A Layman's guide to

The Meidum Pyramid

Keith Hamilton April 2017

This is the first in a series of guides that detail the pyramids which Egyptologists attribute to the 4th Dynasty. Although there is a vast array of books on the pyramids from Egyptologists and those that Mark Lehner would describe as pyramidiots, it is generally the case that only a few pages is given to any particular pyramid. This guide therefore is to fill a gap and provide the reader with a bit more detail on these amazing structures.

I am most grateful to ISIDA-PROJECT.ORG for their kind permission to use their images. All other 3D images are created by myself.

The Meidum pyramid in the early days of Egyptology was often thought to be the work of the Pharaoh Huni, who, on the Turin King list, is given a reign of 24 years. Not much is known about Huni, history and the turn of the spade have not been kind to him; though he is thought to be the predecessor of Sneferu. However, the consensus today is

for the pyramid to be attributed to Sneferu along with the Bent and Red pyramids at Dahshur. The reasoning behind this is relatives of Sneferu being buried in close proximity to the pyramid, graffiti found on the pyramid temple found by Petrie and mason's marks found on casing stones. Huni on the other hand is conspicuous by his absence. That said, and playing devils advocate, I feel the evidence for Sneferu's involvement in Meidum may only apply to the E3 phase of construction.

The mason's or quarry marks with year dates found on the casing stones are, to my knowledge, only found on the casing stones of the final phase E3. Sneferu's name does not appear on them, but Egyptologists ascribe them to Sneferu due to similar marks found at Dahshur.

The graffiti found by Petrie in the Pyramid temple, written by a scribe of the 18th Dynasty "*to see the marvellous temple of Horus Sneferu…*" only tells us what that person believed some 1100 years later; the tower phases could have been constructed by someone else and converted to a true pyramid by Sneferu. Sneferu was greatly endeared throughout Egyptian history and more likely remembered.

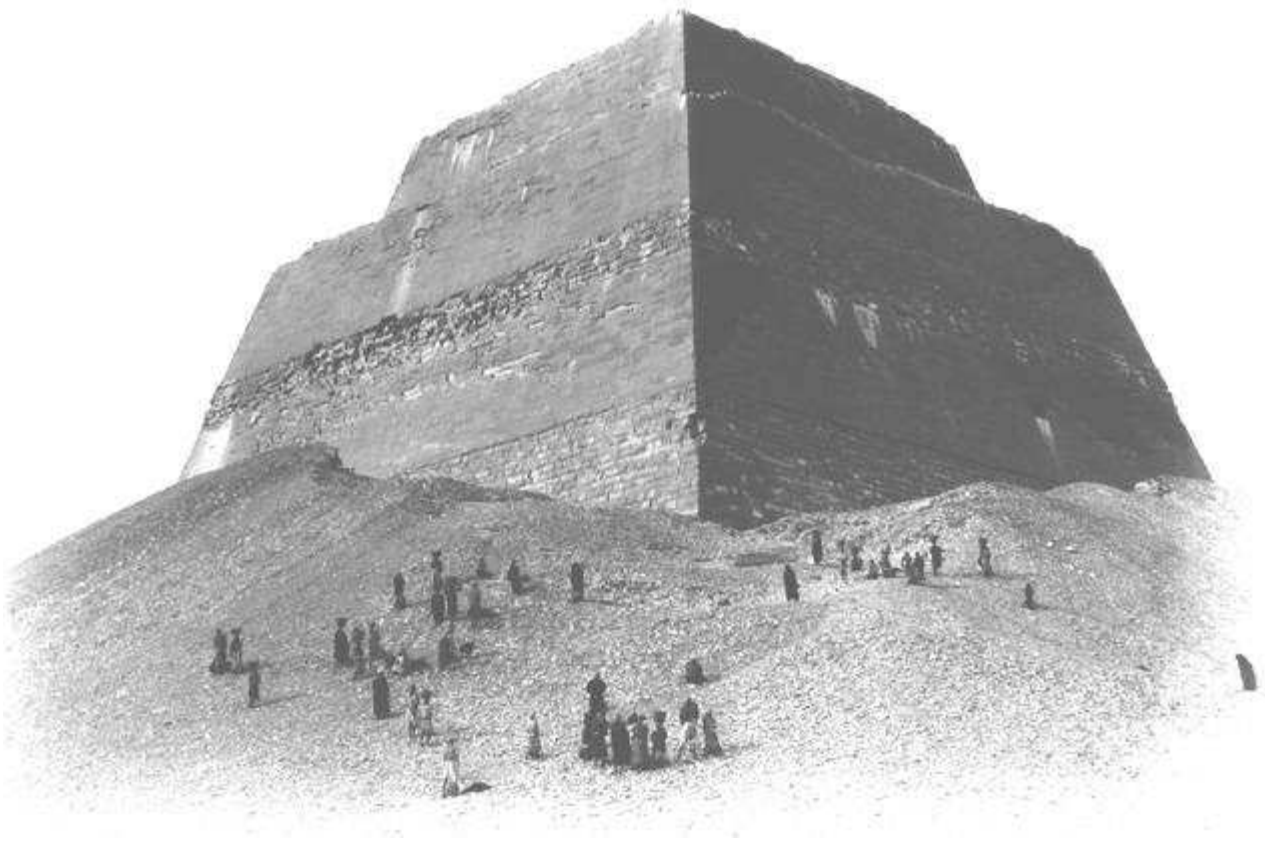
Exploration

Maspero was the first archaeologist to enter the pyramid in 1882 and he discovered some ropes and beams, but we have to wait until Petrie, Wainwright and others 1892, 1910-12 to get a clearer and more detailed picture of the site and still very much a prime source of information. This was added to by Borchardt in the 1920's who deciphered the different building phases at Meidum. Shortly after Alan Rowe, 1929-30, did some work. Finally, the Italians Maragioglio and Rinaldi did some investigation as part of their multi volume work 'L'Architettura Delle Piramidi Menfite' in the 1960's.

I think it's fair to say that apart from a few small forays on the site in recent times, nothing really major like the dangerous and back breaking work done by the likes of Petrie and Wainwright has been done and it's very probable that careful clearance of the debris that cloaks the lower reaches of the pyramid might provide much valuable information.

Description

The Meidum pyramid lies approximately 60 miles south of modern Cairo in the Faiyum district. Today it has the appearance of a truncated tower surrounded at its base by a huge mound of debris, this debris for the most part covering the surviving casing of phase E3.

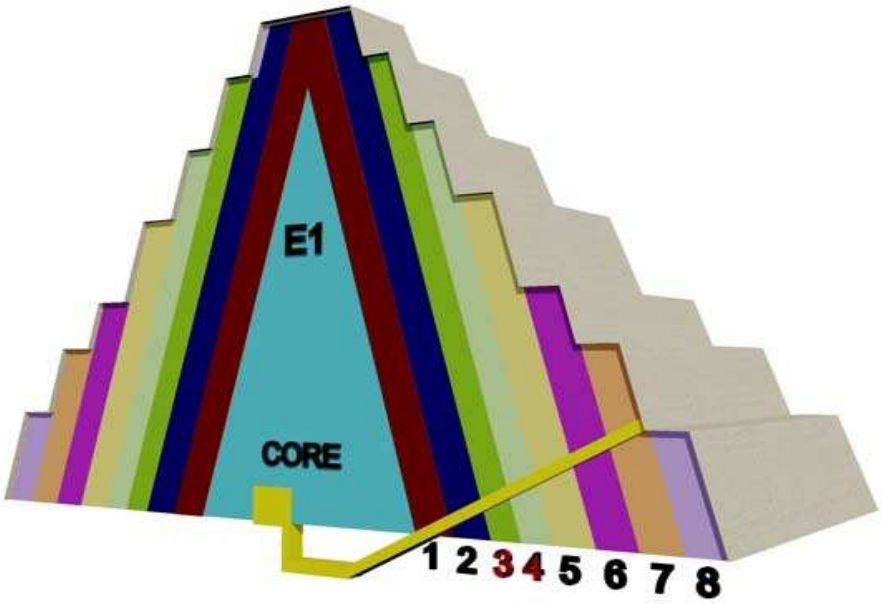


The old image above shows the extent of the debris and some idea of the labour done by Petrie to excavate the Pyramid temple. The form of this debris made Kurt Mendelssohn develop a theory were he suggested that the Meidum pyramid collapsed and published his findings in 'The Riddle of the Pyramids' though the evidence seems to suggest otherwise.

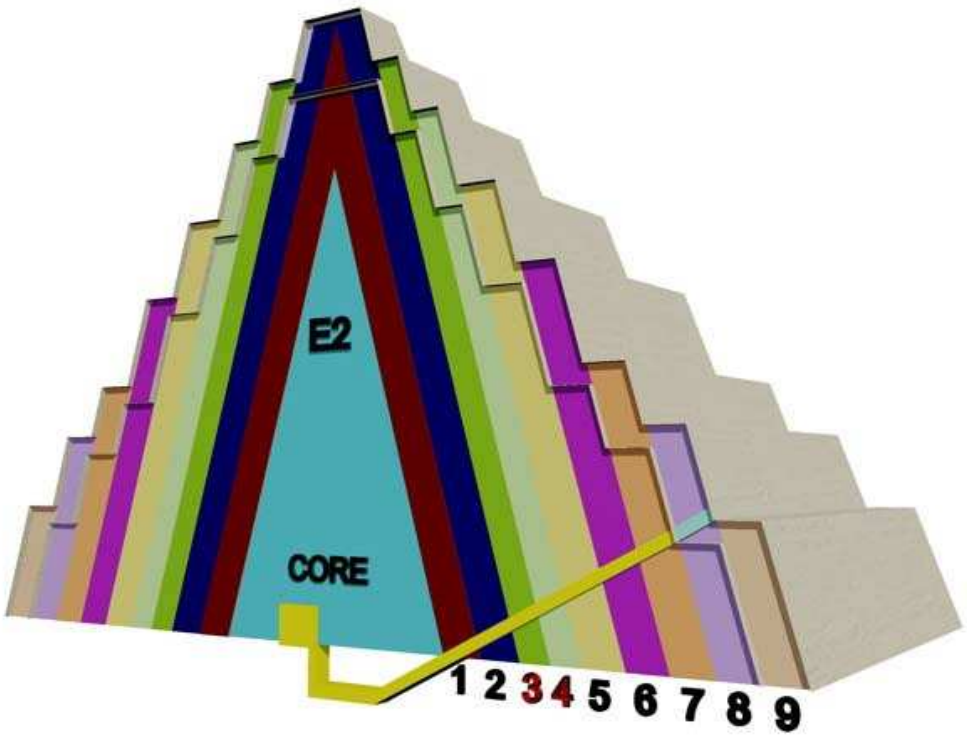
Where the debris meets the tower one can see a thick band of undressed stone, then above this a band of smooth dressed stone, followed by a thin band of undressed stone and lastly another band of smooth dressed stone which terminates as a step. The honour of deciphering these strange bands and what they could mean falls to Ludwig Borchardt who described the pyramid as having three distinct phases, E1, E2 and E3.

E1 was a step pyramid of 7 steps; this was then built over and enlarged to 8 steps, E2. Finally the step pyramid was converted to a true smooth pyramid, E3.

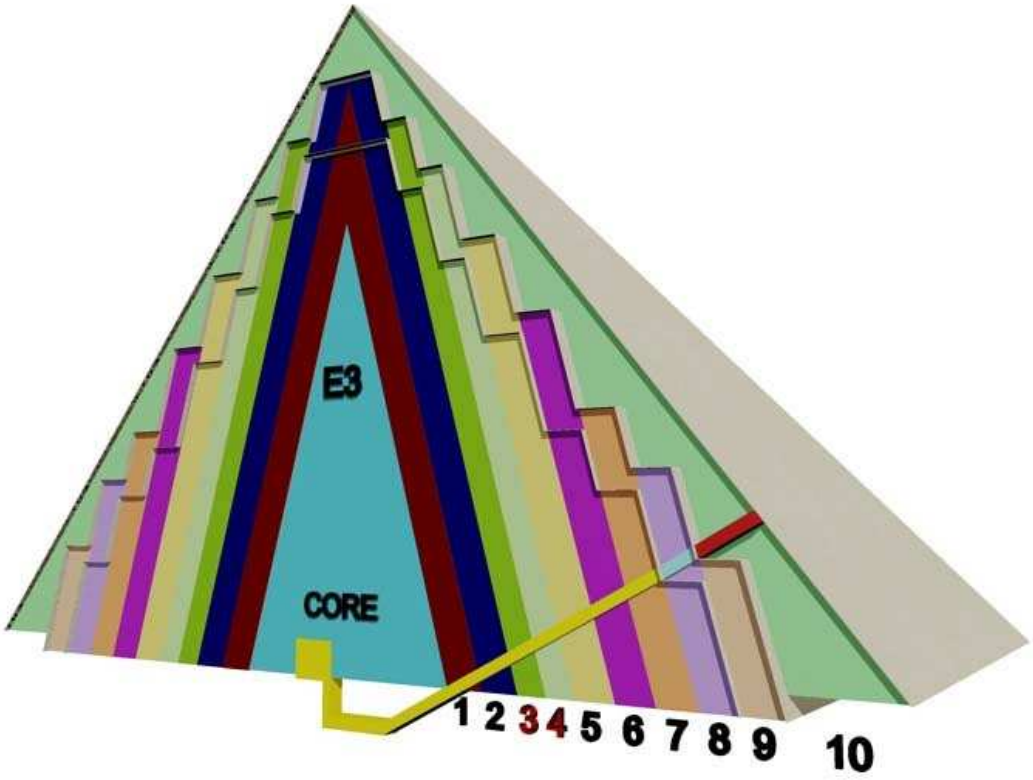
To visualise these phases I have produced the following 4 images, which will hopefully make things a lot clearer.



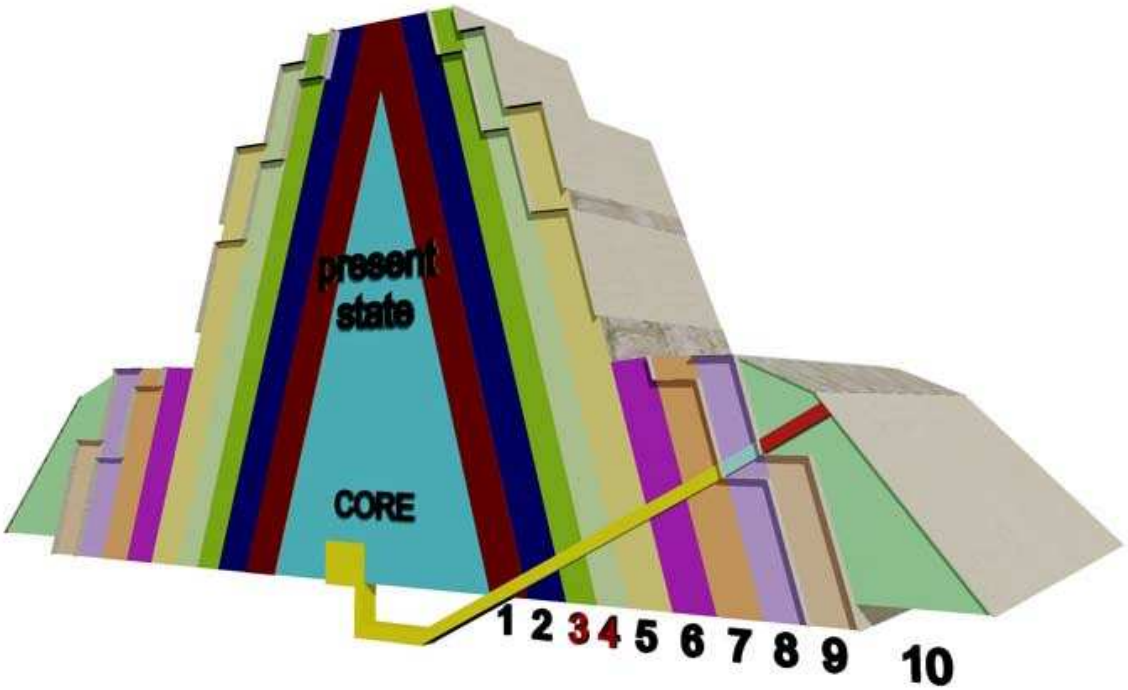
Phase E1, Step pyramid of 7 steps. Width of core Approx 60 cubits, layer 1&2 approx 10 cubits thick, layers 3&4 are thinner approx 7.5 cubits, layers 5, 6, 7&8 all approx 10 cubits.



Phase E2, layer 9 added approx 10 cubits. Pyramid enlarged to 8 steps.



Phase E3, step pyramid converted to smooth pyramid 275 by 175 cubits.



Present State: The smooth face of layer 5 between the two bands is the only visible part of E1 finished casing, the large band below is part of the exposed undressed layer of E1. The Thin band above is part of the height extension of E2.

As can be seen the greater part of the pyramid still remains. The phase E3 has lost about two thirds of its material. E2 has lost its top step and half of its next step; it has also lost its step on layer 6 and most of its step on layer 7. E1 is the most intact with only a small part of its top step and a portion of its layer 6 missing.

It is thought that the robbing of stone from the pyramid had begun by Ramesses II and in the debris intrusive burials believed from the 22nd Dynasty were found up to ten meters from the pyramid base. In Petrie's time he describes quarrying activities still ongoing by the locals. The who, when and why of its destruction may never be known with certainty and we must be grateful that its remote location has in some way saved it from total destruction.

