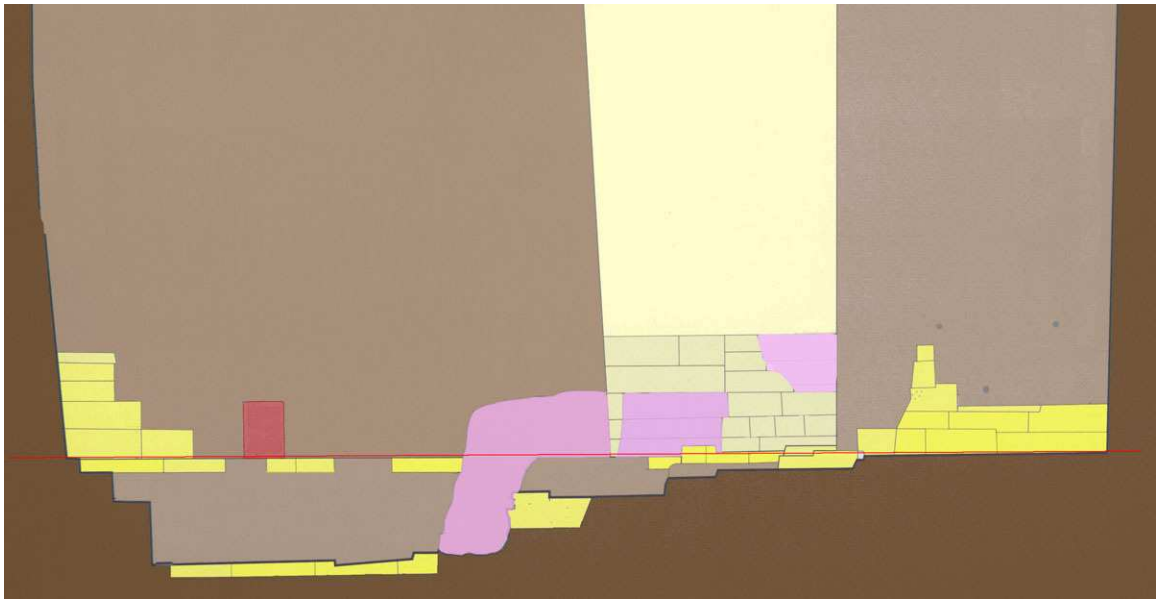
There is evidence of fire being used in this tunnel and Valloggia thought that the tunnel's route through the floor, suggested some prior knowledge of the structure, and that the first looting was not long after the complexes construction.

The Pit

Looking up from the floor of the pit, we can see some of the overhanging masonry from the offset and the void made by the entrance trench.

According to Valloggia, the axis of the pit floor is about 3m west of the trench axis. The top of the pit due to the batter in the sides he gives as 23m x 10m, reducing to 21.0m x 8.0m at foundation level, with total depth about 21m. These can only be rough approximations given the poor nature of the rock, the slope of the offset which is considerable from east to west and south to north. The depth of the pit from north ground level at 158.60m and the main rock foundation level of 144.80m show it to be about 13.80m deep (26 cubits?) the lowest level of the secondary pit is given as 142.30m.

The bottom of the pit is not level, in the western section of the pit, we have a noticeable sort of secondary pit sunk in the floor that Valloggia describes as having a stepped profile of four distinct levels, between alt 144.83m and 142.30m, or some 2.5m deep. A granite block was found in its original location at 144.80m, near the north-west corner (many blocks and fragments of granite were found at these low levels). Like in the descending trench we have some limestone blocks still in their original locations.



In the section of the pit above, based on Valloggia's drawing, we can see the secondary pit in the floor below the red line. This red line appears to be the main level of the pit and lines up with the granite block found in situ and the eastern foundation level. The granite block at 144.80m is some 15.2m (29 cubits) below the 160.0m line, previously mentioned in connection with the slope of the entrance trench.

The purple section is the route of the robber's passage, after descending through the horizontal passage masonry, it arrives at the level of natural rock (144.80m), it then travels south west and undercuts some of the natural rock at the corner of the trench and turns N-S ending in the secondary pit. At this location the tunnel at its lowest is given as approximately 142.60m, while its ceiling is reported at 144.0m; which places it under the level of the granite block, which Valloggia thought may have been part of a granite foundation, placed under the pavement of the vault.

The yellow represent surviving limestone blocks, and it is interesting to note the level of the surviving horizontal passage in comparison to the remnants in the pit (the top of the horizontal passage would originally be higher, as a few courses are missing).

On clearing the rock (144.80m) where the tunnel passes S.W. through the horizontal passage masonry, Valloggia discovered a vertical shaft some 3.1m deep; located approximately on the axis of the descending trench, and somewhat trapezium in shape (1.10m/1.55m x0.90m). Nothing was found inside this trench other than being filled with small limestone chips. Valloggia mentions the pits found in the passages of Meidum and South Dahshur having a similar device. He offers a symbolic explanation for this feature; *"The idea being that passing over a well, the mummy passed through the cave of Sokaris and the tomb of Osiris, both gods of transformation and rebirth. One would find, perhaps, the beginnings of well developed religious conceptions in the royal funeral compositions of the New Kingdom."*

In my previous papers I suggested that such pits were to capture meteoric water that may make its way into the passage. However, this particular shaft appears to have no visible connection to the entrance passage floor, which according to Valloggia's reconstruction[23] could be some 3.4m above the opening of the rock cut shaft. Though it is possible, as we have some courses missing of the passage floor, for a drainage channel to have been made to divert water to the east side and be directed through the masonry to this shaft.

Though I have suggested that the great pit at Zawiyet el-Aryan and here, were somewhat open to the skies; drainage would be a requirement especially in an era when the climate may have been less arid. The great storm that Barsanti describes at Zawiyet el-Aryan and the subsequent disappearance of a large volume of water, may hint at some drainage solutions coming into effect; it may also go someway to explaining the very deep pavements found at both sites.

Some red constructions lines were found inside the pit; Valloggia mentions a horizontal line on the east wall at 147.0m, which he thought could correspond to the assumed level of the sarcophagus foundation. He then goes on to mention a horizontal line on the north wall, framed by three red dots, which he says "*does not indicate, apparently, any significant level"*. Though when I place my scale ruler on his drawing, it closely agrees to a level of 147.0m.

[23] Vol 2, fig 183

One other construction line is mentioned in the secondary pit, with some markings that could not be interpreted, at 143.33m. This line is 3.67m (7 cubits), below the 147.0m line. The lowest altitude of the secondary pit is given as 142.30m, or 1.03m (2 cubits?) below the 143.33m construction

In the image above, the highlighted area in purple shows the route of the tunnel; the yellow area is the opening of the 3.1m shaft. Given that it is on the route of the robber's tunnel, it cannot be excluded that it was made by them; alternatively the robber's followed the route of a drainage system.

In the above image looking west, we can see the secondary pit in the western portion of the pit. Against the south wall several courses of limestone still exist; they highlight the inclination of the rock strata. The highlighted red block is the granite block found at 144.80m; the loose granite block in front of it, obscures some of the block. Below, east view, in the foreground you can just make out the tunnel route into the secondary pit.

Above, looking east through robber's tunnel, yellow area is opening of deep shaft in the rock, shown below.

Along the south wall, we can see several courses remaining, which appear to be built on a shelf of natural rock. This shelf of rock, from Valloggia's drawings appears to be about 2m above the top surface of the pavement at the bottom of the secondary pit, with the shelf itself being at the 144.80m level, the same as the granite block, which was found against the north wall.

In the area of the secondary pit, Valloggia says it has a stepped profile of four distinct levels, between 144.83m and 142.30m.

In the bottom of this pit was found a large wooden beam, thought to have been used in the dismantling of the structure, which was dated to the Roman era.

Another view of the secondary pit, which contains various fragments of granite. Valloggia found a small piece of granite, which he thought was part of one of the butting beams that would make up the roof of the burial chamber. The north south distance between the rock walls of the secondary pit are around 5.3m (10 cubits?)

View of north-east corner, below, view of south-east corner

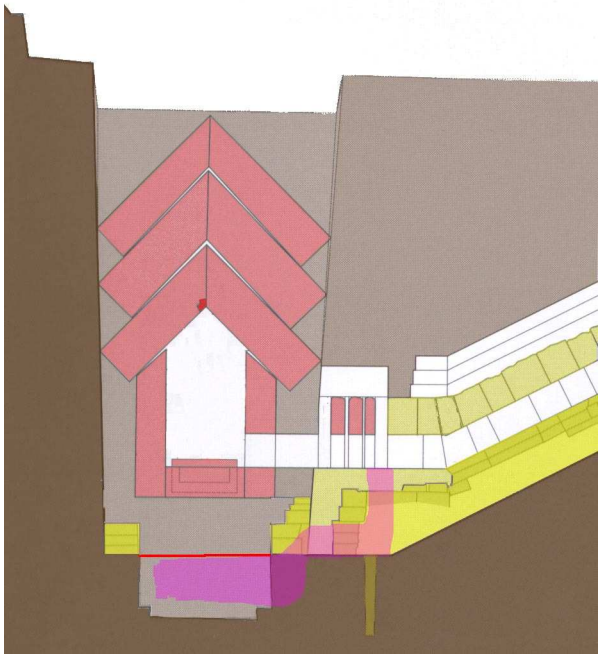
Above, the taller granite block on the left is a remnant still mortared to the wall. Below is one of the red construction lines.

Looking up at the south-west corner, we can see remains of pink mortar

When it comes to Valloggia's reconstruction of the funerary apartments, he opts for a design similar to M&R's (see pg 25). Though he accepts that there are no remains of the funerary apartments in situ, he points out two indicators that they did exist; the first is the fragment of granite that he says probably came from one of the roofing beams. He provides a photograph of this small fragment in his Vol 2, but no other details such as face angles, though in his reconstruction drawing, he shows this piece to be from the apex of two ceiling blocks with an angle of about 45 degrees. This small granite fragment I feel is very tenuous and it cannot be excluded that such a fragment may have had an altogether different purpose.

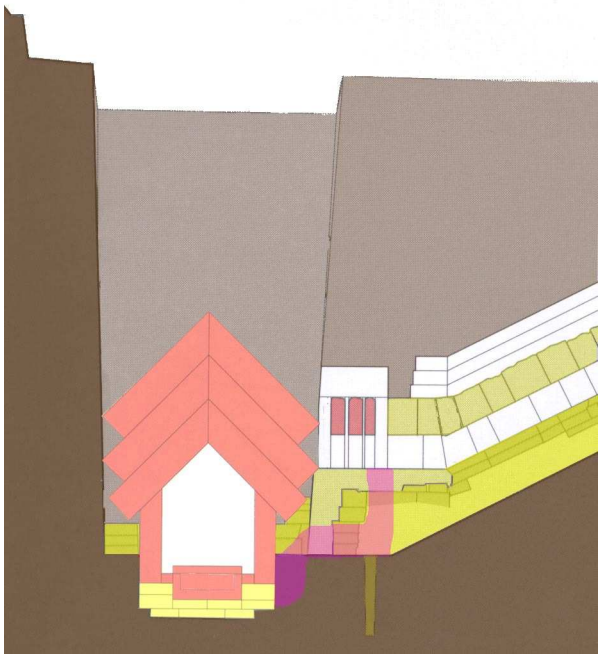
The second indicator is the robber's tunnel, which he says was used to access the tomb from its basement. To me this seems illogical, though he thinks this tunnel was made not far from the date of complex construction, thermo luminescence dating of it was unsuccessful. It is generally thought that most pyramids were violated shortly after their construction, and possibly by those who built them, who had good knowledge of their layout and security features. Given this, and the location of the start of the tunnel

on the short horizontal passage and using Valloggia's reconstruction, the tunnel seems to take an illogical route.

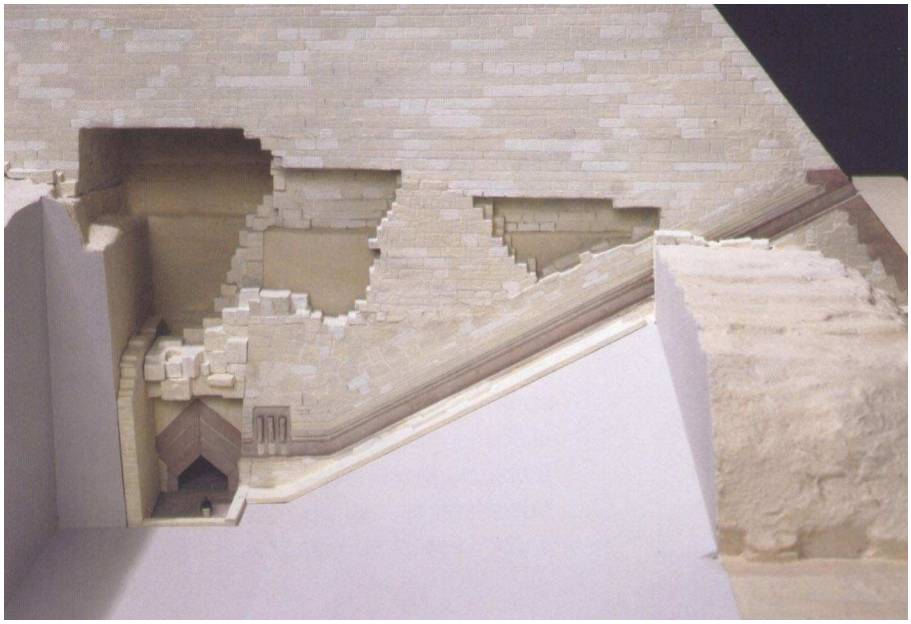


The image above is based on Valloggia's reconstruction. Here he uses a design that we see common in later 5th and 6th dynasty pyramids; a descending passage passes through three portcullis blocks and would enter an antechamber, and from here a passage would head west into the main burial chamber, were he sees a granite sarcophagus sunk in the floor, like in Khafre's pyramid. The tunnel in this reconstruction would appear to descend vertically for some 3.4m, before heading S.W. through the floor masonry and over the vertical shaft, and entering into the secondary pit. The red line denotes the 144.80m level, where the granite block was found, and Valloggia thought could be the start of a granite basement for the chamber above; the ceiling of the tunnel here he gives as 144.0m and its ground as 142.60m.