Layers

What we know of the layers is thanks to Wainright who dug a tunnel under the pyramid. In total he found 9 layers whose foundation is on the natural rock (The E3 casing phase was not founded on rock but on sand, indeed the baseline of E3 is 2.5 meters above the rock foundations of E1 & E2) Wainwright dug through 10 faces, the 10th face being the boundary between layer 1 and the core, at this boundary he drove his tunnel a further 254 inches but encountered no further faces. It is thought therefore that a solid core of 60 cubits width exists at the centre.

Generally the layers closely resemble each other in thickness, the thicker layers vary from a low of 194 inches to a high of 204 inches, however, there is a noticeable change in layers 3 & 4, these layers are thinner, being 152 inches. This may have been a conscious decision by the architect to give a better perspective to the top of the step pyramid. It's of note too, how layer one appears to coincide were the entrance passage and rock foundation meet. Also close to this junction it appears that the relieving corridor, discovered by Gilles Dormion and Jean-Yves Verd'hurt in 2000, ends against a monolithic stone that is laid perpendicular to the slope.

The angles of the layers as described by Petrie: "*The angles of the faces are variable; the upper part of the high face is at 73°20', the lower part 73°54'; and the faces now built over, from the outside through to the passage, are at 74°40' and 75°. The tendency therefore seems to be for the lower and outer parts to be steeper than the higher.*"

For further info on angles, I would refer the reader to John Legon's article on Meidum.

www.legon.demon.co.uk/meydum.htm

The 9 layers are generally referred to as accretion layers; these distinct layers of stone are not laid vertically but are inclined inwards, this construction method was common in the 3rd Dynasty. The image below of the so called layer pyramid at Zawiyet el-aryan gives a rough idea.

This construction method appears further refined at the Meidum pyramid, here the outer faces of the layers are finished with well squared and fitted blocks that cover a nucleus of more roughly shaped blocks. The layers are not totally independent from each other; Wainwright makes the following observation during the tunnel excavation;

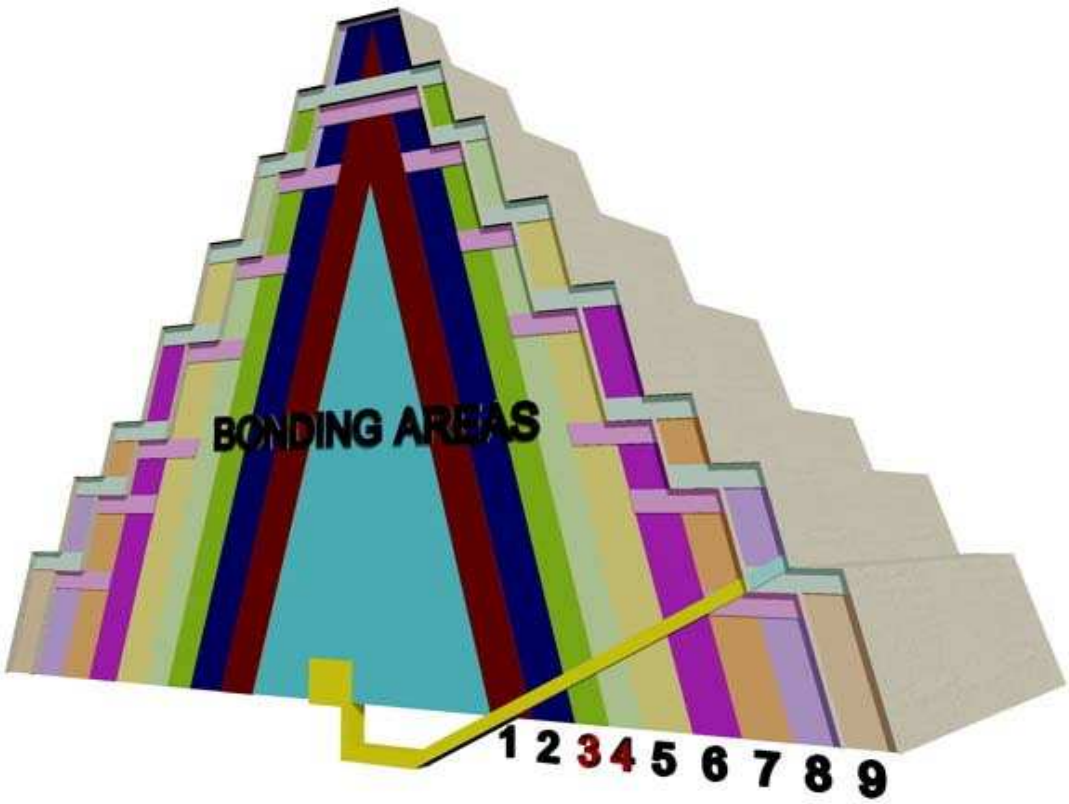
"..on coming to this eighth of the inner faces, we exposed a considerable surface, and found that it was banded just as are those that are visible higher up; the system being to lay a number of smooth courses and then to build another coat outside this structure, raising it to the top of the prepared face; a thick platform of masonry was then laid over the whole, breaking joint with the prepared face. On the top of this platform, which had

now been covered in on all four sides and the top, the prepared face was once more carried up in the plane of that inner one far below. Though those prepared bands in each face are all in a plane of those above and of those below, yet there is no connection whatever between any given one and that above or below it, which seems to be a very remarkable feat of construction"

It is hard to visualize exactly what Wainwright describes, but it may be similar to what has been observed by Maragioglio and Rinaldi (M&R)

"The layers were not independent from one another but each was bonded, at a certain height to the preceding one, and to the following layer at the top."

These possible bonding areas between adjacent layers are highlighted below.



It is thought that as the layers approached the area that was planned to be a step, a single platform was constructed over the two layers, bonding them together; the top of this platform would become the step. The inner most layer would then be extended upwards, on top of the platform guided by its next adjacent layer to the next step, were the process would be repeated.

The picture above shows the large rough band and the smooth casing of E1 above it. The remnants of smooth casing in the foreground are also part of the lower step of E1. Visible at the top of the rough band, one can see the stone protruding below the smooth casing; this is thought to be part of the bonding platform.

On this rough band M&R have the following observation.

"..the rough courses of the lower part of the present tower cannot all belong to a connecting platform, on account of their considerable number. They constitute, at least in part, one of the outer faces of a layer of E1 which was not dressed. The stones of this rough face, forming the casing of one layer, are squared but laid with differences of as much as 50cm. with respect to the plane of the dressed face. Very few of them protrude outwards; generally they are recessed with respect to said plane. We think that it is possible to conclude that this face was never intended to be dressed; otherwise all the stones which formed it should have protruded from the theoretical dressing plane which was coincident with that of the well worked upper part of the face."

The quality of the stone as described by Petrie;

"The inner masonry, within each of the finished faces is very rough; no attempt has been made to fit the blocks, except by selecting chance adjustments; the courses are approximately equal, but a coarse mortar is largely used to fill the hollows that are left. The stone also is very inferior, brittle, splitting, stained and weathering badly; the outer faces, on the contrary, are of excellent stone, weathering to a rich brown, and seldom crumbling away, and the smoothness of the faces and of the jointing is very fine."

The image above shows the comparison between the quality of the finished casing stone and the rough filling. Apparently these large holes that are visible on the tower today are the work of locals to encourage bats and the collection of guano; a highly effective fertilizer popular with farmers. The thickness of the casing does not vary a lot, for example Petrie gives the average of the rough band at about 20.3 inches and in different parts of the smooth faces it is 23.6 to 17.8 inches. The large hole in the north face was mentioned by the English traveler W.G.Browne in 1793.

On the accuracy of the steps Petrie's measures show how the steps vary somewhat on different sides, best summed up by M&R who say,

"It has been observed that the height of the steps is not equal and further each single step has not the same height over the whole perimeter. The upper treads have not, therefore, their peripheral line on a horizontal plane nor are they parallel to each other even on the same face of the tower: whereby the width of the steps is not constant even for each step considered separately"

On the phases of E1 &E2 Petrie states

"It is evident therefore that no great accuracy was aimed at in this internal construction, although it was finished off with finely smoothed faces, well jointed, and of beautiful flatness."

In the literature there appears to be a difference of opinion as to whether the top of the steps are inclined, like Djoser's step pyramid, (believed to aid water run off) or horizontal. The evidence seems to suggest that they were horizontal, M&R state;

"The uppermost course of each step was appropriately shaped in order to render the tread of the step practically horizontal. Lepsius saw the free edge and the upper tread of one step and noted that it was horizontal and formed by slabs of exceptional dimensions carefully laid and smoothed. This was obviously a step intended to remain visible. To day this edge no longer exists but on the north and west faces it is still possible to see two of the outer and upper edges of the steps, formed by wedge-shaped blocks 67cm. thick."

"Rowe states to have noticed that, on the north face the upper tread of E 2,2 was 15cm. lower at the inside than at the outside. This circumstance is rather strange and we think that it may be due to a settling of the masonry or to poor workmanship, which has been observed also in other places."

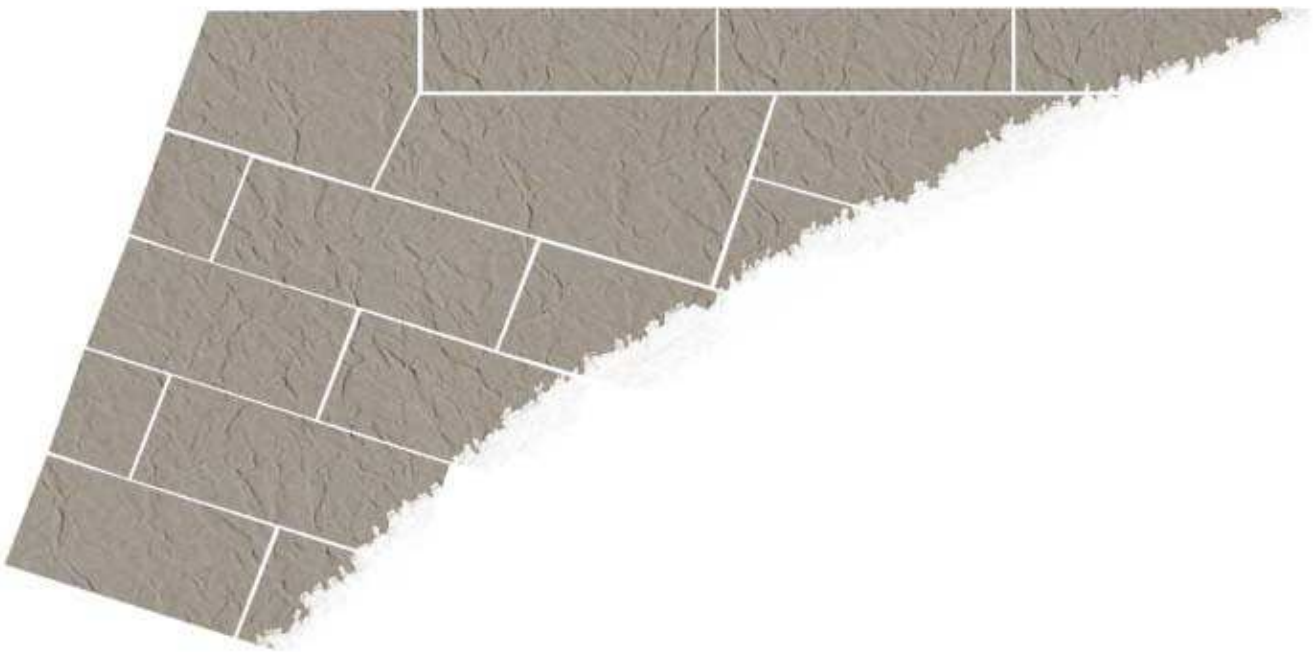
The confusion seems to appear in Kurt Mendelssohn's book *'The Riddle of the Pyramids'*. Here he uses the observation of A. Robert of the Egyptian Survey Department 1899 to state that steps 5 and 6 of E2 were laid sloping outward, similar to Djosers pyramid; Mendelssohn further states that there could be little doubt that the lower steps also had outward slopes.

Mendelssohn's book was first published in 1974 some 10 years after M&R published their findings on Meidum 1964. In their work M&R did comment on the observation by Robert, they say;

"Concerning the treads of the steps, many authors state that they are nearly horizontal or slightly sloping inwards. We do not know what importance should be given to the statement of Robert who, in his article…… The first tread (of the present ruins, constituted by E2,5) is formed by a platform 5 metres wide, slightly sloping outwards in order to aid the draining of water. I climbed the face of the second step (E2,6) by means of a ladder 11 metres high… the crowning tread is also inclined but is only 4 metres wide."

Here Robert, provides no measurements, just the statement *"slightly sloping outwards"* Rowe's inward slope of 15cm could also be described as slightly sloping. Certainly I feel there is no evidence to suggest that the treads were anything like the quite distinct sloping treads of Djoser's Pyramid and that investigations by Lepsius, Borchardt, Rowe, M&R and others are more to be relied upon. Though I can see why Mendelssohn would be attracted to the article by Robert, as it helped his theory on pyramid collapse.

I can only add to what I have observed on aerial pictures of the tower that show the tops of the treads that Robert mentions. The treads as one would expect are quite encumbered with debris and given the tendency of debris to accumulate more against a face were it is better protected than say the outer edge of a tread that is more exposed to the elements; it follows that there should be a natural slight outward slope to the debris. The reader can find some great aerial pictures in '*The Pyramids and the Sphinx' by Corinna Rossi.*



Tread edge showing wedge shaped block, based on M&R diagram.

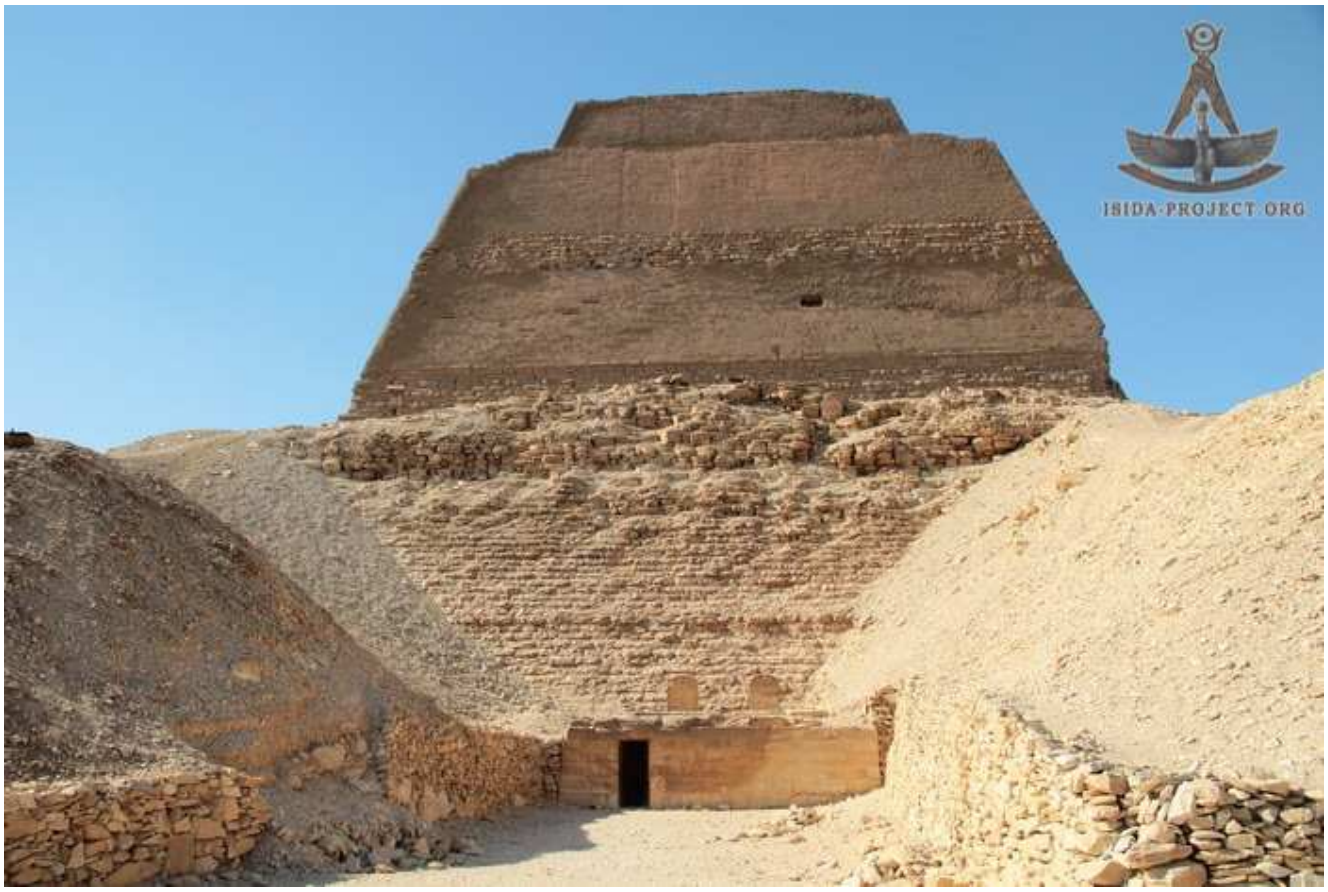
There are two further features on the tower faces that deserve mention. The first as described by Petrie;

"A puzzling question is raised by certain groups of pitted holes, on the faces of the inner coats of the pyramid. They are in square groups of five each way, exactly like a modern siga board. And they are so high up that they cannot have been reached for some centuries."

I have not seen any pictures of this feature, or information on how often it occurs and their locations. M&R have this to say;

"..we think that these holes were made during the construction of the monument for purposes we are not able to ascertain at present. They probably are concerned with the construction itself."