Such a route makes little sense, having tunnelled to some depth to arrive under the granite basement; the robber's then have the arduous task to tunnel upwards through some 3.4m of granite and pierce into the burial chamber. Surely any robbers knowing the layout would hardly take such a route, when smashing or prising up the portcullises would be the easiest option.



There appears to be some confusion in Valloggia's reconstruction, shown in the previous page; for in his 2001 book, he provides a reconstruction, showing the chamber in a different location as in the image above.



He even provides the above CGI image, showing the much lower position of the burial chamber. In this reconstruction, he describes the funerary apartments as being divided into three contiguous sectors, but of different altitudes, of the burial chamber, he says; *"The sepulchral chamber,*

arranged in a pit of about 5.25m x 7.10m, was oriented east-west. Given the deepening of the foundation level below the burial chamber, it is tempting to assume that the royal sarcophagus, as well as the canopic chest, were embedded in the thickness of the granite tiling,"

It seems clear from the above that he sees the secondary pit as the home for the sarcophagus; maybe the route of the tunnel influenced his decision at this time. He goes on to say, *"As for the roof of the vault, several indications are in favour of a herringbone vault, whose north and south counterstains appear to have remained in place."*

For some reason, not made clear in his later two volume excavation report, he has discarded the lower chamber reconstruction, and raised the burial chamber up to the level of the horizontal passage; but I have to ask, what happened to the counterstains, or markings left on the north and south walls for these pent roofing beams? These markings cannot so easily be raised. These markings are not mentioned in his later excavation report, neither are any photographs provided in his publications.

In summary, his 2001 reconstruction has the burial chamber in the secondary pit, and he mentions marks on the north and south walls to support the idea of a pent roof at this level. Then in his later two volume excavation report, he provides a new reconstruction, with the chamber greatly raised to align with the horizontal passage and no mention of any markings on the north and south walls (in the many images I have of the walls of the pit, I have been unable to see anything definitive that could be ascribed to roofing beams). As a layperson I find the whole thing very unsatisfactory.

At Zawiyet el-Aryan and Abu-Rawash, Egyptology have imposed later 5th and 6th dynasty chamber designs onto the pit floors of these two locations; however it must be stressed that not one shred of archaeological evidence exists to prove that these reconstructions are correct, they can only be hypothetical. Both locations from the earliest days have been assumed to be pyramids, which by its nature, limits the choice of chamber designs that can fit into the available space, hence the favoured design that we see in later dynasties.

In my Zawiyet el-Aryan paper, I suggested that nothing was built on the pit floor and that it was surmounted by a low platform, and that the structure may have been some sort of temple/observatory; given the similarities at

Abu-Rawash, I feel it not unreasonable to suggest that this site too, was a low mound used as some temple/ observatory.

In the above reconstruction of the pit of Zawiyet el-Aryan, we see a granite path leading to the oval tub, which was hollowed out of a single monolithic granite block. The visible granite above was not a single course, but it extended through 4 courses to a depth of some 4.5m and lay on the bedrock.

A similar thing may have happened at Abu Rawash, where the granite block found in situ by the secondary pit, would be some 3.4m below the pit floor; though it is possible that it was deeper still, if the space in the secondary pit was also filled with granite. Though the pit of Abu Rawash is inferior in many ways, be it in quality and size, they both display similar traits. The

unusual oval granite tub might be matched by the curved sarcophagus fragments found by Petrie at Abu Rawash. At Abu Rawash it's possible that a stairway similar to the grand staircase at Zawiyet el-Aryan, lead down to a fine granite path, that would travel west to a curved granite box. Whether large monolithic granite blocks such as we see at Zawiyet were used is unknown, but it's possible that such a granite path could have existed and extended for many metres, down to bedrock.

The quality of the natural rock at Zawiyet is also superior, with Moret describing it as, *"the limestone plateau was simply hollowed out, but the cross-sections as smooth a surface as a roll of butter cut with a thread."* However at Abu-Rawash the poor rock required the pit sides to be clad with fine limestone; likewise any stairs leading to the pit would have to be made of masonry (at Zawiyet the grand stairs were cut in the rock). I somewhat doubt the need for the walls of the pit to be clad in fine limestone, and then to be filled with the masonry of funerary apartments, the cladding seems superfluous.

The offset that surrounds the pit at Abu Rawash, which has remains of headers protruding into the pit, might be a method of reducing the pits aperture for observation, as well as protection from the rain. Rain would always be an issue, and to avoid any standing water, drainage would be a requirement; the storm reported at Zawiyet, suggests some drainage system coming into effect. It is not known if any similar offset is present at Zawiyet, only future excavation can tell us, Barsanti's drawings suggest a sort of bevel around the edge of the pit, some 2m high, could this be debris sloped on an offset?

In his excavations at Zawiyet, Barsanti was convinced that a hidden chamber lay under the floor of the pit, and in its western end; was such thinking in the mind of the people who made the robbers tunnel at Abu Rawash? Might the secondary pit and these deep floors, serve some function for the drainage of water? If such pits were partially open to the skies and regular temple functions enacted on the floor of the pit, rain would be a major concern for the builders; after all the granite tub at Zawiyet is at floor level, and save for a small lip would easily be inundated with water.

The Enclosure Walls

In the above image, we get a rough idea of the inner and outer enclosure walls. The enclosure walls themselves are not fine quality limestone walls, but rough fieldstone walls, that were given a clay coating. The exterior face of the northern wall from the face of the pyramid, is given as 106.60m,

which Valloggia says is the same as the base of the pyramid, at 203 cubits. (M&R thought a base of 200 cubits and 200 cubits to the interior face of the wall)

The outer wall is given as about 2.6m thick (5 cubits) with a possible batter to both sides; Valloggia thought the minimal height of the wall could be 6.50m. The northern and western sections of the outer wall run parallel, whereas the south and east are clearly not, and may be due to the topography of the ground. The east wall runs close to the edge of the cliff and parts of its foundation had to be supported by limestone blocks.

The inner enclosure wall, was enlarged, originally it would have been 2.10m wide (4cubits, yellow portion in image), it was then widened by two cubits on each side, bringing the total width to 4.20m (8 cubits). The distance from the pyramid to the inner enclosure wall is 6.25m on north and west sides; the southern side is larger at about 8.75m. The enlargement of this wall, meant the closure of original entrance C, found at the N.E Corner; a new entrance was made further west. The wall takes a circuitous route along its east side, enclosing various buildings, the boat pit, and the so-called satellite pyramid at the S.E.corner; here the short southern part of the wall appears to match the angle of the outer enclosure walls south side.