The second feature is the mysterious grooves mentioned by Petrie.



The Grooves are visible just above the upper rough band.

The Grooves are only visible on the two faces of E2 above the upper rough band; there is no groove visible on the face of E1 between the two bands. Petrie gives the width of the upper groove as 211 inches and the lower groove as 195 inches. The depth of the grooves is only 2 to 3 inches. Petrie states;

"In 1891 I proposed that these grooves were analogous to the grooves on the successive coats of brick mastaba's, indicating where the false door and ka chamber lay behind them in the first body of the mastaba; hence these grooves might indicate that there was a ka chamber in the first body of Sneferu's mastaba."

Petrie thought that there might be a primal mastaba at the heart of Meidum of 100 cubits square and 25 or 30 cubits high.

The grooves are placed south of the pyramid axis and not exactly aligned with each other; Petrie gives the upper groove as 2291″ to 3202″ from north pyramid base E3; and the lower groove as 3020″ to 3215″. Therefore taking the southern most vertical limit of each groove we have a slight offset of only 13 inches. Petrie's own drawing is inaccurate and greatly exaggerates the offset of these two grooves.

It may have been intended that these grooves were to be vertically aligned, and given the poor accuracy demonstrated in the interior construction, certainly possible. A further example of inaccuracy Petrie provides on the lengths of the edges on the top step, which vary from 1212″ to 1231″ a difference of 19 inches, the second step is even worse and vary from 1832″to 1905″. Petrie on the grooves:

"They are clearly excentric on the faces, and as the temple is centred on the face they cannot be connected in any way with that. But the sepulchral chamber is about 2918 to 3151 south of the north base, which is not far from the position of the grooves..."

Sadly the next two steps of E2 are missing, but a small excavation where step E2,2 is partially covered with the remains of E3 would be useful to ascertain if the grooves carried down to the base and highlighted the chamber.

Petrie also mentions how he thought the approach (what seems to be an earlier causeway) appears to point to the grooves, and that it was probable that the approach might have terminated at the site of the ka chamber.

It may well be that the step pyramid phase and the approach are contemporary; then when the phase E3 was embarked upon, the approach (original causeway?) and what it may have led to, were redundant, to be replaced with a new temple and causeway, which was centered on the new face of E3.

Phase E3

E3 appears to be a conversion of an already complete step pyramid into a smooth pyramid. M&R believed that the materials and workmanship of E1 & E2 were the same and *"…whereby we may conclude that this first enlargement took place in a period of time immediately subsequent to the original construction."* But for phase E3 they say *"The diversity of the material used in this third stage, with respect to the uniform material employed in the first and the second stage, appears to indicate that it was accomplished in a period perhaps not much later, but certainly well distinct from that of the first two."*

It has been suggested that Sneferu returned to Meidum some 15 years after phase E2 to convert Meidum into a smooth pyramid. What has been discovered by Petrie and others are various markings on stones and date marks from the seventh through to the eighteenth cattle counts, but no ruler's name. Petrie mentions many marks on clearing the eastern face and apparently also in Wainwrights tunnel, but there appears to be little in the way of context of where these marks are found, to give a clearer picture and

timeline on construction. This is not surprising given that the date marks appear to be found on scattered blocks of unknown original location. A more detailed excavation of the site and debris clearance might provide a clearer picture.

What we do know, is that the accuracy of E3 is far superior to that demonstrated in E1 & E2 which also suggests a distinct gap between the phases. Petrie states;

"Hence the average length of the base is 5682.0 with an average variation of 6.2 inches: the average error of squareness at the corners is 10'11": and its average azimuth is 24'25" W. of N."

"A line of leveling was carried all round the pyramid with a discrepancy of only ¼ inch on the 2000 feet length, or 2". The resulting levels of the pavement surfaces are: N.E +.5, S.E.+.2, S.W. +2.0, N.W.-2.8 inches. So in this respect the accuracy is comparable with that of the Great Pyramid, although in size and squareness it is far inferior to that."

Petrie also thought that the angle of E3 was the same as the Great Pyramid, therefore giving a height of 175 cubits and base length of 275 cubits.

We also see a distinct change in construction method of E3, instead of inclined layers seen in E1 & E2, the masonry of E3 is laid in horizontal courses that are first seen in the top portion of the Bent Pyramid at Dahshur. The stones of E3 according to M&R are also of a different quality.

In order to make an accurate survey of E3 Petrie at each corner excavated through some 10 to 12 feet of debris to reach the original pavement and casing; he found:

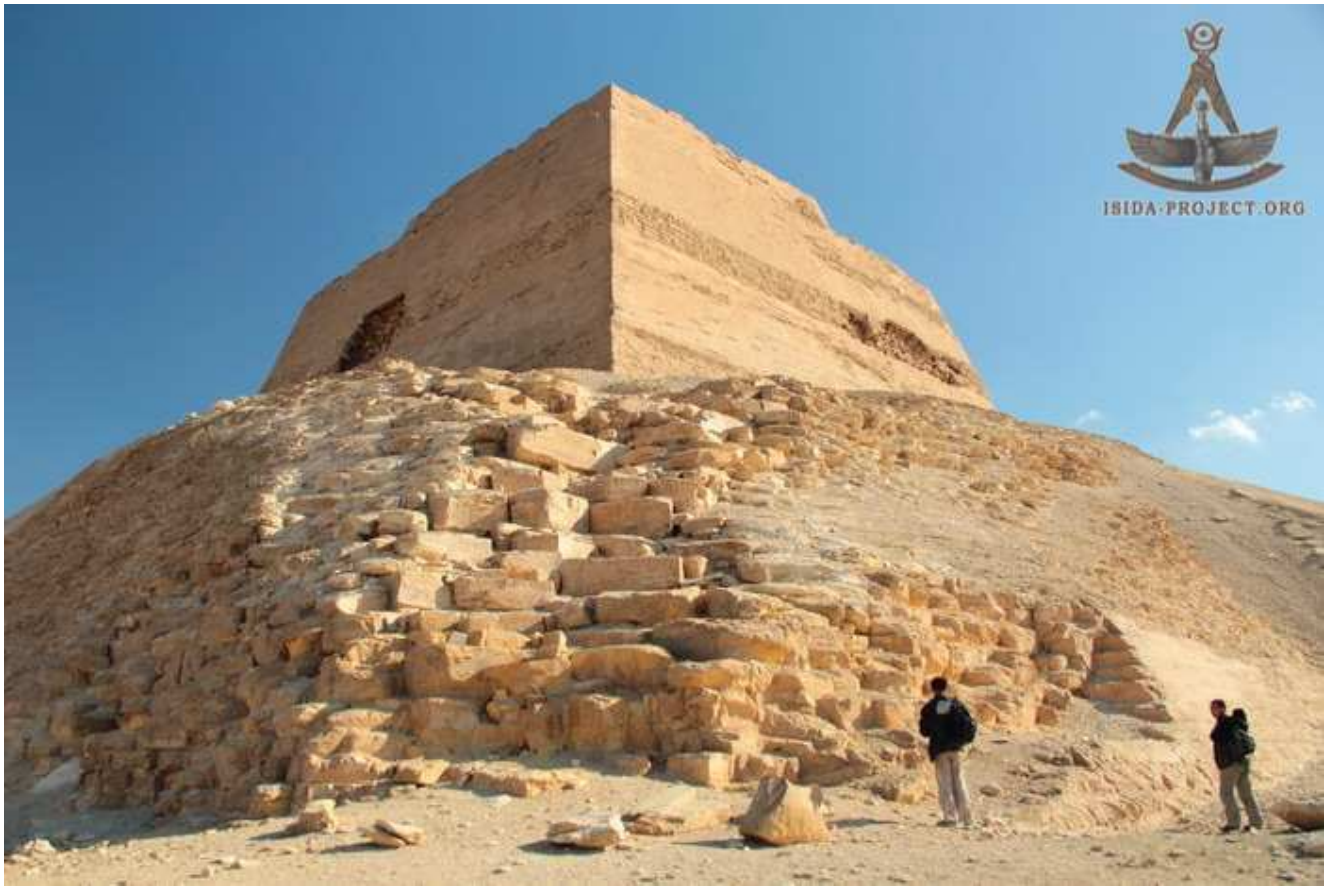
"At the S.E. corner the lowest course of casing remains entire; at the other corners it has been partly removed, and is only found at 20 or 30 feet distant along the sides."

"The base of the pyramid is built on a pavement, which underlies the casing at every part examined, of both sides and corners. The pavement consists of three courses at the N.W., where the ground was rather low. These courses were not thick, being 17.6, 14, and 14 inches; and they project not far from the casing edge, being 22, 38, and 48 inches out, respectively."

Unlike the layers of E1 and E2 whose foundations are the natural rock, the foundations of E3 is compacted sand, such that the casing edge is some 2.5 metres above the rock foundations of E1 & E2. This may sound strange, but I feel M&R make a valid point.

"It is difficult to ascertain whether the casing has undergone some settling, since only a little of its surface is visible today on the east, north and west faces, but no yielding or settling can be seen here. Moreover, the measurements of the base sides given by Petrie are so similar to one another that one is led to think that the system has given good results. Sand—if appropriately compacted, and water is not present—is a good foundation material, and this must have been well known to the ancient Egyptian builders.

Admitting that sand has a compression coefficient highly different from that of rock, we must point out that only the lower courses of the filling of the lowermost step and of the casing rest on the sand; namely those placed in front of the outermost layer and of part of the subsequent one. The remainder of the masonry is supported by the upper treads of the steps and therefore rest on the rock through the mass of the layers. The weight supported by the sand is thus not excessive"



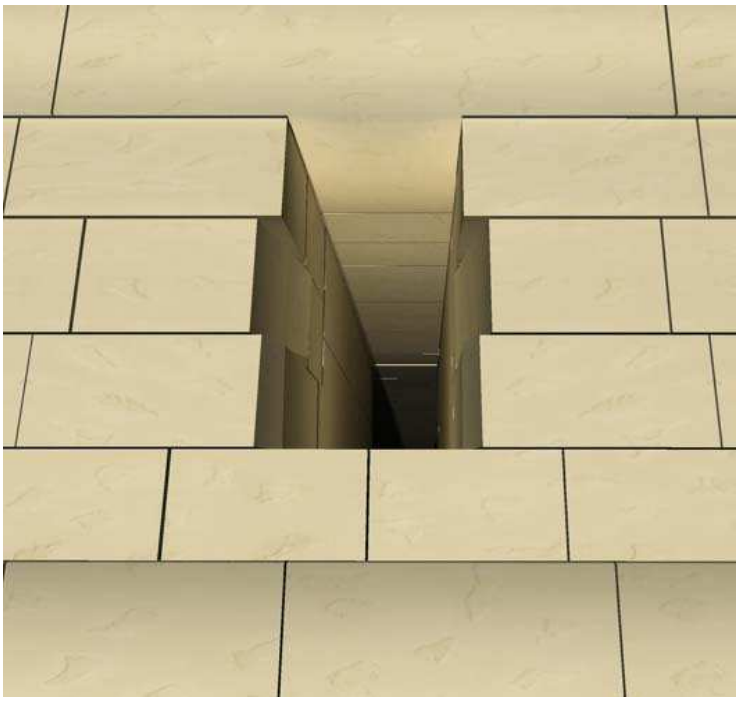
In the image above one can see in the foreground some of the remaining casing and backing stones of E3.

The Pyramid Entrance.

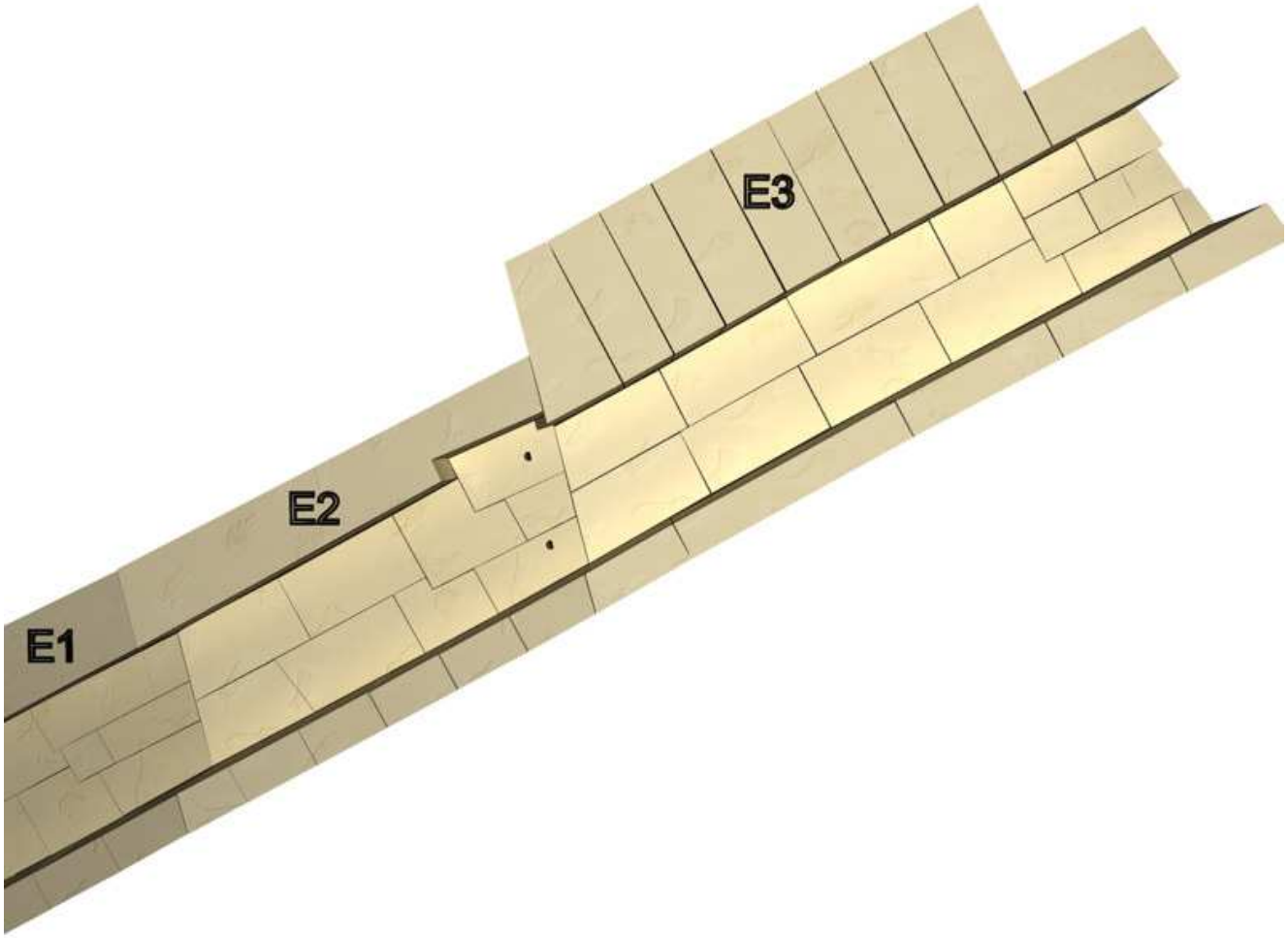
The entrance today is still in pretty good condition and surrounded by surviving casing stones of E3. The floor of the entrance passage Petrie gives as 720.7 inches above the pavement of E3, which is about 35 cubits or 1/5th of the height of E3. In comparison to some other pyramids the perpendicular height of the passage is a quite comfortable 62.5 inches or 3 cubits; the width Petrie gives as 32.2 at top and 34.3 at base; M&R thought a possible 1 cubit 4 palms wide, which is a bit narrower than some other pyramids.

The good preservation of the entrance along with Petrie's and Rowe's observations allows us to see how the entrance was closed. The passage walls at the entrance consist of three courses, then afterwards the passage walls reduce to only 2 courses; this continues to the face of E2 were we are again met by 3 courses which again reduce to 2, until the face if E1 is met wherein the pattern repeats itself. These 3 courses are a requirement in order to help conceal the entrance and blend in seamlessly with the existing casing. This camouflage of the entrance on the face of E3 is taken further by the bottom two courses in differing amounts having their vertical faces being cut away to reveal an inward slope. Into these cuttings would be placed casing stones that would be tapered to fit; the end result being that the 3 casing stones that closed the entrance, would have their verticals joints not aligned but offset like the neighbouring casing stones. This deception is further enhanced by the door threshold being formed by two adjacent blocks, after this the passage floor is made of single blocks.

The lintel above the entrance is probably the only giveaway for would be robbers, as it is noticeably longer than the neighbouring stones and in a course of greater height.
This method of concealment present on E3 is not repeated on E2 entrance as there is no cuttings visible, and the entrance of E1 is too badly damaged.



Open and closed views of E3 entrance highlighting the method of concealment.



The image above shows the three entrances corresponding to each phase. E3 passage is the best preserved; E2 the upper portion is well preserved, but the lower portion becomes gradually more damaged until the entrance of E1, were the damage is so great that it's not possible to discern if it had similar features to E2 entrance, like the roof cutout and D shaped holes on passage walls. The remainder of the passage leading to the chambers is badly damaged. Petrie states;

"But the salt has so violently scaled the surface of the stone, that it is exfoliated into a circular cavernous form, and it is only by referring to the joints that the plane of the roof can be observed."

Such was the extent of exfoliation in the entrance passage in Petrie's time;

"But the floor itself was not seen, owing to the large amount of exfoliated sheets of stone which more than half fill the passage."

The method of closure for the entrance to E2 appears different to E3. E2 has not the cutouts on the passage walls for wedge shaped blocks; but it has a cutout in the roof of the passage along with D shaped holes, present on both east and west walls.