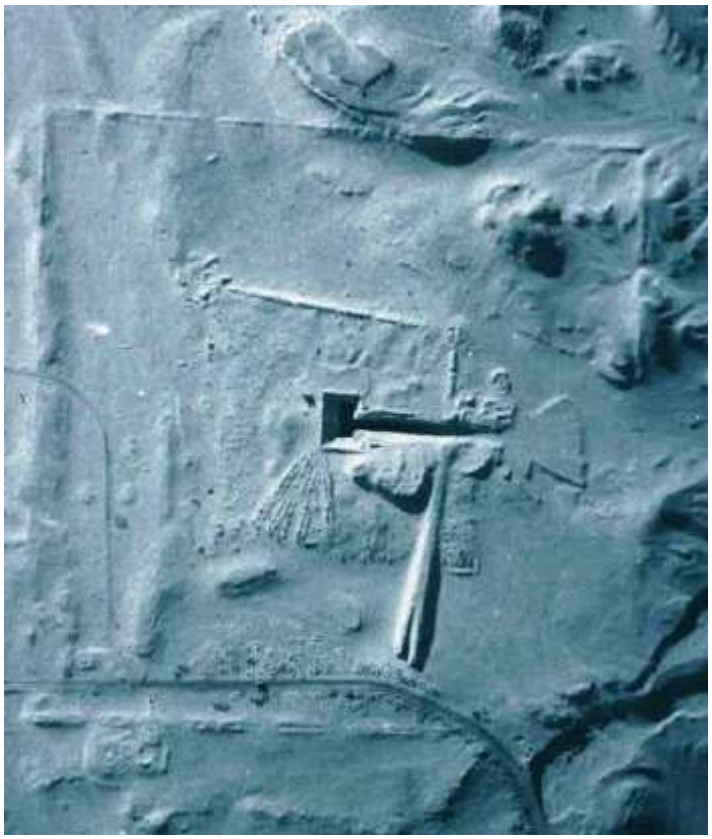
In the outer enclosures north wall, we find three entrances, the blue entrance was a later change, and originally it would be positioned slightly west; this original entrance, Valloggia thought was aligned to the intersection of the diagonals of the pit. The new entrance was moved east to align with the N-S axis of the pyramid; this necessitated a slight change at the north end of the path that would lead to doors ABC.

Valloggia states that a 3-4-5 triangle, placed in the centre of the original opening, would result in its hypotenuse, going through doors ABC. The other entrance on the north side is around 48.55m from the west wall and here its N-S axis is aligned to the outer face of the inner enclosure walls first phase.

The outer enclosures west wall is said to be 59.85m from the base, and there is one entrance, whose E-W axis is said to align to the inside face of the inner enclosure walls first phase.

The last entrance in the outer enclosure wall is to be found on its south side around 103.43m from the base; Valloggia suggests that its position could have been motivated by a 3-4-5 triangle, placed at door A. As for the east-west direction of the wall, he suggests that it could have been placed with a right angled triangle, whose sides are proportional 4-5.

All the doors in the outer enclosure are similar in size at around 3.7m wide (7 cubits) and each have 2 cubit deep piers, on their inner faces, possibly for wooden doors to abut against. Valloggia's excavations of these walls, allowed him to state that they *"perfectly established that these walls were made after the completion of the construction of the royal pyramid"*.



In the image above of the Great pit of Zawiyet el-Aryan, we can clearly see the outer enclosure wall, which begs the question, if such walls were built after completion of the pyramid, why is it here? After all, Egyptology tells us that this pyramid never really got started, but for a hole in the ground. Yet at this site, similar sloping foundations were found, as were large nucleus blocks and large quantities of granite chippings. I suspect that if the site had

a similar natural rock core like we see at Abu Rawash, the story might be different, and that we had yet another pyramid that had been quarried away.

Having so many fine entrances available to the outer enclosure seems strange; surely a single entrance in the north from the causeway was sufficient, what need was there for all these entrances if the structure was a pyramid? Might they have a more practical function for say a temple/observatory? There are indications that the corners of the enclosure walls were rounded.

From the blue entrance, a path heads in a south east direction, it is around 2.50m wide and flanked by two side walls about 2 cubits thick (1.05m); (M&R's section of this path, TAV 2, fig 5, shows the width of the path as around 2.10m (4 cubits) and the side walls with a thickness of .70m, which is quite different to Valloggia's measures). At the end of this path, there appear to be three access options through the inner enclosure wall, at doors ABC; subsequent modifications would alter this access arrangement, as already mentioned, door C would be relocated further west due to enlargement of the inner enclosure wall, with its west side aligned with the north east corner of the pyramid. Door A would become abandoned and blocked up; with Door B being the only original door, not to be moved or blocked up, it would become a secondary access at the end of a corridor, created when the service areas were extended to the north.

It is thought that originally door C would provide access to the worship buildings, and doors A&B providing access to the service areas. The doors are fairly similar, believed to be wooden double leafed doors with openings of two cubits (though door C is slightly wider at 2.5 cubits) and widening to 3 cubits, through the remainder of the wall. When door C was relocated, the opportunity was taken to build a stone drainage channel through the old entrance before blocking up the wall.

In the image above we can see the extension of the wall at the north east corner; door A was blocked and further rooms were added in this section. The new area created by the extension, meant a new doorway was created opposite the access path and a corridor created to join with the original door B, with new buildings either side. The east wall of this extension, does not follow the N-S direction of the wall with door A, but is angled around 7 degrees, in order to avoid a limestone outcrop. These various changes to the

site appear to have been done in the 4th, 5th and 6th dynasties, indeed Valloggia states that the funerary cult had been maintained at the site until the end of the old kingdom.

In the N.E extension area, several phases were noted, with the bulk attributed to the 4th dynasty, changes from the 6th dynasty were also noted, such as a religious installation, complete with a limestone libation basin. The area appears to be a mix of habitation, stores and production areas. Valloggia reports a ceramic dump north east of the inner enclosure wall, that yielded an estimated 45,000 cups and miniature votive jars, dating from Djedefre to Neferirkare (5th dynasty).

The original area which contained habitation and stores, and was accessed through doors A & B would also be subject to modifications. The blocking of door A allowed for extra priest accommodation, resulting in a terraced row of 4 or 5 houses against the eastern enclosure wall; store rooms were also enlarged against the north wall. All these habitations, store rooms etc were built of mud brick, including those in the N.E. extension area.

As several authors have commented, the layout of the temple complex is very unusual in many ways, take for example the priest accommodation. In an article by *archaeologynewsnetwork.blogspot.co.uk/2015/05/could-djedefre-pyramid-be-solar-temple.html* it states;

'The second anomaly, and the one tougher to explain, is the presence of what seems to be dwellings for priests beside the pyramid, along with storage areas. "Usually this is something you expect in the valley temples," said Baud. "Everything is on the plateau, it is quite strange."

Michel Baud was part of the team that worked on the site, and excavated in the cemetery 1.5km's to the east, where it is believed some of the mastaba's belonged to Djedefre's sons. The presence of this accommodation and stores might be better understood if instead of seeing this structure as a pyramid, we look at it as a possible temple/observatory. One can imagine lengthy night time and daytime observations by several priests, which would require accommodation and stores to sustain them.