Petrie describes this cutout in the roof as 48.2 long and 7.3 inches high, though this would vary as M&R point out that the cutout was not parallel with the floor, but less inclined; such that the southern end of the cutout is higher by 3.1 inches than the entrance end.

The D shaped holes are parallel to the face of E2, with the vertical part of the D facing the entrance and 14.6 inches from the face. Petrie gives the holes a size of 4 inches and distance between holes as 43 inches. The top hole he gives as 12.7-16.7 from the roof of the cutout; and it appears that the bottom hole has a similar distance from the passage floor. M&R say the east hole was 10cm deep and 6cm deep in west hole. On the holes Petrie thought;

"These probably held metal bars, against which rested a slab of stone filling the doorway, until the outer coat was finished, and the entrance wedged up."

On the roof cutout M&R say;

"It seems apparent to us that this device must have been correlated to the closing of E2, which probably was made with three blocks whose height corresponded to that of the three courses cut by the opening on the outer face of E2,2: also the greater height seemingly served to hold the uppermost blocks in place."

I would amend Petrie's idea, as I would suspect that regular access to the inside of the E2 step pyramid would be required during construction, therefore instead of metal bars and stone slab, I would suggest something more portable. The deeper depth of the holes in the east wall suggest that beams were inserted into this hole first until the beam became aligned with the hole in the west wall and then the beam would be withdrawn from the east hole and inserted into the west wall. When inserted the beam would probably only occupy two inches of each hole with the eastern end of the beam having a smaller profile than its corresponding hole to enable its insertion at an angle.

Against these two beams would be placed a wooden board the same dimensions of the passage. This would be a good enough barrier for protection from the elements and bats. For security, projections from the beams could have been made, such that when the board was placed on the beams the projections would come though matching holes in the board. These projections with holes at their ends could align with matching

projections on the board so that they could be secured together and possibly sealed with clay seals to alert any official to unauthorized entry. This is just an example as there are various methods that could be employed.

In the image above looking up toward the entrance we can see the relatively good preservation of the upper passage and the upper D shaped holes. Petrie describes the joint thicknesses as very fine and under 1/100th of an inch. The height of the cutout of E2 can clearly be seen against the last roofing block of E3. The walls of the corridor rest on the floor stones. Apparently inscriptions were found in the upper passage from 19th dynasty scribes.

The angle of the entrance passage is not uniform and there appears to be some confusion in the literature, for example M&R's text and drawings do not agree. It appears that the greater length of the passage from the bottom to the face of E1 is a uniform 27°36′ then a change occurs to the face of E2 of 29°22′ possibly to align the passage to the new tread of E2. Finally from the face of E2 to the face of E3 the angle

increases to 30°23′ possibly to ensure that the entrance aligns with 1/5th of pyramid height.

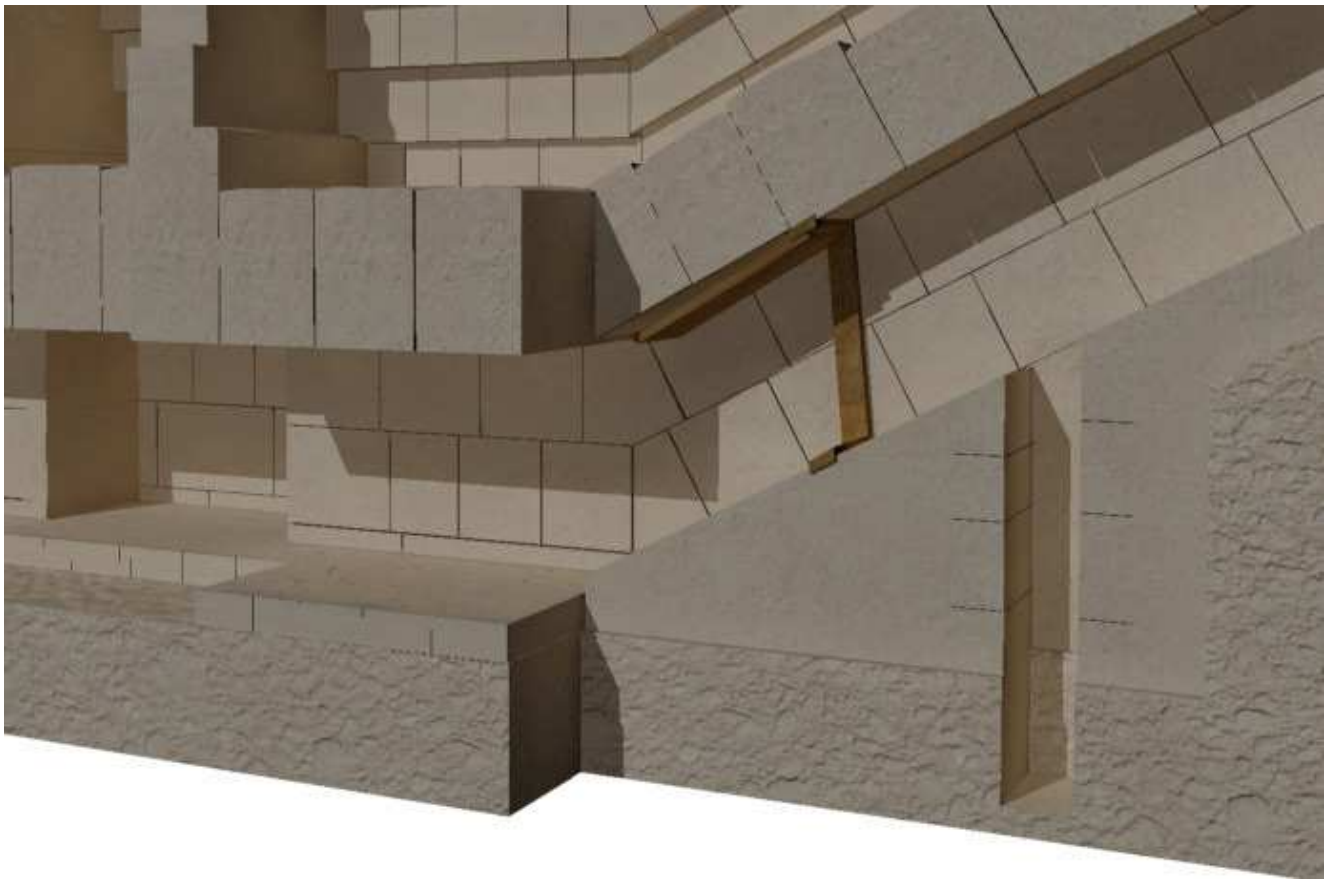
Looking down the passage the damaged southern edge of the cutout can be seen along with the start of the cavernous damage that greatly afflicts the remainder of the passage.

The passage length Petrie gives as 2247.6 inches or 57.09 metres, M&R thought Rowe's figure of 57.85 metres probably more accurate.

The extensive damage to the passage means that the joint lines are often the only clue to the form of the passage. Examination of the joints shows that the passage wall is composed of two courses from the original E1 entrance all the way to the passage end. M&R thought this proof against Borchardt's view that a structure of two or three steps that he termed E0 might exist. As a consequence it would also affect Petrie's idea of a primal mastaba.

The Azimuth of the passage is 21′23″ west of north which compares well with the average azimuth of E3 which is 24′25″ west of north. The west side of E3 has the lowest value of 18′3″.

The next features of note in the passage occur at its end, where a small pit is to be found in the floor of the passage and south of the pit is a groove that runs all around the walls, floor and roof; in this groove, fragments of wood were found.



In the section above we see the pit in the floor and where the groove is I have taken the liberty of inserting a wooden frame and hinged door.

It is thought that the lower chambers were excavated in a trench cut into the rock, such that the end of the passage floor is built of masonry courses founded on the rock floor, the pavement stones of the lower chambers also rest on the rock floor of the trench. M&R say of the pit;

"The purpose of this pit, whose walls are undressed, is unknown: however it certainly is original and was made during the building of the pyramid."

The pit which runs the width of the floor and is about 55cm wide, drops a vertical depth through masonry of 2.14 metres from the pit's northern face; at this depth it hits the floor of the rock trench, but the pit carries on vertically for a further 78cm in the natural rock.

M&R point out that some casing is missing on the east and west walls of the pit and at these points the rock of the trench can be seen.

A short distance south of the pit we have the groove which is not quite vertical, in that the top of the groove is slightly further south than the bottom of the groove. The groove is 14cm wide and in the side walls 20cm deep according to M&R's drawings

The roof of the descending passage ends with a step 12cm high in relation to the roof of the horizontal passage. This junction is slightly further north, than the floor junction, where there is a step of 15cm above the horizontal passage floor.

So what could be the function of the pit and the groove south of it? I suggest their function was to protect the lower chambers from the elements. In the time that the pyramid was erected, the climate might have been less arid than today. I recall a visit to Giza where I was met by such a downpour of rain that would make Ireland proud. I suspect such downpours of rain would have been a concern to the builders during construction. A rough calculation shows that the pit would hold over 1000 litres of water and it's noticeable that the builders excavated into the rock a further 78cm. Today the only visible part of the rock the visitor can see is in the shaft leading to the upper chamber; here the stratification of the rock can be clearly seen and it looks quite porous.

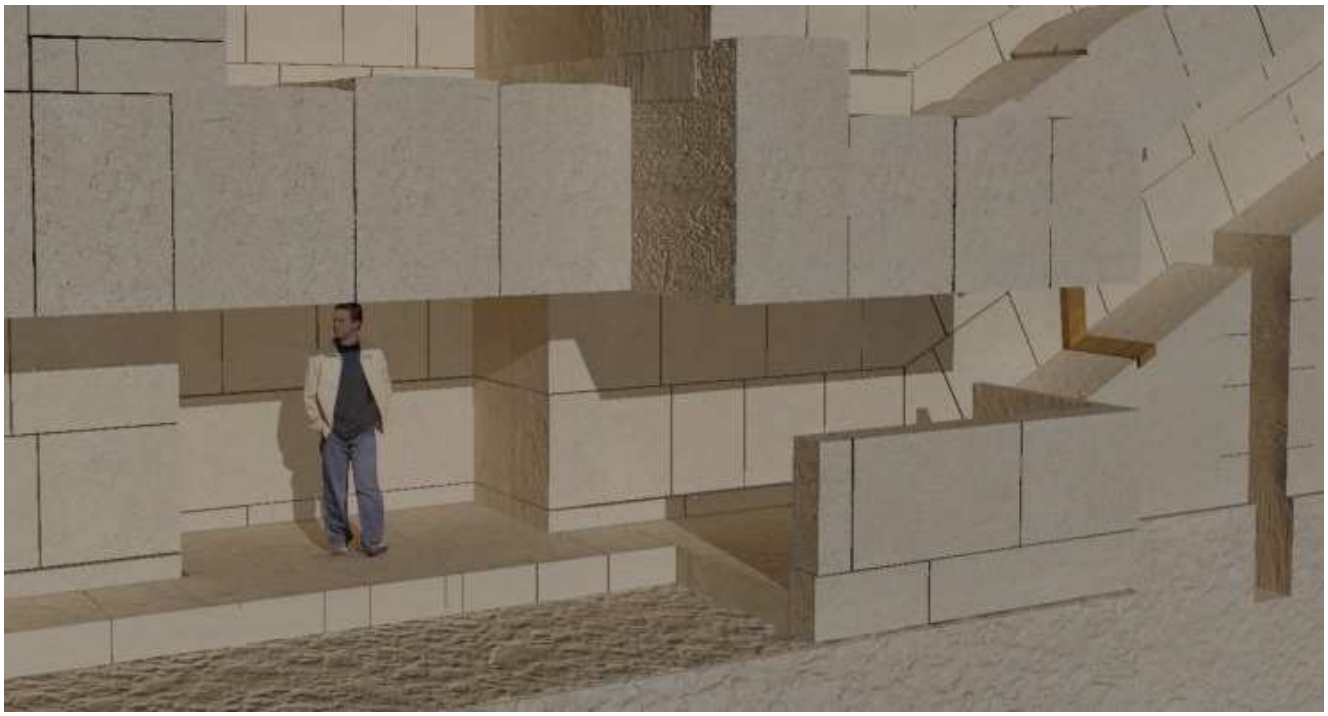
I believe this extra excavation in the rock is a soakaway, to help the pit drain when meteoric water found its way into the pit.

The next line of defence is the groove that may have held a doorframe, which may have been flush with its corresponding masonry, hinged from the top of this frame a door could be hung, that swung inwards and it's interesting to note that a door in this configuration practically takes up all the roof space down to the roof junction with the 12cm step. This step would neatly conceal and protect the edge of the open door.

In M&R's drawings, the groove is noticeably deeper in the side walls, 20cm, than the floor and roof portions of the groove, which they give no measurements of. 20cm is a considerable depth and combined with the 14cm width of the groove, a wooden beam of such dimensions fitted into the side walls would be more than strong enough to support a wooden crossbeam that held the hinged door. The frame may have been flush on the walls and floor so as not to interfere with items slid down the passage, the only restriction to the original passage dimensions being an open door, which probably didn't occupy any more space than the 12cm step in the roof.

The closure of the door, for example, could have been secured by bolts into the floor portion of the frame.

The Lower Chambers



The lower chambers, as seen in the section above, are quite small and of the same size, being 5 cubits long by 2.5 cubits wide, excluding passage width. The descending passage opens immediately into the east chamber via the 15cm step. The flooring stones of the horizontal passage and side chambers all lie on the trench floor. There are 3 masonry courses to the chambers, with a smaller course at the bottom. The roofing blocks are quite substantial as they have to span approximately 2.2 metres of chamber and passage.

The east chamber is exited via a very short length of corridor of 60cm, before entering the western chamber; the corridor exiting this chamber carries on southwards for approximately 4.55 metres where it meets the south wall of the vertical shaft that leads to the main chamber.

In these small chambers were found a few small blocks of limestone measuring 52.5 x 42 x 36.5 cm, not dissimilar to those found in the Bent pyramid chambers. It has been suggested that these small chambers were used to store plugging blocks that may have been too large to be brought down the descending passage after any burial. To me the considerable amount of engineering in making these small chambers, the large roof beams, and the corbelled relieving chambers above them, seems overkill to create small bays to park plugging stones. The descending passage is not small and quite sizeable

stones could be transported down it and how much simpler would it be to simply plug the descending passage. I feel they had a more important role and it's interesting how similar the chamber layout is to the Red pyramid. I feel that there might have been only one plug block in the vertical shaft that leads to the main chamber. As for the small blocks that were found, did Sneferu introduce them to shore up any defects? Cracks in the masonry have been reported and are still visible today. Indeed these chambers appear just as badly damaged as the descending passage.

In the image above we can see the damaged junction between the descending passage and the horizontal passage. The masonry joints can be seen, including the 12cm high step that may have protected the end of a hinged door. Though the chambers and passage are equally damaged, M&R point out the good preservation of the floor.

The height of the chambers and horizontal passage from the pavement flooring is approximately 1.8 metres.

The image above gives a clear indication of the damage to the lower chambers, one would be forgiven for thinking that the chambers were carved out of the natural rock and not made of masonry.

The positioning of the chambers might have been intentionally related to the pyramid N-S, and E-W axis. The centre axis of the descending passage M&R show as 90 cm to the east of the N-S axis of E3. It may have been intended that the first of the lower chambers, i.e. the easternmost, should lie east of the pyramid N-S axis and the next chamber to the west of the axis and that both chambers would lie north of the E-W axis.

The main chamber would lie to the south of the E-W axis and the chamber would be divided in such a way that its entrance and the floor that aligned with it was in the east of N-S axis and the remaining greater portion of the floor would be in the west. The poor construction accuracy of Meidum is a problem in trying to reconstruct the architect's intents. Though the later, more accurate, Pyramids do seem to show intent on chambers' location in respect of pyramids axis.

The Vertical Shaft

The horizontal corridor leaves the westernmost chamber and carries on south to open onto the vertical shaft. The height of the shaft from corridor pavement to main chamber pavement is about 6.25 metres. Today the corridor pavement in the vicinity of the shaft is missing and the rock floor of the trench has been cut deeper to a depth of 80cm from top of pavement level. Also the lower block on the north wall of the shaft appears to have its lower edge cut away.

M&R thought it possible this damage was done in antiquity and *"perhaps to allow the passage of some object of considerable length"*.

The dimensions of the shaft are that the E-W dimensions mirror that of the corridor, being about 85cm; the N-S dimension in the better preserved top of the shaft is about 1.30 metres. Two grooves M&R say are 12-15cm wide and about 10cm deep, run up

the length of the north wall of the shaft and end on a level with the pavement on the chamber floor.