Paths

Some of the paths have left traces, the original path from door C was discovered running N-S next to the enclosure wall; but when this door was relocated further west, new paths bordered by brick lines appear to have been created. A diagonal path some 1.60m (3 cubits) runs to the N.E corner of the courtyard's north wall; an L shaped path, slightly wider at 2.10m (4 cubits) also runs along the courtyards north wall and appears to follow the outline of the chapel/hypostyle hall; the path also runs along the pyramids east face towards the enclosure wall entrance.

A yet wider path 2.60m (5 cubits) was found running east-west along the inner face of the enclosure wall from the enclosure entrance to the vicinity of the descent; no existence of this path was noted on the western side of the pyramids entrance. It might seem strange to build a path to the pyramid entrance, highlighting its location; or perhaps the path was a permanent access route for priests, who could have mounted steps to gain access to the pits entrance, and perform their functions.

The destination of this path Valloggia says is unclear, and in front of the trench entrance he could find no trace of a construction that could be compared to a possible chapel; however he did find two statue fragments in gneiss, discovered above the level of the passage, in layers of disturbed embankments.

The Courtyard

The courtyard is said to occupy an area of some 25.50m by 16.00m, badly destroyed, what remains today is an under-pavement of limestone, which was laid to compensate for the irregularities of the ground. On top of this pavement it is thought that a basalt pavement was laid, similar to what we see at Khufu's temple. Fragments of basalt were discovered in the area of the courtyard, though none in situ. Valloggia's reconstruction of this courtyard includes porticoes on three sides, based on other funerary temples of the time.

The courtyard appears to have had up to 5 entrances, one in its north and south walls, one to the boat pit, and two for the chapel/hypostyle hall.

Chapel/hypostyle Hall

The chapel/hypostyle hall, east of the courtyard is said to occupy an area of some 19.20m by 9.40m, and built of mud brick; Chassinat describes the walls as ranging from 1m to 2m thick, with a 3cm plaster coating of a light yellow hue. The hypostyle hall was accessed through the courtyard (the remains are too badly damaged to deduce other access points, such as from the east, which cannot be excluded), and is thought to be approximately 6.50m by 5.30m; here was found 3 bases for limestone columns about 90cm in diameter, placed on the N-S axis of the room.

In the hypostyle hall Chassinat found the statue remains of 5 statues; 3 sons, 2 girls, all believed to be members of Djedefre's family. The statues were reported as facing east, and four of the statue pedestals were in groups of two, at the foot of two of the columns; the 5th statue further north almost touched the west wall, and near it was found a small wooden hippopotamus, also nearby was found a painted limestone sphinx,

Immediately north of the hypostyle hall, is believed to be a chapel, again this is accessed through the courtyard. It is thought to consist of 3 contiguous rooms, the first two rooms are of similar size, the first by the entrance is about 2.25m x 3.20m and the second, immediately east of the first is 2.15m x 3.20m (4 x 6 cubits?). In the N.E. corner of this room a passage goes north through the near 2m thick brick wall into the last room, which Valloggia calls the chapel; this measures approximately 2.67m x 5.34m (5 x 10 cubits).

The Chapel of the Royal Cult

This chapel is directly south of the courtyard, the south wall of the courtyard, being the north wall of the chapel. Like all the other structures it is built of mud brick. On the outside it is reported as being 11.53m x 8.35m (22 x 16 cubits), with walls two cubits thick. Valloggia thought the chapel was inspired by the stone temple found against the east face of the Meidum pyramid (though there are significant differences between the two).

The entrance was in the S.E. corner, which opened into an oblong space 5.10m x 1.60m, whose north end had a door giving access to a room 3.10m x 2.60m. In the first oblong space a sizeable opening at its north end on the west wall of about 2.20m gives access to a similar sized space. This west

wall acts as a chicane and probably prevents prying eyes from the chapel entrance. In the S.W corner of the second oblong space we have an entrance to what is thought to be a courtyard that opens onto the pyramid face, of some 6.10m x 1.40m. At the north end of this courtyard, another entrance was found to connect to two adjoining rooms of 2.45m x 2.40m and 3.00m x 1.00m.

In the second oblong space, and set into the base of its south mud brick wall, is found a monolithic limestone drainage channel; some 1.44m long, with its outer section being 33cm x 25cm high, the internal section being 15cm x 13cm high. The ground appeared slightly lower in the vicinity of this channel and it drained into a basin cut out of the limestone rock of 3 by 2 cubits, about 1m south of the chapel's outer wall. (A similar channel can be found leading north from Shepseskaf's temple, into a stone basin, and another to an earthen basin; see my Mastaba el-Fara'un guide)

All the above structures in the temple area were badly eroded away, leaving just the wall bases, the form of the roofs is not known, though Valloggia has suggested brick vaults or flat wooden roofs.

The Boat Pit

The boat pit is aligned with the chapel/hypostyle hall, and is bordered by the enclosure wall on its east and south sides; to its west side an extension of the enclosure wall appears to travel north and end by the south wall of the court. Its north border was the south wall of the hypostyle hall, and from this wall a small section of mud brick wall, extended south and ended at the entrance to the boat pit from the court. There appear to be two entrances to the boat pit, one at the S.E. corner of the court (width 1.55m) and one in the N.E. corner of the pits enclosure (about .80m wide), which probably joined the path down the east side of the chapel/hypostyle hall.

The total area of the pit enclosure is about 38.00m x 8.00m, with the actual cavity around 36.30m long with a maximum width of 4.25m. Levelings of the rock surface of 2 to 3 cubits, either side of the pit suggested large limestone monoliths of around 10 cubits in length, which would cover the pit.

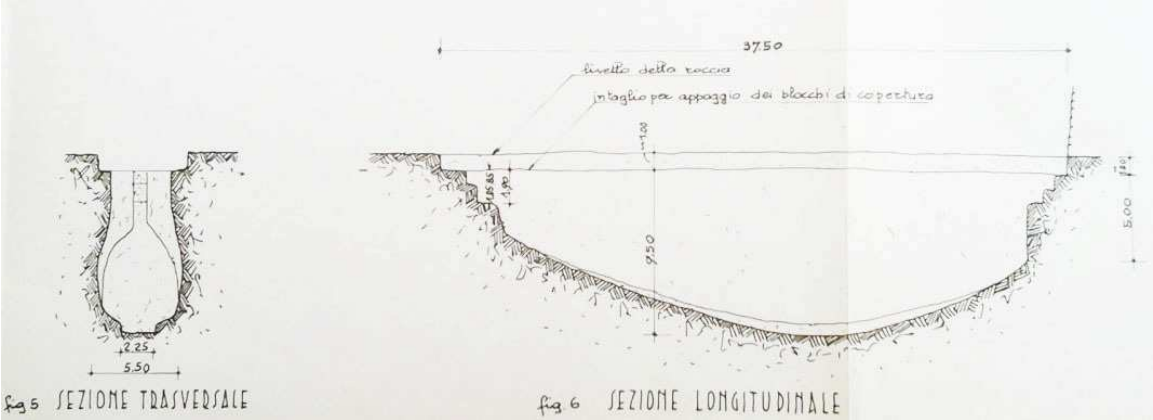


fig 5 SEZIONE TRASVERSALE

fig 6 SEZIONE LONGITUDINALE

Above we have sections of the boat pit, made by M&R; the pit itself takes the shape of a boat, we even have what appears to be a flat band at the bottom of the pit, as if to mimic the keel of the ship. Even the sides of the cavity appear to mimic the shape of the hull, the cavity itself narrows at the top, such that the beam of any boat that matched the profile lower down, could not be introduced into the pit without dismantling.