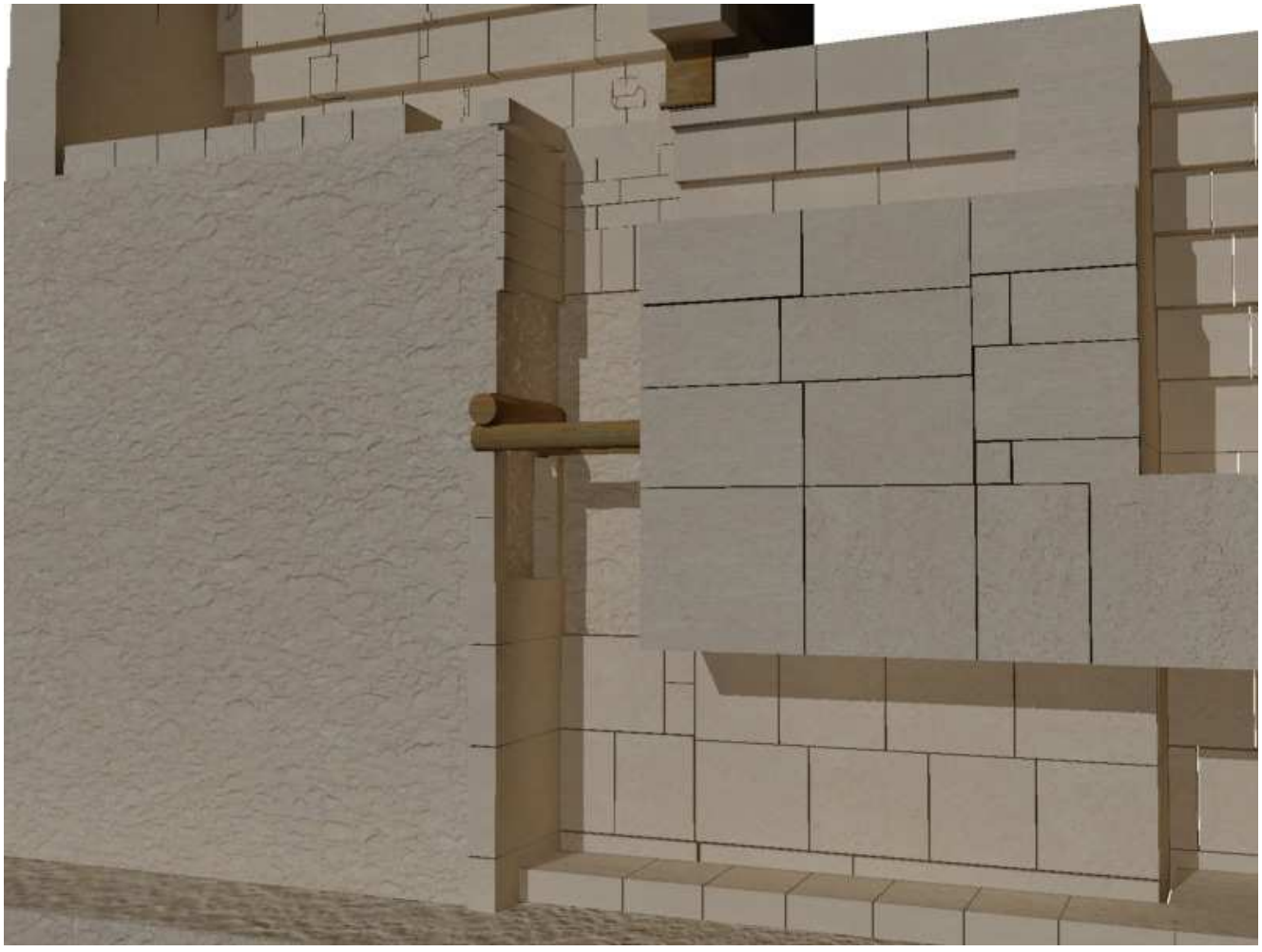
The east groove is interrupted by four rough blocks that closed off the relieving corbels above the corridor. Looking at Dormion's photos the groove does not appear on these blocks but instead the blocks appear recessed compared to the neighbouring stones. Today these blocks have been removed and one can see inside the corbelled space.

In this corbelled space M&R describe a 10cm diameter wooden beam tenoned into the north wall and, although broken, protrudes by some centimetres. The beam is roughly level with the chamber floor. Immediately above this beam a wooden board about 5cm wide and 40cm deep fills the uppermost corbel space, the blocks that also closed the lower corbel space were also about 40cm deep.

Looking down the shaft we can see the eastern groove interrupted by the blocks that cover the corbelled space and, above the blocks, the tenoned beam and wooden board. This beam is not centered on the shaft but about 30cm from the east wall.

According to Dormion the blocks that cover the corbelled space were badly joined with gypsum. They seemed to follow the contour of the corbels on the east side but on the west side the wall was cut as a trapezium for a depth of 13 cm and filled with small fragments of stone.

The north wall of the shaft is made up of masonry blocks, in contrast the east, west and south walls have been tiled with very thin limestone. Where the tiling has fallen off the natural rock can clearly be seen.



Indications are that, for the most part, the vertical shaft was tiled, although I believe the space below the wooden beam in the south wall may have been left. In the south wall four courses of masonry have been laid of unknown depth, and on top of these are what appear to be two stone supports that support the southern ends of the two beams that are recessed in the east and west walls. The northern ends of these beams are inserted into the masonry of the north wall. These beams are about 20cm in diameter. It has been suggested that the beams were to help support the rock in the shaft.

Looking south up the shaft we can see the stone support supporting the beam. The space between the supports and under the beam is the natural rock and probably the most southern edge of the trench.

Looking further up, one can see near the top of the picture some of the surviving tiles adhering to the south wall; part of a thin slab of stone can also be seen on the west wall.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The close up image shows the tiles in more detail, and remnants just visible above the left beam. The reason I feel that tiles might not have been fitted in the space between the supports and below the south wall beam, is to do with the practicalities of inserting the beams. Like the D holes in the descending passage I suspect the holes in the rock were made bigger than the beams, to enable the beams to be slid in at an angle and then withdrawn to fit into the holes in the north wall. The excess space left in the rock holes could then be filled with masonry and mortar to tightly secure the beam. The picture shows bits of masonry below the south beam in the corners where the beams would be inserted; are these remnants of tiling or masonry inserted to make good a hole? Of course tiling could have been done after the beams were fitted.

Looking down the vertical shaft and the grooves on the northern wall.

The Main Chamber.

This impression, looking north, shows the vertical shaft entering the main chamber in the northeast corner. The pavement is mostly missing in the northern half of the chamber. The north and south walls are vertical.

The corbelled chamber has seven overhangs and it's interesting to note that these overhangs are not at the same level as the corresponding overhangs on the opposing wall. In a way there is a hidden overhang; the small patches of stone by the chamber floor are just thick slabs of stone that cover the overhang of the first masonry course

that lies on the leveled rock. The floor of the chamber has been further excavated in the rock by some 80cm.

In the image above, a breach in the southern wall shows the lower patches of stone and, where they have been removed, the natural rock can be clearly seen.

Three of the overhangs have had their lower edges chamfered; the first overhang on the east wall is chamfered along its length. This may have been done so as not to interfere with bulky items that came up the shaft. The fifth overhangs on both walls also have their lower edges chamfered along their length; these might be connected to the beams found on the overhang above that are present at the north and south end of the chamber. For example, a taught rope may have been connected to the two beams and used as a sort of gantry; the chamfered edges could help for bulkier items or the splaying of guide ropes. The second and third overhangs have square holes on both walls at the north end and appear connected to transport of items up the shaft, a piece of surviving beam is present in one of them.

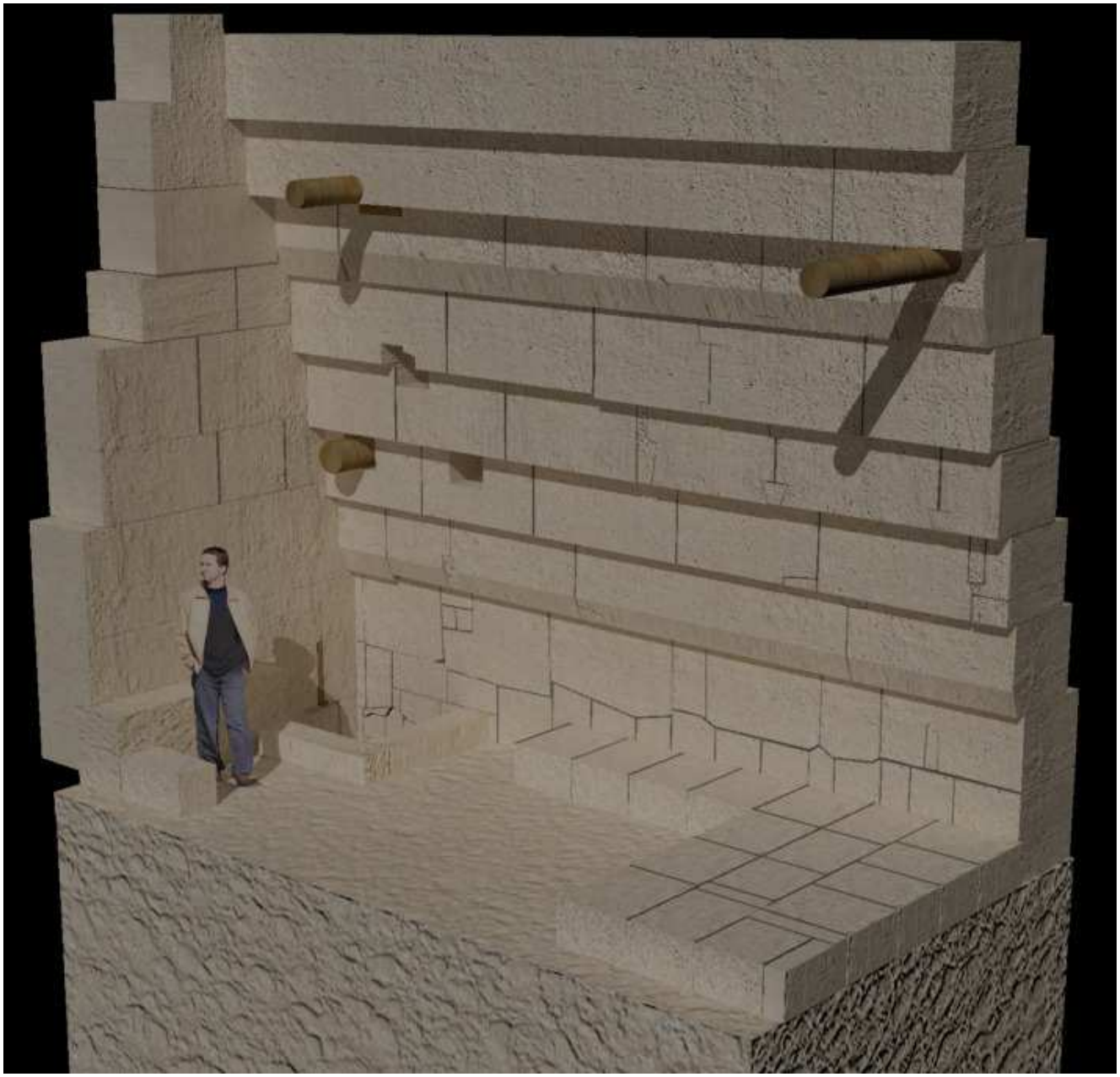
A feature often unnoticed is the long bank found against the North wall, M&R say:

"Along the north wall, between the shaft and the west wall, was laid or cut in the rock during the construction of (C) – a long bank rising about 30-35 cm from the floor and 30 to 40 cm wide: this bank is very roughly dressed. Also the blocks forming the masonry of the walls, the overhangs and the pavement have been barely squared"

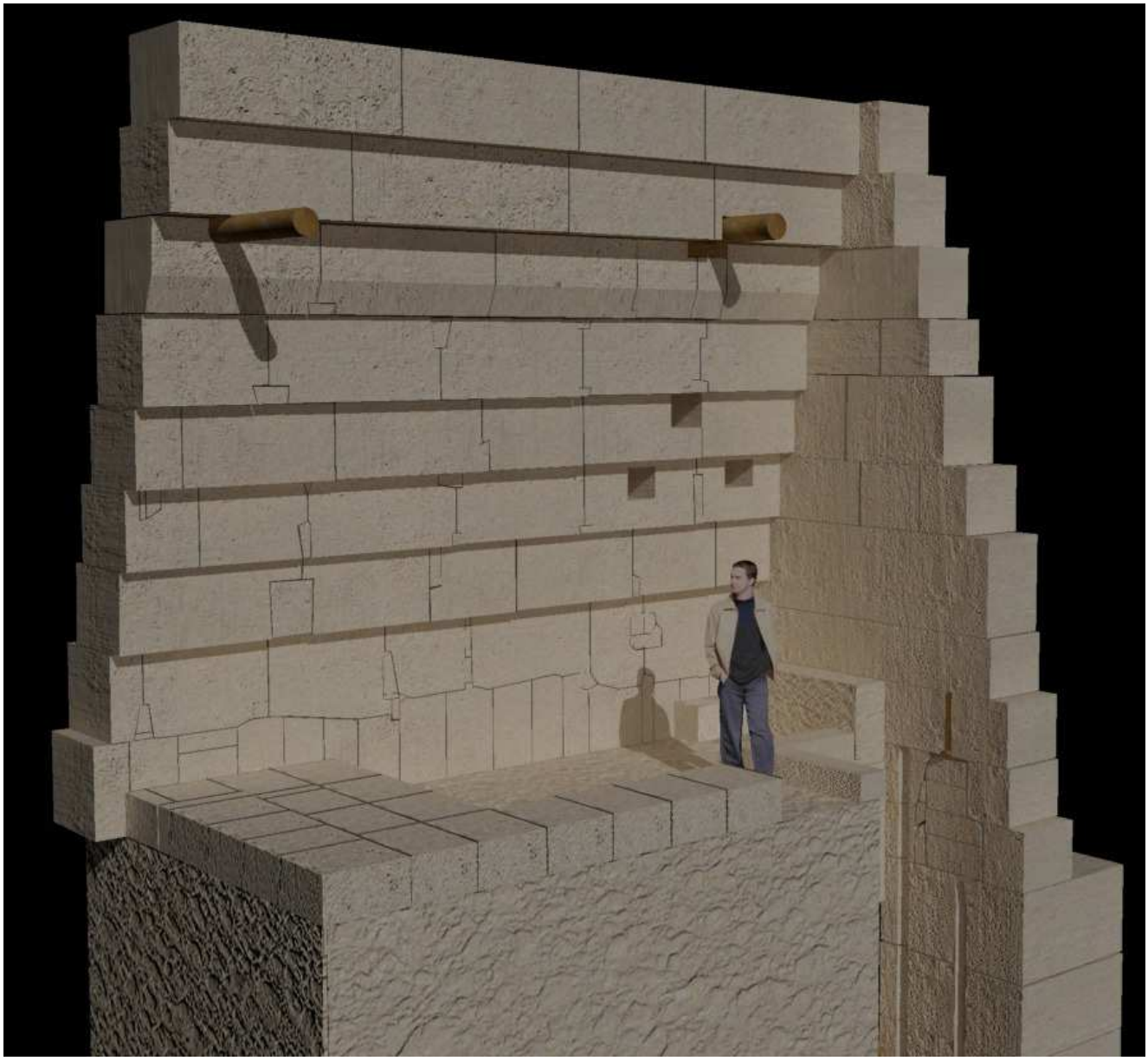
It has been suggested that the chamber was left unfinished, but I doubt this is the case. The chamber, it is fair to say, has suffered the ravages of time, be it salt incrustation, human damage etc. The chamber has many signs of damage; there are frequent stone patches on the walls, large chips and pieces of stone missing. The chambers would have been completed very early in the course of the Meidum project and given the differing phases present, surely there was ample time to finish the chambers.

In 1999 Dormion and Verd'hurt who discovered the new relieving chambers above the lower chambers and passage used an endoscope to take some pictures. These chambers above the lower chambers were basically hermetically sealed and showed no salt formations; the remarkable preservation of these chambers is a stark contrast to the injured and exposed main chamber, which surely would have been as good as the hidden relieving chambers.

The Bank is just visible in the right foreground of the above image.



The image above looking towards the east wall shows the relative positions of the features described.



View looking towards west wall.

The chamber itself is not large, the height from the pavement to the roof of the last overhang is 5.05 metres. The width is 2.65m and length 5.9m.

The square holes on the west wall M&R provide some measures. The first hole nearest the north wall starts at 43cm from N.wall and is 21cm wide; a gap of 76cm occurs until the start of the next hole on the same overhang begins and is 27cm wide. The hole in the overhang above is 25cm wide and slightly north of the 27cm hole, such that their north and south sides nearly align.

Looking south, we can see the surviving pavement stones laid on the rock; also in view is the excavation in the south wall and the chamfered edge on the first overhang on the east wall. There is hardly a block in the chamber not damaged in some form or other.

Looking along the east wall, we can see a piece of beam in one of the square holes; the other two square holes are just visible above and to the right of it. Also visible are some patches of stone near the joint lines that are quite widespread in the chamber.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Looking down the shaft we can see some of the wooden board and beam in the north wall, below that a hole that is part of the corbelled space that originally would have been closed with a stone block. To the right of these features, there appears to be a depression and some damage to the east wall which may have a bearing on what I want to discuss next and that is the sealing of the chamber.