Image of boat pit

The Boat pit was found to contain debris and statue fragments, though strangely not a piece of wood, rope or anything that could be connected to a boat was found in the pit. Indeed not all boat pits are alike, the two boats attributed to Djedefre south of Khufu's pyramid, of which dismantled boats were found, are definitely not boat shaped; though on the east side of his pyramid we do find empty boat shaped pits. It may be possible that we have empty symbolic boat pits, shaped like boats; in earlier dynasties we find mud brick boats and at Userkaf's solar temple, we find a stone replica boat. Whatever the function of this boat pit at Abu-Rawash, what strikes me as strange is what Djedefre built at Giza.

For decades the general view of Djedefre's boat pits at Giza, could be summed up by the following from Zahi Hawass;[24]

"The days before the death of Khufu, when the once-powerful king lay helpless on his sickbed, were filled with turmoil in the royal family. And then he died, and the passing of the god was announced to the land. Grief blanketed the country, and within the palace there were whispers and rumours. Would Djedefre succeed, or would his half brother Khafre take the throne from him? But Djedefre was the elder, the official crown prince, and had influence within the royal council. And so he won the battle and took over preparations for his father's burial. He asked the chief carpenter, Intyshedu, to finish the dismantling of two great wooden boats that were to be placed inside the two boat pits south of his father's pyramid. As evidence for his role in his father's burial, he had his name, newly enclosed inside the royal cartouche, inscribed eighteen times on the slabs that sealed these pits."

The impression has always been that these boats were buried at the same time as Khufu, but this appears no longer to be the case. The graffiti found in Khufu's boat pit, Valloggia uses, to suggest that his pyramid at Abu-Rawash was completed in around his 23rd year (Valloggia, says this dating cannot be in relation to Khufu as evidence suggests a year as high as 27 for khufu), and that therefore these boats pits at Giza were built, we assume, when he had spare time to do it, some 23 years after Khufu's death. This seems illogical; we have evidence when kings died that often their successor would complete constructions somewhat cheaply, with use of cheaper materials such as mud brick, or not finish them at all.

[24] Mountains of the Pharaohs 2006,

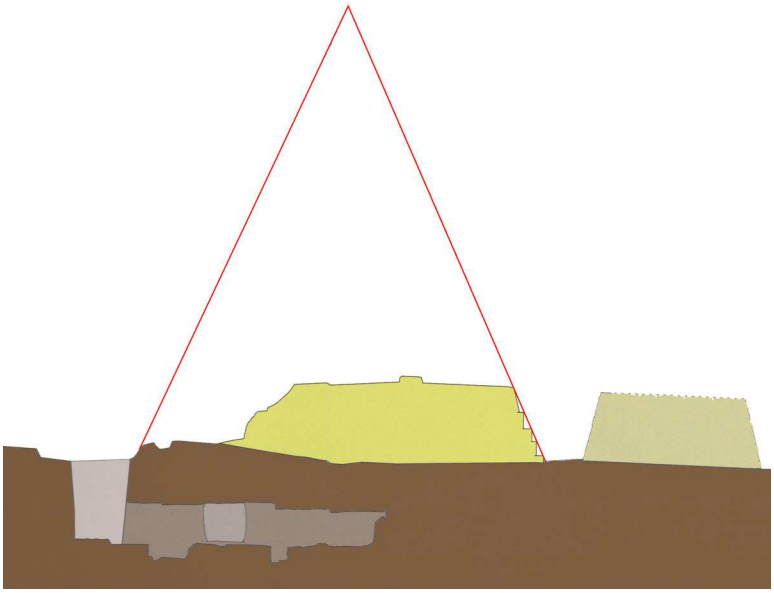
But here, we are lead to believe that some 23 years later, Djedefre returned to Giza and built not one but two boat pits for his father. These boat pits are only slightly smaller than at Abu Rawash, (about 32.5m x 5m), and looking at the excavation photographs appear of a superior quality of construction. These boat pits at Giza are not boat shaped, but rectangular and consisted of two dismantled boats; further they were neatly concealed and a wall built over both pits, this concealment would keep them safe until 1954.

It also begs the question, who built the other boat shaped pits on the east side of Khufu's pyramid? Khufu has five boat pits at his pyramid, two on the south, two on the east and one along the causeway. It seems illogical that Djedefre should satisfy himself with one boat pit, and go build two superior boat pits at Giza. Indeed when you look at Djedefre's Abu-Rawash site, and compare what went before and after his reign, i.e. Khufu's and Khafre's fantastic complexes, it really is a poor show, more a gate lodge than a stately mansion. Abu-Rawash has rough field stone walls and large use of mud brick structures; it cannot be compared to Khufu's of Khafre's complexes, yet he finds time and materials to build and conceal two fine boat pits at Giza; would he not be better spending his time improving his own poor complex?

The Satellite Pyramid

Prior to Valloggia's excavations, it was often thought that a satellite pyramid, often called Lepsius 3 was to be found under a noticeable mound to the S.W. of the complex; however this would turn out to be a knoll of natural rock. What was found during the clearance of the inner enclosure wall was a structure of around 4 courses, about 1.85m high, in the S.E. corner of the inner enclosure wall. This structure Valloggia believes to be the remains of a satellite pyramid.

The structure itself, like the rest of the buildings in the temple complex is fairly poor quality, and very small in size. Valloggia suggests a square plan of 20 cubits (about 10.50m). The irregularities of the ground were compensated for, by the first course of limestone blocks, being of variable heights, such that the top of this course would reflect a horizontal level. Valloggia deduced the slope of the structure, by aligning the stepped back courses, and estimated an angle of about 65 degrees and a theoretical height of about 11.25m for the pyramid.



In the image above based on Valloggia's drawing, we see the theoretical slope of the structure, which he arrives at by aligning a line along the 4 steps of the surviving structure. However I fail to see the logic in this reconstruction; one only has to look at many other structures in the old kingdom, such as the queen's pyramids at Giza for example. If we take G1A, next to Khufu's pyramid, we can clearly see that the steps slope at about 75 degrees, which is obtained by slightly retreating each course inwards in respect to the one below, exactly as we see in the remains above; only here Valloggia obtains an angle of about 65 degrees.

We know G1A does not have a casing angle of 75 degrees, but one closer to 52 degrees; indeed the convention seems to be that satellite pyramids match the angle of their parent pyramid; clearly Valloggia's reconstruction above does not match the 52 degrees he gives for the parent pyramid. Moreover, we appear to have the smallest pyramid casing to be found, in order to fill these small steps, which could be as little as 10cm! (Using my scale ruler on his scale drawings) No trace of casing was found at this location.

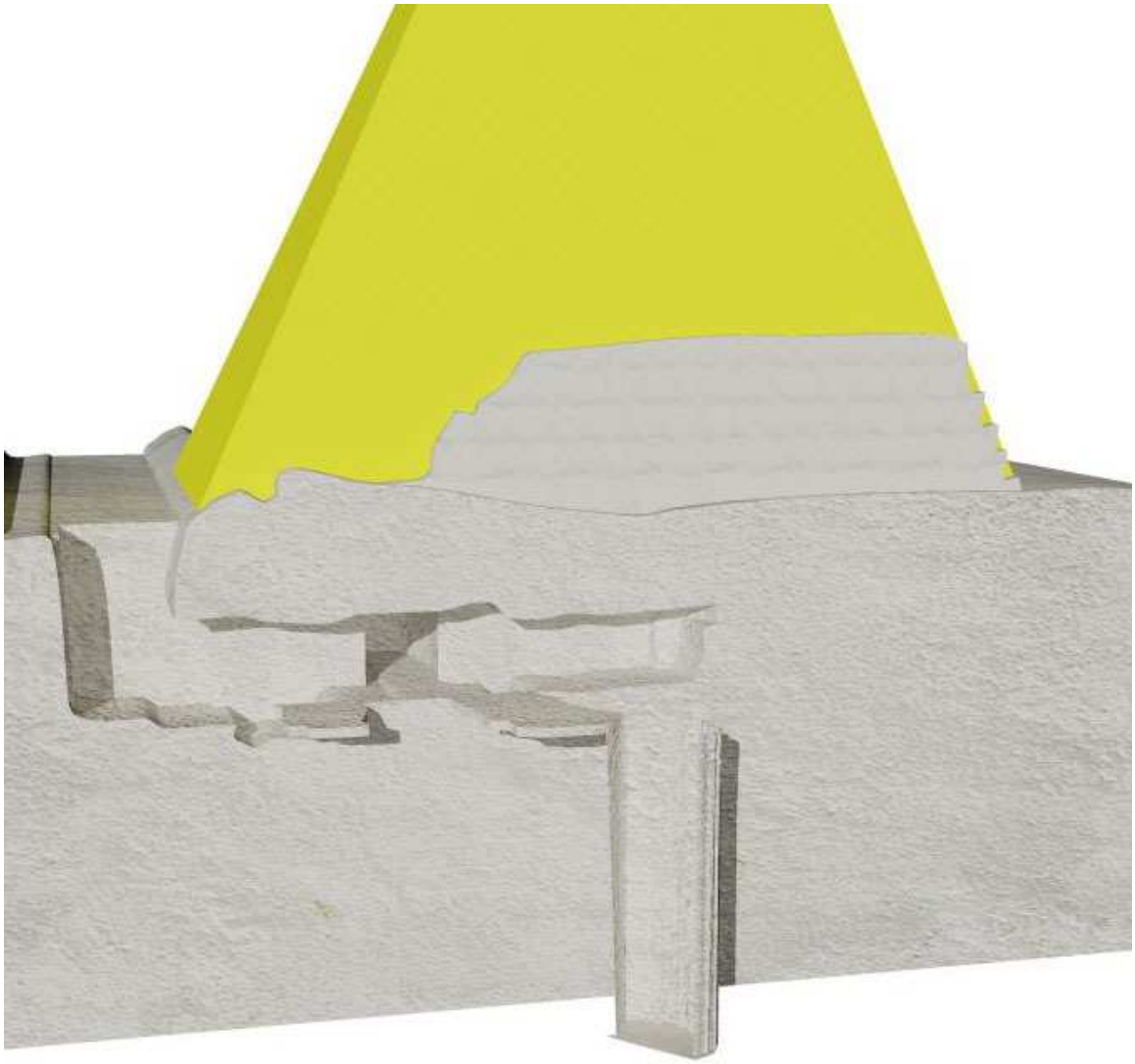
If this is a satellite pyramid, we might have a few steps, like we see at the queen's pyramids at Giza, this stepped core, would then be filled with backing and casing stones to the angle of its parent pyramid. At Abu Rawash we only have 4 courses, combining to give a height of around 1.85m, we do not know if there were any more steps. It appears as if Valloggia's reconstruction is a result of space limitations; on the one side we have the

proximity of the inner enclosure wall, and on the other, the vertical shaft that leads to the very poor underground apartments.

The image above, illustrates the casing problem, and how close the inner enclosure wall is to the lowest course (75 cm at the corner, according to Valloggia's scale drawing). It is clear that if this is a satellite pyramid, with steps like we see at Giza and conforming to the 52 degree angle of its parent pyramid; then this enclosure wall will clearly be in the way, there is no room. At the same time, I doubt they would use such small casing stones on these steps; we must recall that we are at the peak of Old Kingdom prowess, as is clearly demonstrated, by the constructions at Giza before and after Abu Rawash, yet here we have a very small structure that I can best describe as pure tat!

The above remains show that walls were built on the diagonals and in the space between them and the outer stepped limestone blocks, rubble was thrown in pell-mell. In the middle of the north face we have a vertical shaft about 1.58m on the sides and about 2.10m deep, carved out of the rock. At the bottom of this shaft on its south wall, were found a few courses of

blocking masonry, laid dry; beyond this we have a very rough rectangular corridor, which has three rough chambers leading of it, one on the east and two on the west.



The above image gives a rough idea of the arrangement underneath the structure; Valloggia states that the floors and walls were poorly trimmed and probably unfinished. The chamber in the east contained the broken remains of a fine limestone sarcophagus; this chamber is around 1.15m x 2.00m and a ceiling height of just over 1m. The sarcophagus is given as 2.00m x 0.72m x 0.70m high, and it is thought that the first chamber on the west (1.15m x 1.40m) was used to help turn the sarcophagus into the eastern chamber. A cavity found in the corridor floor south of the burial chamber, Valloggia thought may have served as a pit for canopic jars.

The last chamber in the west (1.15m x 2.20m) dug in a south-west direction would hold a surprise; at the end of this chamber a portion of the wall was found coated with plaster for the whole height of the wall. On removing this plaster, a stone block was removed and a deep shaft some 4m deep was found, completely filled with limestone debris. Valloggia thought it may have some connection to the shaft, found in the robber's tunnel in the pit.

A large amount of ceramics was found, broken and scattered in great disorder throughout the chambers; included amongst the finds, was a calcite canopic jar and two stoppers; a calcite bowl inscribed with Khufu's name, copper needle fragments, flint blades, and even a basalt weight, marked as 90 deben.