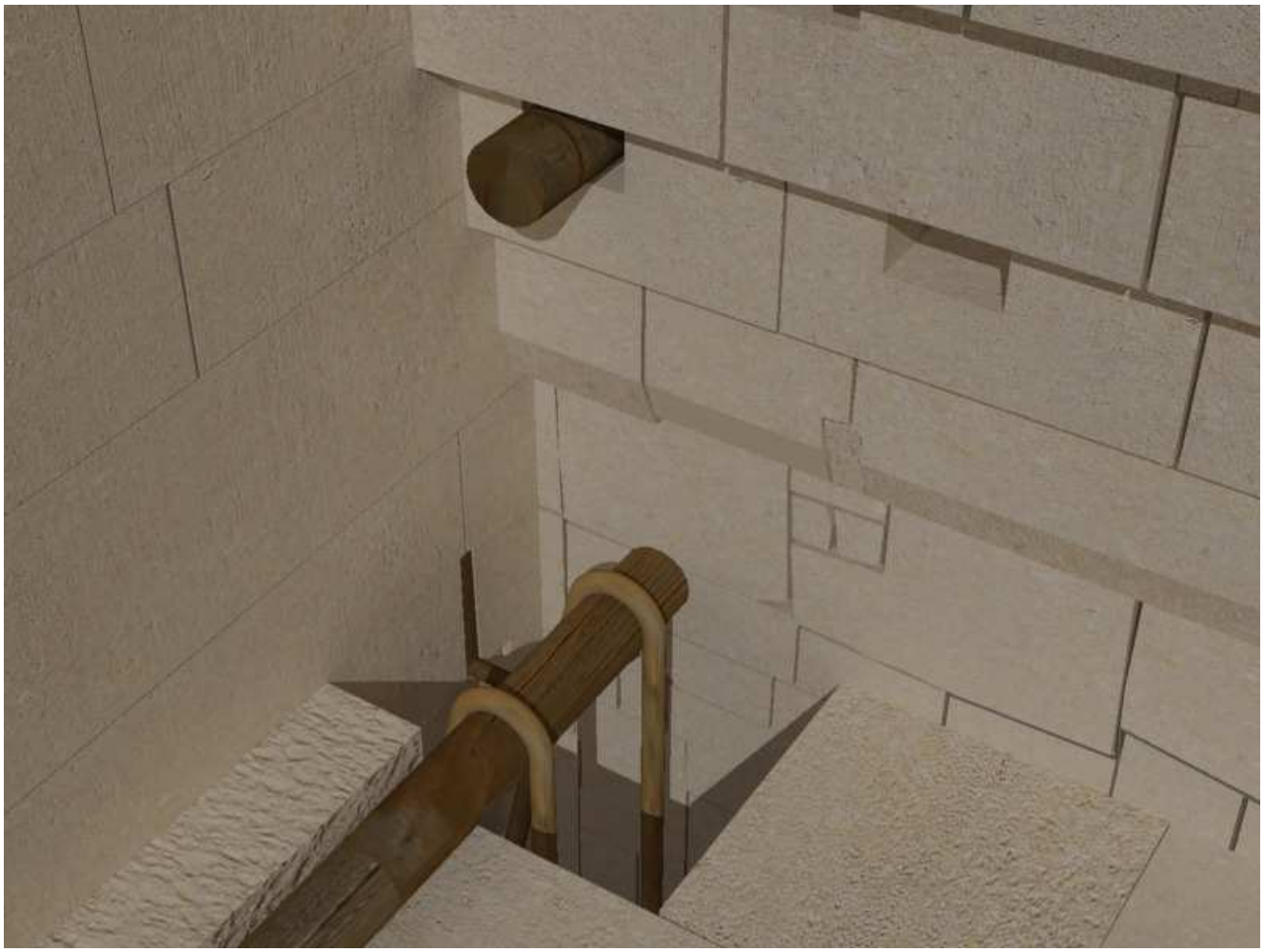
The following features I believe are all related to the sealing of the chamber and their functions need to be explained. They are:

The Bank that stretches across the north wall and terminates at the west wall of the shaft.

The wooden board and beam found in the corbelled space in the north wall, and the rough and ready nature of the blocks sealing this space.

The two parallel grooves that run up the face of the north wall, and end on a level matching the pavement.

The three beams embedded into the east, west and south walls of the shaft.



Once the decision to seal the chamber was made the following sequence of events may have been done. First, the corbelled space in the north wall of the shaft would be walled up; the trapezium cut mentioned by Dormion on the west wall of the space was probably made to aid in inserting the four blocks and then patched up with the small pieces of stone. Next, the 10cm beam would be inserted along with the 5cm wide wooden board. The four blocks and board would sandwich and hold fast the beam, this beam would probably only protrude into the shaft a short distance and its function would be to provide a backstop to prevent any intruders from attempting to push the portcullis block up the shaft. The board, beam and blocks in the space are 40cm deep.

A beam would be placed across the width of the chamber along the bank on the north wall and possibly engage into a recess in the east wall; wedges could be added to the end of the beam against the west wall to tighten things. Alternatively, or as well, the beam could have been supported by rope from the beam that is vertically above it.

Any portcullis raised would have to be well balanced due to the close tolerances of the shaft; therefore it would be important that the pull via the ropes should be up the middle axis of the shaft, to prevent the portcullis block from tipping and catching on the shaft walls. We know the N-S distance of the shaft is 130cm, giving the passage axis as 65cm; the damaged bank is 30-40cm, a beam of 20cm diameter and thickness of rope, show that there is room for a clean vertical pull.

The dimensions and form of the portcullis block is an unknown, we can guess that the width and length of the block would be slightly less than the shafts for clearance. The height is the unknown part; it may have mirrored the height of the horizontal corridor of say 1.7m. The block may have been stored in one of the lower chambers or brought down the descending passage, moved to the bottom of the shaft and turned upright; in this scenario, corridor paving stones at the shaft entrance may have been temporarily removed to provide clearance for up righting the stone and connecting the ropes. Or the exposed edge at the bottom of the shafts north wall may have been chamfered to aid access. The bottom of the portcullis may have been tapered to ease the block into the beams in the shaft, during lowering.

The three beams imbedded into the shaft walls, would have had a trial fit long before this day of sealing the chamber and the tiling of the walls in the shaft would be largely complete. The three beams would be absent from the shaft when the portcullis was raised, the portcullis would be raised high enough to clear the area where the beams were to be inserted, and possibly held in place by some beams brought into the shaft.

The three beams would then be introduced into the shaft and fixed into position, possibly with mortar and small stones; some small residual tiling down onto the beams may also have been carried out at this stage. The beams themselves would be fitted in such a way that they protruded slightly past the plane of the tiled walls; this was to ensure that when the portcullis was lowered it would jam tight against the beams and be held in place. For good measure when the portcullis was in the raised position before lowering, the exposed tiled walls may have been coated in mortar to further secure the portcullis. In this scenario it's interesting to note that a clear line of surviving tiling exists approximately 1.2 metres above the west & east wall beams; below this line the tiling is missing. Could a smaller portcullis in height have been used and mortared as described, then when violators attacked and destroyed the portcullis, those tiles adhering to the portcullis would most likely also be removed as a consequence and leaving the upper tiling intact? The line from the surviving tiling to the beam backstop is also nearly 1.2m.

In the reconstruction above I have used a portcullis block whose height is equal to the corridor below as an example, but it may have been smaller in height.

Such an obstacle would be a difficult task for would be robbers, who would no doubt prefer something a little more accessible. I suspect the portcullis was probably also mortared to the tiled walls and held the block enough to prevent robbers levering it up to access the beams; leaving the robbers no choice but to hack through the portcullis to gain access.

This method of closure I believe best fits what has been observed. But this then raises a bigger problem; that is, the surviving elements of the closure method show that the chamber was sealed, yet it is often felt that this pyramid was never utilized and that Sneferu was buried at one of his pyramids at Dahshur. Maybe the pyramid was utilized by an ancestor of Sneferu after phase E2; could Sneferu have held this ancestor in such high regard that some years later he dispatched a workforce to convert Meidum into a true smooth Pyramid? Certainly Sneferu seems to get good press throughout Egyptian

history, a sort of philanthropic character perhaps? Did Phase E3 ever finally get completed? Might this explain the uninscribed stela in the pyramid temple; did Sneferu die before completion, to be succeeded by Khufu who appears to attract bad press? Did he cease any completion works at Medium, in order to focus all efforts on his own grandiose project? All very tentative I know, but something that I feel cannot be ruled out.

Inside the Pyramid, Petrie commented;

"That this really was the sepulchre is shewn by our finding thrown down the well the pieces from a wooden sarcophagus, of the early plain style,"

This tells us little as intrusive burials or Saite era restorations can easily confuse matters. If said remains are stored in some dusty storeroom and can be examined and dated, then it may shed some light on the history of the Pyramid.

A close up view, where West and South wall beams meet

The Relieving Chambers.

In the image above the relieving chambers/spaces can been seen above the two lower chambers, the lower end of the descending passage; and the corridor leading to the shaft. Dormion and Verd'hurt discovered these unknown spaces between 1998-2000. They were concerned about the large span that the roof beams of the lower chamber had to cover and wondered if a weight relieving system was present above.

In May 1998 they closely examined the masonry for any clues, and on day one;

"…in the upper section of the shaft, we discovered a bonding symptomatic of a walled aperture we called window"

To me the most amazing aspect of this discovery, as a layperson, is how such a clearly observable walled up space went unnoticed for so long, especially when the often reported wooden board and beam is so intricately linked to this space. I can understand early explorers like Petrie etc missing such a clue, conditions were a lot poorer in those

days, especially lighting; but surely in modern times this should have been picked up a lot earlier. I always assumed that these structures would have been meticulously examined; but it appears this may not be the case.

The first corbelled space with the wooden board and beam is 2.8m long, 0.75m at the base and 1.44m high and consists of three corbelled courses. Though the space was walled up with 40cm of stone and wood, it has suffered substantial salt formations and splitting of the masonry; which is in sharp contrast to the much better preserved relieving spaces above the lower chambers and descending passage.

The relieving spaces above the lower chambers are made of seven courses of which 5 are corbelled. The floor of the spaces is the upper face of the beams that span the chamber below, which vary in height. Dormion commented on how he thought the horizontal ceilings of these spaces appeared to correspond to the level of the natural rock. On the condition of these spaces Dormion says:

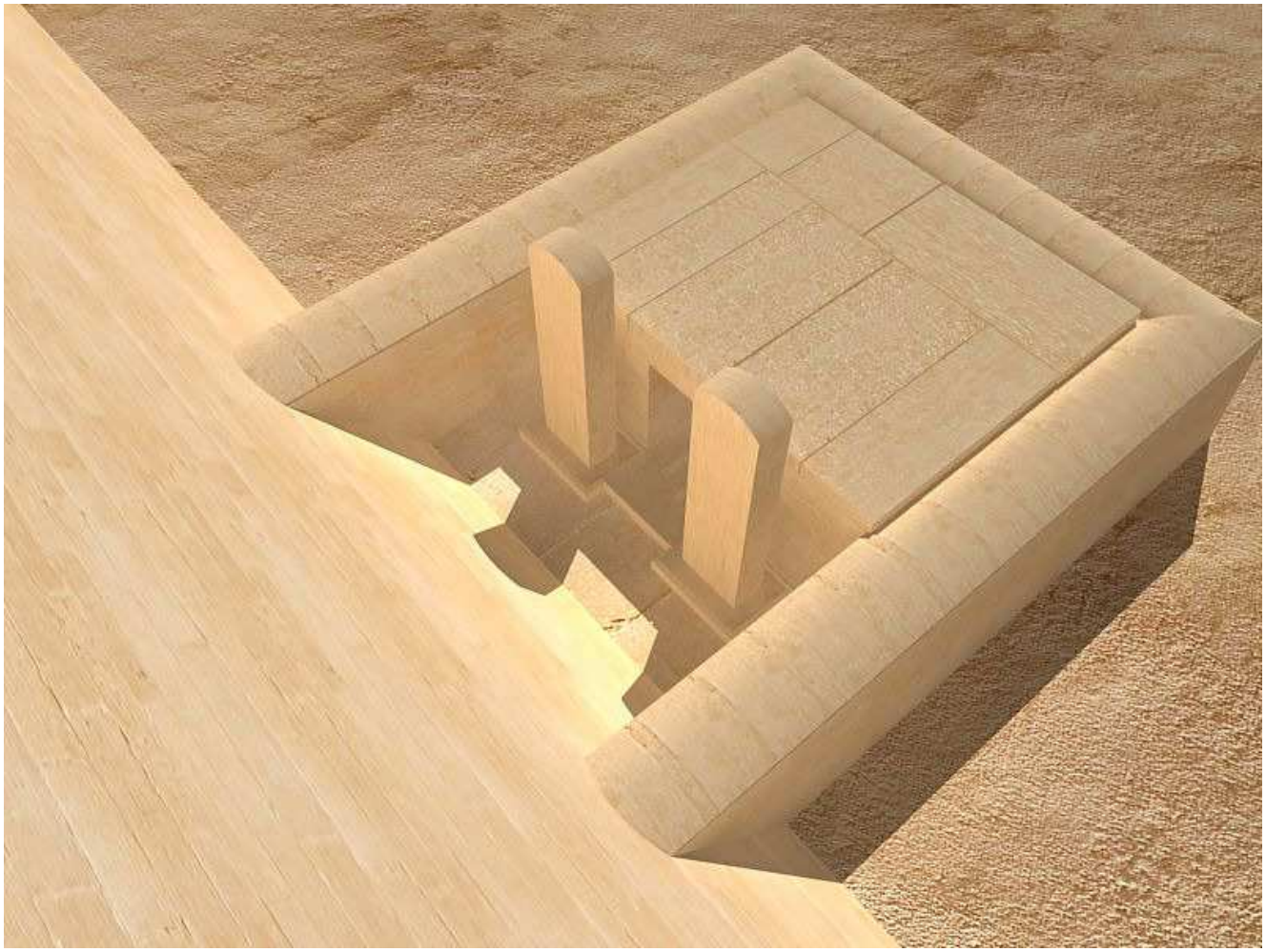
"What surprised us most is the excellent state of preservation of the chamber. It seems that the damage due to moisture and salt, visible in the other sections that can be visited and in the small corridor discovered, has not affected this chamber at all."

The space above the northernmost chamber next to the descending passage has an opening in the western lower corner of the north wall and here the corbels belonging to the space above the descending passage meet the west wall at a similar angle. The space above the descending passage consists of three corbels and terminates against a monolithic block laid perpendicular to the passage. This end is approximately 15 metres from the lower end of the passage. A 2 metre deep hole was made further up the passage, 19.7 metres from the lower end; but no space was found. Unlike the large beams that span the lower chambers, the roofing beams of the descending passage all exhibit the same height.

It would be nice to revisit these newly discovered spaces with more modern equipment. The discoverers were somewhat limited in what they could observe; I feel a more detailed examination would shed some more light on construction methods, maybe masons marks etc could be found in the better preserved spaces.

It appears the relieving spaces end where they leave the rock cut trench, which also seems to coincide with the first of the accretion layers.

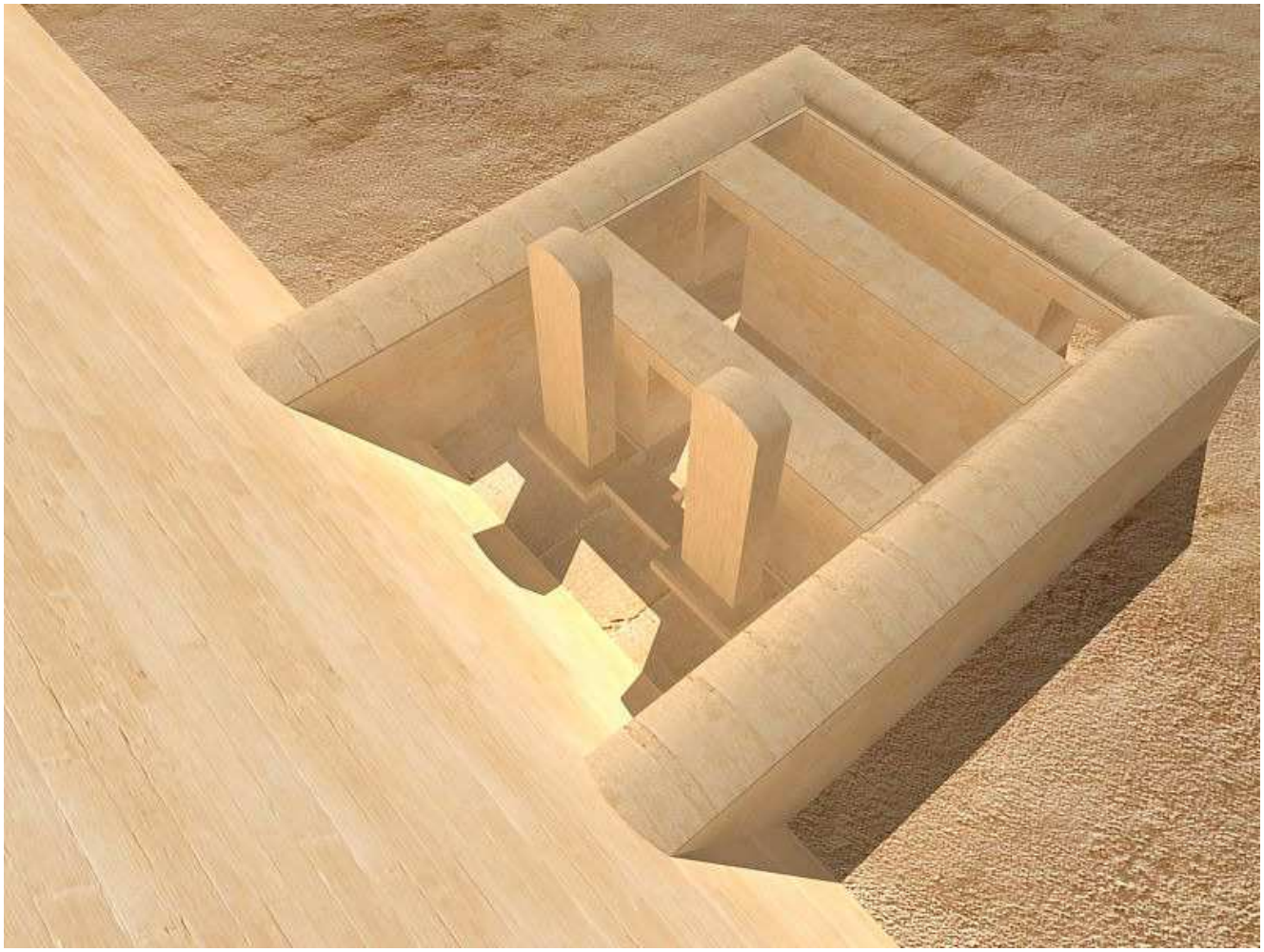
The Pyramid Temple.



The pyramid temple was discovered by Petrie, after much arduous and dangerous work in clearing the debris from the east face. It is accurately centred on the east face, being only 2.1 inches south of the face axis. It is built onto the face of E3 but the temple is not bonded or joined to the casing stones of E3. Petrie reports that there is a slight batter on the outer faces of the temple *"amounting to 5.5 slope inward on 90 height"*.
The tops of the walls are curved and apart from later graffiti, the temple is devoid of any decoration, it appears quite austere and bare. M&R say:

"In many points the blocks have not been dressed: this and other particulars which we shall describe below, show that the work was completed but not finished"

The inner passages are roofed over by large stone slabs; outside of this we have two uninscribed stela and a small courtyard.



With the slabs removed we enter the temple at the south east corner, the entrance is similar in width to the pyramid passage and the outer walls where they have not been dressed down appear 3 cubits thick. A short walk north along a corridor, 48 inches by 237 inches long another doorway of the same width as the entrance appears through a wall of 2 cubits thick. These two doorways have not their sides aligned with the north and south walls, but set back from the walls from 6.2 to 7.7 inches. The next space is wider than the preceding corridor at 75.5 inches; the chamber length is the same at 237 inches. The next doorway is located in the middle of the wall that leads out to the courtyard; this wall is also 2 cubits thick and the doorway is wider than the other two at 61 inches or 3 cubits.

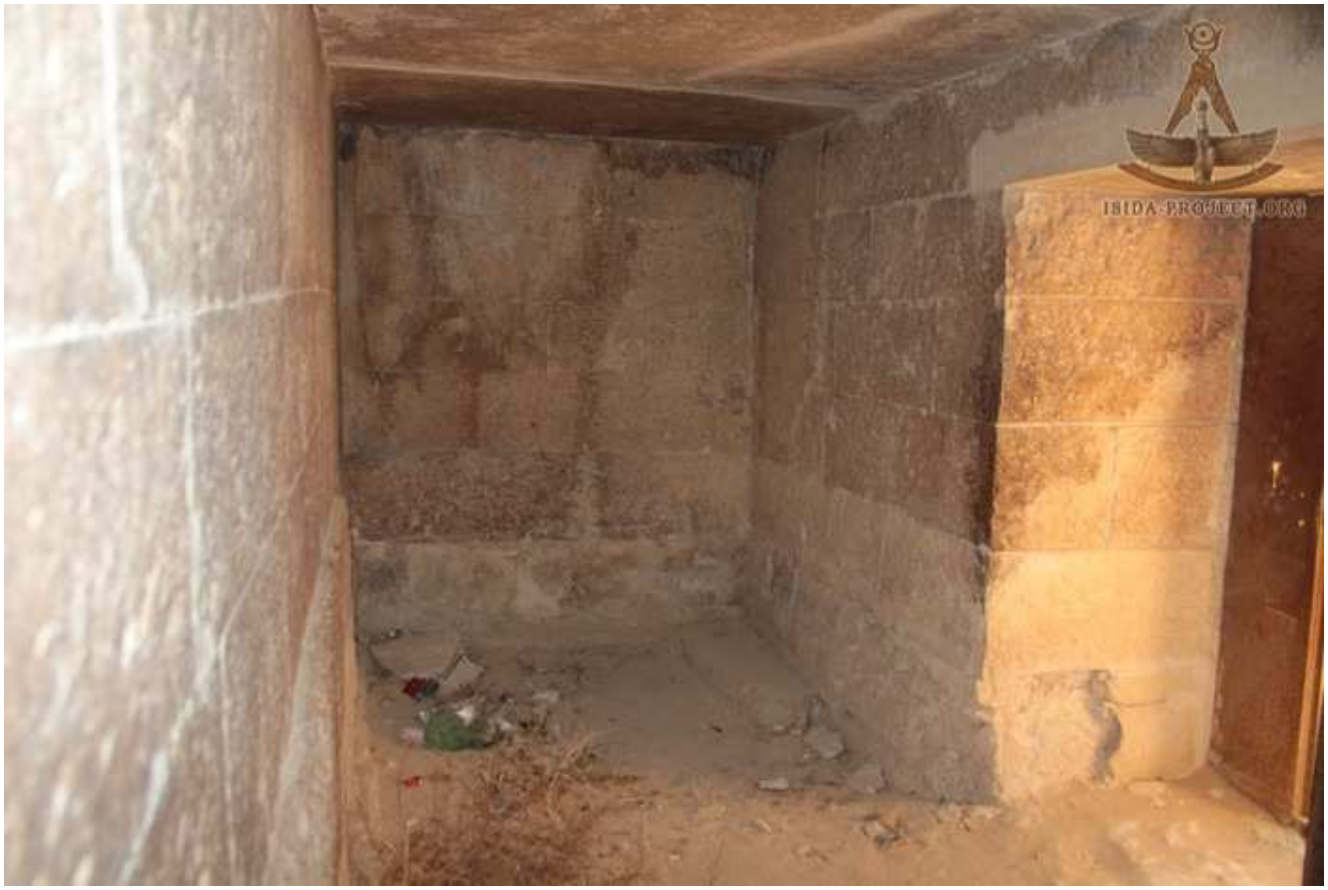
The courtyard at pavement level is 237 by 92 inches. In the courtyard we have an altar placed between the two stela; the two stela Petrie gives as 8 cubits high, 1 cubit thick and 2 cubits wide. He also describes them as standing on low bases with sloping sides. However M&R say;

"As a matter of fact, these bases are only false bases since they are formed by vertical slabs, properly shaped and placed around the lower part of the stelae which are actually founded below the ground level."

The courtyard is the only part that is paved by limestone slabs; M&R describe the rest of the temple floor as having a pavement of mud, Petrie describes it as desert pebble and sand. Why no flooring? It's unlikely to have been robbed, sparing the rest of the structure; or is this another example of the unfinished state of the temple, like the undressed walls on the north and south walls of the courtyard and elsewhere.

Petrie states that the temple lay on a footing of about 17 inches. The 6 courses of masonry that make up the walls vary from 13.4 to 16.4 inches high and do not match the corresponding E3 course heights. The top of the 5th course equates to the top of the entrance, about 77 inches, the lintel above is 13.7 inches thick, to give total wall height of 90.7 inches, the thickness of the roof about 14 inches, gives a total of 104.7 inches, close to 5 cubits.

In the image above, the lowest course of the temple is clearly different to the others and not unlike what we see in the main chamber in the pyramid, are these thick tiles? Was the top of this course intended to coincide with the finished floor level of passage and chamber? If so this would reduce doorway height to 60.6 inches (1.54m) though once through the door, the lintel course would increase headroom to 1.88m.



In the image above in the chamber by the courtyard entrance, you can see what appears to be an undressed lower course and possibly a broken tile by the door. Generally the temple is described as being made from tura limestone; but is this lower course local stone simply tiled? Was the thinking not to waste better quality stone on this course as it would not be seen by any subsequent floor blocks?

In the foreground is part of a ledge which is the second course, sitting proud of the course above, was this course still to be dressed?

Also in view is the footing that extends beyond the walls, that Petrie measured as 17 inches high in the south west corner of this chamber; this footing could also be used to support paving slabs. It's hard to imagine paving not being fitted and the floor being left in this rough unfinished state. One tends to think a temple to be a clean sacred place, were cleansed and purified priests went about their rituals; walking along a dirty floor doesn't seem to fit the picture.

View along entrance passage

Apparently in this passage Petrie found an intrusive burial from the 18th dynasty and the entrance door was carefully blocked with pieces of stone to protect it.

After examining the temple Petrie reburied it.

"To have left it open would have been to ensure its destruction in six months. The pyramid of Meydum is the quarry of all the neighbourhood."

In the image above we see the north wall of the temple rest up against the casing of E3. The damage apparent on the casing is quite distinct to that of the temple wall, which seems strange.

Outside of the temple M&R say;

"No trace of a stone pavement has been found in the court surrounding the pyramid. Some remains of a paving or of a footway in mud or mud bricks have been observed from the end of the causeway to the temple door"

The overall impression is of a temple that has been mostly completed but for some reason during the finishing stages, work appears to have stopped. This may explain the numerous undressed areas of the temple, the uninscribed stela and perhaps the missing pavement.

View along chamber east wall

The Peribolus Wall.

Surrounding the pyramid is a rectangular wall, which Petrie calls the Peribolus wall.

"The peribolus wall around the pyramid has been entirely destroyed, excepting the foundation stones in most parts, and the lower course of wall in the deep chip rubbish on the south side. In some parts even the foundations are gone, and their place can only be traced by the hole being filled with sand, against the chip and stone-dust bed which formed a pavement outside of it."

Petrie thought the wall to be 57 inches thick with a height of 70 or 80 inches, based on a fallen causeway block. The east and west walls are practically equal; the east is 9307 inches long and the west 9300 inches, The north and south sides show a greater discrepancy, north wall is 8561 inches and south 8479 inches. Petrie says;

"The design for the breadth of the peribolus is pretty clear, as 1420.4 inches is a quarter of the base of the pyramid, so that the enclosure was half as wide again as the pyramid"

The 1420 inches is the distance of the outside of the east and west walls to the pyramid base. The north and south walls are not equidistant to the pyramid base; the north wall is about 780 inches further from the pyramid base than the south wall. North wall distance is 2203 and south wall 1393 inches. Petrie's scheme for east and west walls, means that an E3 base of 275 cubits, gives a wall distance of 68 ¾ cubits (1/4 pyramid base) therefore total distance from east to west is 412.5 cubits. The mean length of the north and south walls is 8520 inches; divided by 412.5 provides a cubit of 20.65 inches which is in the normal range for Egyptian cubits. This spacing between the north and south walls, Petrie says *"I fail to see any reasonable hypothesis."*

Having looked at this puzzle I have devised a possible solution. Petrie's idea of using the pyramid base as a relationship to the east and west walls, made me think of the other quantity that defines a pyramid and that is its height, which Petrie gives as 175 cubits.
The south wall at 1393 inches, I suggest was intended to be the same as the east and west walls of 1420 inches, or 68 ¾ cubits. The north wall I suggest was intended to be 106 ¼ cubits from pyramid base; using a cubit of 20.65 this would be 2191 inches. The scheme means that the pyramid height has a relationship with the north/south walls and the pyramid base has a relationship with the east/west walls; as 68 ¾ + 106 ¼ =175 cubits or pyramid height and 68 ¾ + 68 ¾ = 137.5 or half base length.

The only entrance through the wall was on the east side about 25.5 metres from the temple entrance. M&R say;

"by uniting with an imaginary line the middle of the door of the offering temple with the entrance door it has been possible to determine the angle of the causeway with respect to the east enclosure wall: it is about 86°20' "

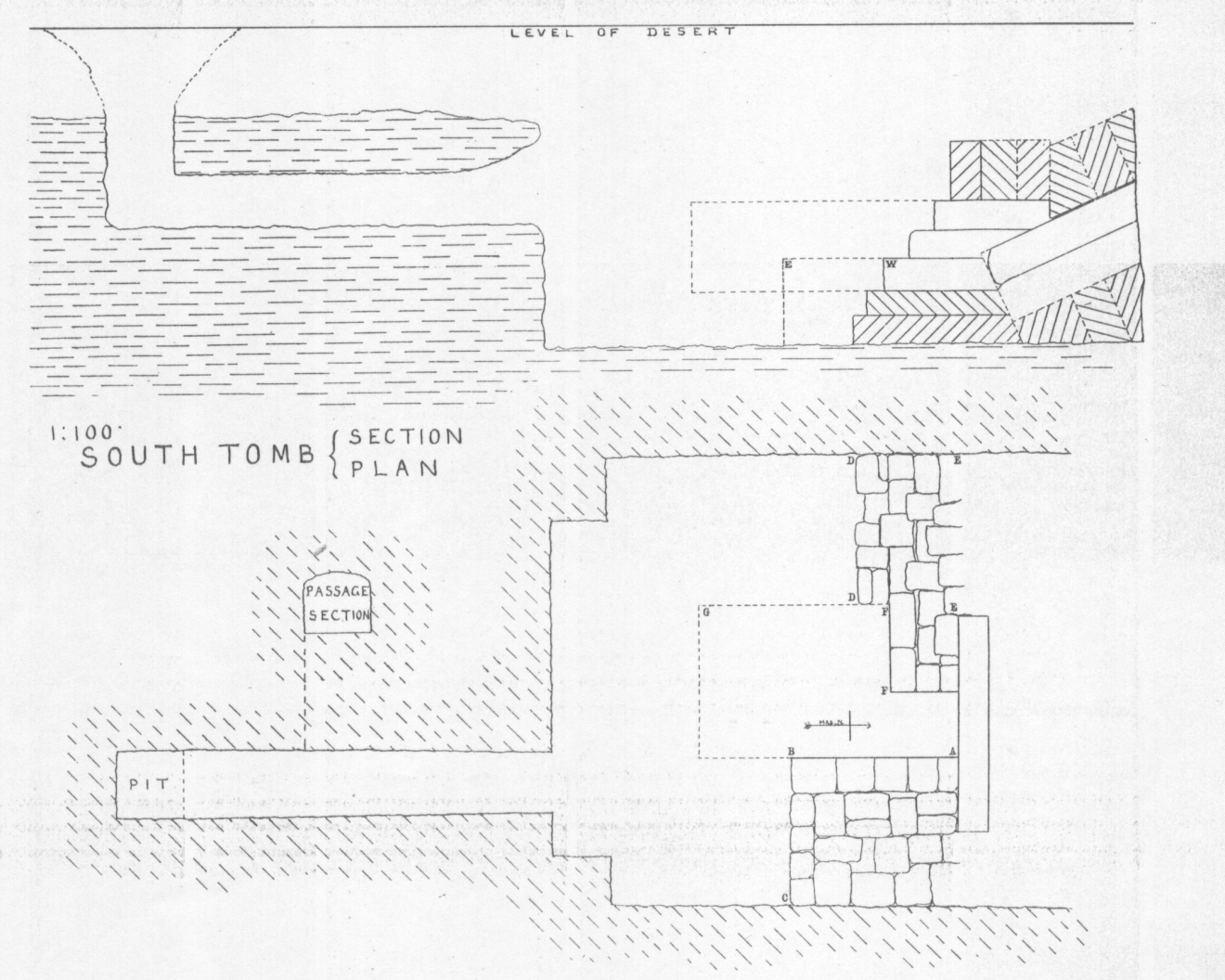
Before the entrance there is a rectangular enclosure, and it has been suggested that maybe statues could have been placed at its ends; this enclosure opens out onto the causeway and on the north and south walls of the causeway at this point, there appear to be entrances. Inside the peribolus wall two other structures were found, a tomb to the northwest and a subsidiary pyramid to the southwest.

The Subsidiary Pyramid.

This structure has been so destroyed that its original form may never be known; the superstructure has gone entirely along with most of its substructure, only a few stones remain in proximity to the remains of a sloping entrance passage. M&R thought that the structure was a 50 cubit wide step pyramid of 4 steps and layers of 5 cubits width. The foundations of the outer layers appear to be laid in a trench inclined at 30 degrees towards the centre and about 28 metres square. The pyramid chamber was built in a pit some 4m deep, about 8m wide and unknown length and it is thought one small room was built. The surviving descending passage was plugged by two limestone blocks and apparently the northern end of the passage still lies under a huge pile of debris and has not been excavated. In the central pit burials dating to the 22nd dynasty were found.

M&R believe that the structure was a stepped layer pyramid, and believe the structure may be linked with the E1 or E2 phases. There is only a 5 metre gap between E3 and the structure and the vertical shaft and vaulted horizontal passage that leads to the pit south of the pyramid, may have been another entrance to the structure, caused by the enlargement of E3. Maybe further excavation could shed more light on the structure, as Petrie says;

"It would be desirable to clear it completely; but the depth and hardness of the material, and the absence of a single stone left in situ so far as I went, dissuaded me from working further."



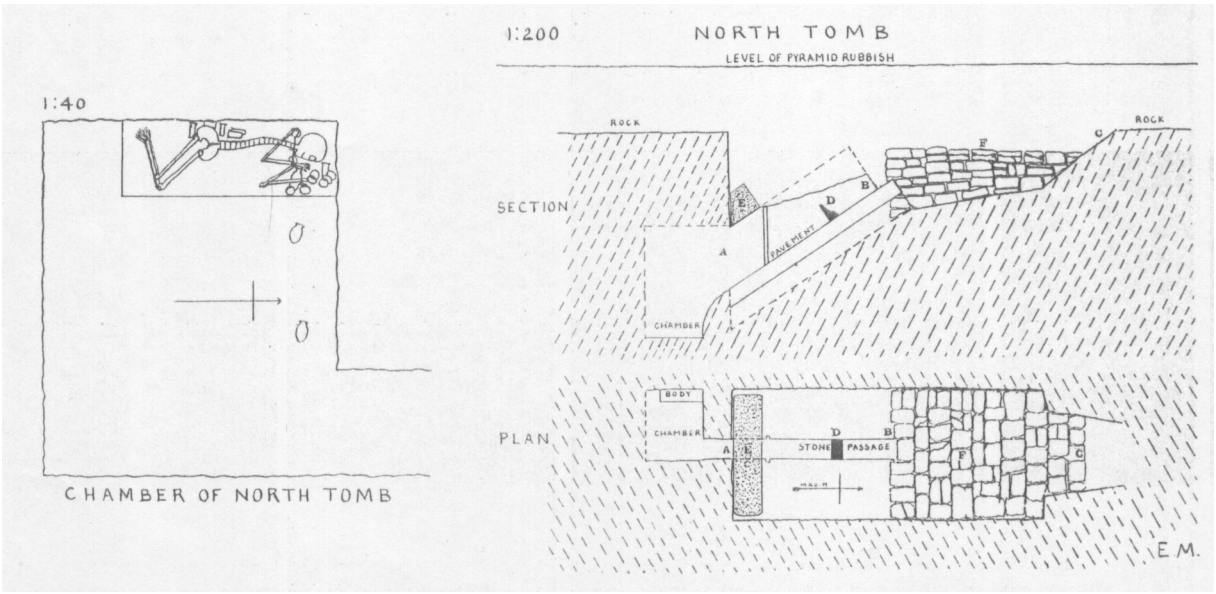
Plan and section of subsidiary pyramid chamber

The Northern Tomb.