Valloggia appears to see this as a female burial, why is not so clear, he states; *"Her sarcophagus, which has the characteristics of a female burial, evokes the possibility of the burial of a person of high rank. It is, therefore, possible to contemplate the presence of a queen's pyramid, whose holder was, perhaps, a close friend of Khufu, as suggested by the large calcite dish, inscribed with the name of this king."*

Valloggia accepts however, that this pyramid is very small compared to the queen's pyramids built at Giza (indeed the quite small G1D, Khufu's satellite pyramid is twice as large, around 23m square and exhibits a 52 degree casing angle); further no indications of a chapel or stele were found; indeed he admits that, *"no concrete trace of burial has been found in the infrastructure of this pyramid."*

The fine limestone sarcophagus was broken into many pieces, but it was reconstructed; Valloggia states that it was 2.00m x 0.72m x 0.70m high (these measures include the fitted lid). However his scale drawing suggests it is 2.06m long; this might sound nit picking, but I feel it would be useful for more detail along the lines supplied by Petrie, as in Khufu's sarcophagus. An accurate study of these many fine boxes found in the Old Kingdom, can possibly shed some light into their use of maths, volumes etc. As it is, the small scale drawing that Valloggia provides, is not really detailed enough to try and recover its intended dimensions in Egyptian cubits; though from his drawing it would appear that the internal space is 1 cubit wide by 1 cubit deep.

From Valloggia's drawing I created the above image of the sarcophagus, the sides are relatively thin and a ledge has been left around the top of the box, which matches a rebate in the lid. The lid has four lifting bosses, and according to my software is about .13 of a cubic metre, with the box being about .42 of a cubic metre, for a total of .55 of a cubic metre, or around 1.3 metric tonnes. It is interesting to note that it is too big for its chamber, which is 2m deep, as the lifting bosses extend around .16m; with the box at 2.06m? It would therefore, extend into the N-S corridor by .22m, and if we add the other lifting bosses, the lid would extend into the corridor by .38m; and as the corridor appears to be just over a metre wide, the sarcophagus would extend into at least a third of the corridor's width. It all appears shoddy; indeed shoddy is an apt description for both the superstructure and substructure.

It would seem strange that Djedefre would allow for such a poor structure, while at a possible similar time frame, he was building two fine boats pits at Giza. So what are we to make of this poor structure? I don't think it was a satellite pyramid; the proximity of the inner enclosure wall is an issue, as is the unusual steep angle of 65 degrees and extremely small casing. Valloggia

provides no detail on the bedrock surrounding the structure, as to whether there are any tell tale marks that might suggest that casing was fitted; all we have is a small mound and maybe this is what it always was, to match its parent mound that surrounds the pit.

The nature of the substructure and its entrance outside of the superstructure does not necessarily mean that what we see today is contemporary to the superstructure above. It seems clear that many modifications have taken place at the site extending into the 6th dynasty, so it cannot be excluded that the substructure or aspects of it are a later addition.

Concluding Remarks

Without doubt Abu Rawash is one of the most perplexing of sites; it certainly does not scream quality; gone are the huge impressive stone temples of Khufu and Khafre, instead we have a small unusual temple complex along with priest accommodation made of inferior mud brick. Valloggia in his conclusion and on the graffiti of Khufu's boat pit states, *"In this place, the presence of a graffiti, dated XXIII, provides a milestone for the length of his reign and consequently for the completion of the royal pyramid of Abu Rawash,"*

The poor temple complex of Abu Rawash, is so poor in comparison to the fine boat pits that Djedefre builds at Giza; it makes little sense, why provide two superior boat pits for a king who died some 23 years ago, and settle for a single inferior one? The wherewithal to build a fine quality complex even if smaller than Khufu's or Khafre's was surely there, as is evident from the quality on display at Giza.

So many things appear not to add up at this site and I feel that observations made by M&R have not been satisfactorily answered. As they suggested, it is inconceivable that in order to recover quality materials from internal chambers they would demolish an entire pyramid and leave no trace of this demolition work; and as they rightly point out, the huge labour involved would be completely out of proportion to the results obtained. Several authors have mentioned the distinct lack of fine limestone casing; it seemed to have an effect on Petrie, who suggested the entire pyramid was cased with granite!

Even the stratigraphic report of trenches made around the structure, show only thin layers, of what is thought to be polishing residue from limestone casing, when compared to the granite polishing residue. This in itself appears confusing as those granite casing blocks that have been discovered have undressed faces like at Menkaure's pyramid; so this residue would appear to be processing of the inferior faces of the granite casing blocks.

My main concern is where has all the debris from a dismantled pyramid gone? It appears to be missing, or it was never there in the first place. It is quite clear from the excavations that there was a Roman presence at the site, and from the granite debris, it would appear that this was their goal. In the Roman era, the capital of Egypt was at Alexandria, and therefore the nearest granite quarry would be the structure at Abu Rawash, and then further south at Giza. But would the Romans dismantle an entire pyramid, there is not a great demand for rough limestone core blocks; it is the finer casing stones that are in demand, yet the lack of limestone casing, a concern of several authors, and lack of debris for a dismantled pyramid, leads me to conclude that all we had at Abu Rawash was a low mound, probably not much higher than its current form, and cased with a large quantity of undressed granite.

The destruction or robbing of stone at Abu Rawash, like so many Old Kingdom structures, probably began at the end of the Old Kingdom during the first intermediate period. Many examples of reused blocks from Giza are also to be found in later dynasty constructions, though it appears to be at a low level in the scheme of things. Early reports suggest that the Giza pyramids were largely intact of their casing in the 12th century and that it was only the hungry demands of Cairo that would be their downfall; yet we appear to have a pyramid at Abu Rawash, torn down some one thousand years earlier!

Looking at this site, I can't help but see the similarities to the great pit of Zawiyet el-Aryan; in my guide on this site I suggested it could have been an observatory/temple surmounted by a low mound with the pit open to the skies, and that the pit opening might have had a reduced aperture. This I suggest is what we may have at Abu Rawash, and that those who have suggested that it may have been some sort of a temple are more likely to be correct. It might help explain the rather utilitarian feel of the temple complex and the large use of mud brick structures and somewhat unusual accommodation, which would make sense if it was used as an observatory.

Abu Rawash is no Giza class construction, yet Djedefre's reign length and the wherewithal of the state, could have easily made it so.

So who was Djedefre? He clearly had a role at the site, and members of his family appear to be buried in the cemeteries to the east, but was he a full king? Yes his name appears in a cartouche, but then so did some others, as evidenced by the list at Wadi Hammamat who were thought not to be kings, and to these we can add the unknown cartouche found at the pit of Zawiyet el-Aryan. The fine execution of the boat pits at Giza is at odds with the poor quality of construction seen at the temple complex, if anything, should it not be the other way round? Indeed there appear to be aspects at Giza (beyond the scope of this guide) that suggest to me that there was no interruption in construction activities at Giza, and therefore possible that Abu Rawash was being built at the same time as the on going construction at Giza.

Whatever the function of this site, I feel that many unanswered questions remain to explain what we find there today. Please keep in mind that this is just a layman's view, ultimately it is up to the reader to do their own diligence and see where the evidence takes them.