The northern tomb inside the peribolus wall lies to the north west, Petrie states;

On the north of the pyramid we found a strange form of tomb. A small mastaba, fifty feet wide, and probably a hundred feet long, stood in the peribolus enclosure. On the north side near the ground a sloping passage led down. The rock cutting for this was nearly fifteen feet wide, and the building of it was splendid, with great beams and blocks of fine white limestone. The passage was plugged with stone, below which a door slid in grooves. And yet after about twenty feet the end of all this fine work was reached, and only an ignoble little room cut in the soft muddy marl contained the burial; and the

roof of this had readily fallen and filled the chamber, in entire contrast to the splendid 14 foot beam of limestone which roofed the entrance to the chamber. Where sharp contrasts of work are found they are commonly supposed to be due to neglect. But here the rough crumbling chamber must have been cut first; and the massive stone passage was added in front of it, quite incongruously."



Plan and section of Northern tomb

The Approach and Causeway.

While excavating on the east of the pyramid Gerald Wainwright discovered the approach, which he describes as a well made causeway that was very carefully constructed. To maintain a constant incline of approx 10 degrees, the rock would be excavated to a depth of 8 feet; areas that were lower than the line of the incline were banked up by a mound of rubbish, enclosed by a mud plaster facing wall. The cutting in the rock was 201 inches wide, in this cutting two walls of rough stones covered in mud plaster was made, reducing the width to 123 inches; this space between the walls was paved with crude brick.

On each mud wall a red line was drawn with an even slope; one large limestone block was found in situ on the brick paving, and the upper surface of this block coincided with the red line, suggesting that the red lines were guides for the limestone paving. It is not known if the approach was ever finished, or if the valuable limestone paving was removed before the approach was filled and concealed with debris. The lower two thirds of the approach are covered in clean white chip. Wainwright says;

"Moreover it is exactly the same as the chip filling of mastaba17, and that composing the rest of the smooth ground, which has been levelled round about."

The western end near the pyramid he describes as;

"entirely filled with the concreted red sand of the surface clearance; a little further down away from the pyramid the red sand is mixed with broken marl from the deeper digging, the marl increasing as the red sand decreases, and finally disappears; soon after on the top of the marl is thrown clean limestone chip.."

Wainwright's hypothesis on the filling sequence of the approach concerns me. He thought that the *"approach was made for the building of the original mastaba, from which the pyramid grew"* This idea of a primal mastaba, or Borchardt's E0 seems to be prevalent at this time; but there appears to be no evidence for it. Wainwright goes on to suggest that the;

"King determined to enlarge it into a pyramid, surrounded by an enclosure, the old approach leading up to the south part of the face would be unsightly, and it was necessary to build a new causeway leading up to a temple against the middle of the face, which being done the old approach became nothing but an eyesore, to be done away with as quickly as possible. Hence they began at once to fill it up with the material they obtained from the foundations of the first parts of the new work.

This change of design appears to have taken place after the building of the fourth of the eight mastaba faces, that with the outermost groove. For such evidence as we have goes to prove that the idea of an enlarged mastaba, bearing the usual indications of the Ka chamber in the form of a groove on its outside, lasted as late as the building of this fourth face, during all of which time the old approach would be suitable. Then we find the old approach filled up by rubbish which, as far as our evidence goes, came from the next work which was undertaken on the structure.

This can only mean that that under the new scheme the old approach had become useless, and was replaced by the new causeway, which was part and parcel of the new arrangement"

This Idea that the upper third of the approach was filled with debris from the pyramids foundation as it was enlarged seems unlikely. The evidence instead suggests that phase E1 was planned from the outset, and there are no grooves on the casing of E1 that we can view. The grooves appear on two of the steps of phase E2 enlargement; if the approach was intended to be related to these grooves; surely it would still be in use. Wainwright mentions three ingredients filling the approach; the red sand, the marl and

chippings; but if the approach was abandoned early would we not have more stratification noticeable in the filling. If abandoned during E1 we could maybe expect sand and marl from this phase and chippings from E1 casing, then maybe more sand and marl and chippings from E2 casing. Added to this after a long interval, we have phase E3 which would add mostly chippings. The debris found in the approach doesn't seem to fit the phases of construction.

Wainwright states that the chippings are exactly the same as mastaba17, which we know, comes from the casing of E3, built many years after E1&E2, and as he reports that the lower two thirds of the approach are covered in these chippings, does that mean that the lower part of the approach was still uncovered before the E3 phase began?

Could the sand and marl in the top third of the approach come from other sources, I should imagine that the nearby mastaba17 could be a good donor for example. I feel that the approach should be re-examined in light of the building sequences we know today that was unavailable to Wainwright. I suspect that the approach was used and uncovered at phase E2; years later when E3 was embarked upon, the old approach would be abandoned, robbed of its valuable stone and filled in with the new constructions related to E3.

M&R say the approach had an azimuth of about 100 degrees with respect to north. The end of the approach near the pyramid is unclear, Wainwright states;

"Moreover at the top end the native rock was left rising high above the bed of the approach, up to just the level of the red line on the sides."

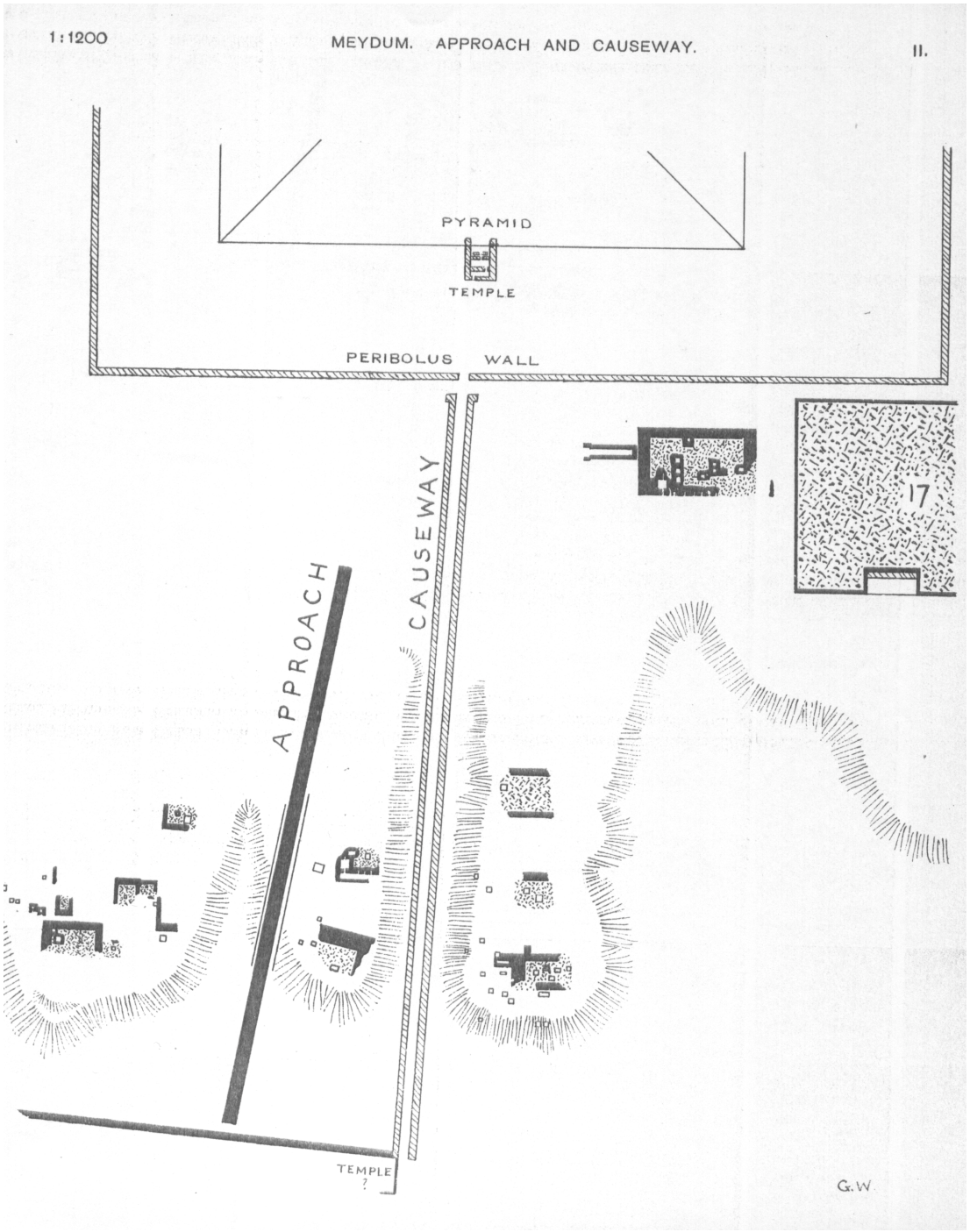
It may be that the approach was just a causeway that started from the lower cultivation and terminated on the level surface of the desert on the east side of the pyramid; as far as we know there appears to be no earlier peribolus wall, connected with phase E2.

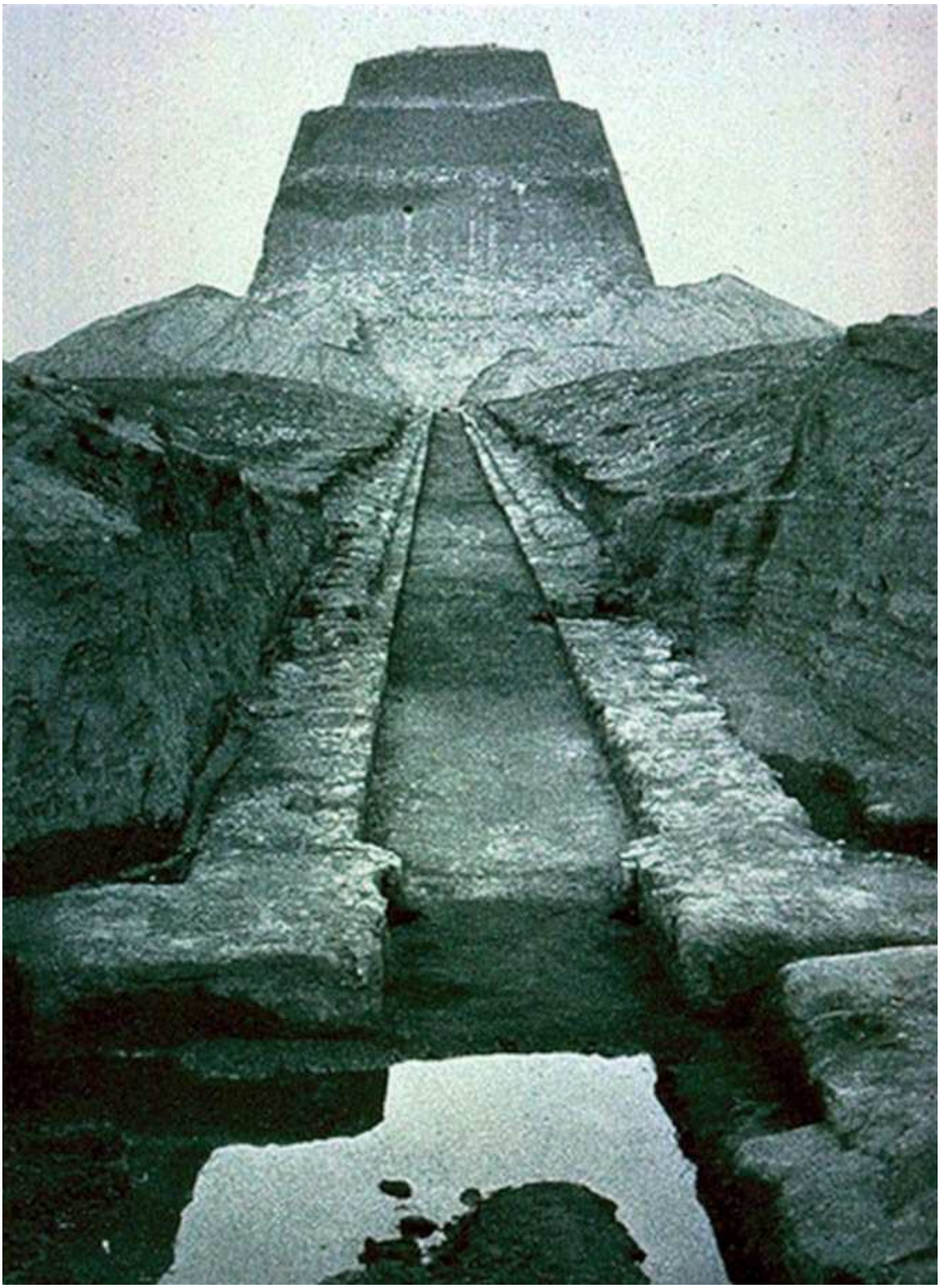
The end of the approach in the cultivation is unknown, as the area has not been excavated, due to the high water table in this location. All we know is that a wall of crude brick about 65 to 75 inches wide, that was connected to the later causeway runs across the approach.

The Later causeway appears to belong to Phase E3, and like the approach, it leads from the cultivation and terminates at the peribolus wall entrance. Mostly destroyed; Petrie thought it was an open causeway and from a surviving coping stone, thought the walls to be about 66 at base and 90 inches high, with a batter of 1 in 10 on the sides. Like the

approach, we know little of the east end; the form of the valley temple etc, due to the ground water problems

Plan of the two Causeways.





Causeway.

Conclusion.

As the title suggests I am just a layperson with no professional or specialised training in Egyptology. I have never been to Meidum, indeed I have never been in any pyramid, of any description; access to the full literature on Medium has also been a problem, so there will be gaps and no doubt errors. That said I feel I have accessed enough material to give me a basic understanding of the pyramid complex.

Mark Lehner in his book '*The Complete Pyramids'* states;

"In many ways Meidum is the most mysterious of all the great pyramids"

I would certainly agree, to me this structure is the catalyst that ignites the great pyramids of the 4th dynasty. A significant change appears to occur in design at this time that carries throughout the old kingdom; indeed the grandfather of them all.

The consensus seems to be that Sneferu built the Meidum complex in its entirety from start to finish, along with the huge pyramids at Dahshur; the Bent pyramid and the Red pyramid. To me this seems incredulous; the reign length of Sneferu, I have seen as 24, 28, 30 or even as high as 48 years, though the consensus seems to be falling around the 30 year mark. In Lehner's book he says that Sneferu competed phase E2 in his first 14 years and that he and his court moved to Dahshur in year 15; then around his 30th year on the throne, he abandoned the Bent pyramid to begin the Red pyramid, and at the same time sent his workers back to Meidum to create phase E3. Can we say another 15 years perhaps for a total of 45 years?

Into this mix we add the various date markings that have been found, and often the assumption that the cattle counts were biannual, while others argue that the counts were not always biannual. In short we have a reign window, from the Turin canon of 24 years to a possible 48 years (the highest year, count 24, was found at the red pyramid). Stadelmann reports a year date 15 from the corner of the red pyramid from a piece of fine limestone casing and a further stone 30 courses higher, dated four years later. But is this necessarily the build rate of the pyramid or of the casing? Debate rages still on how they were constructed, but there is a school of thought that they were built in steps first and casing stones last; if this was the case, it would put back the start date of the Red Pyramid considerably, and obvious knock on effects for the Bent and Meidum pyramids.

As a layperson I get the sense that there is an eagerness to give Sneferu the benefit of the doubt, when it comes to years reigned, in order to assist him in accomplishing these huge projects; but are we laying too much at Sneferu's door?

I suggest that maybe we are, and the 14 years that Lehner thinks Sneferu spent at Meidum did not occur. This would bring a reign length down to a more reasonable figure, allowing for ambiguities in the system of year counts.

To me I feel Meidum was the work of someone else, Huni perhaps? I suggest that the tomb was used and sealed at the end of Phase E2. Sneferu ascends to the throne and sets up court at Dahshur and begins construction of the Bent Pyramid; sometime during his builds at Dahshur, he sends a workforce back to Meidum; to convert the stepped pyramid to a smooth pyramid, E3. But why would he do such a thing? The family tree is not clear; it has been suggested that Huni was even his father. Apparently contemporary and later documents often mention Huni and his follower Sneferu in the same sentence and always in direct succession, which has lead some to think that they were related.

Being well advanced in his projects at Dahshur, did Sneferu choose to honour Huni by upgrading Meidum? But the evidence seems lacking; Lehner states;

"Previously it was suggested that Huni was responsible for this pyramid, based solely on the need to identify a large royal tomb for this king. However, the ancient name of Meidum, Djed Sneferu (Sneferu Endures), and the fact that Sneferu's name, unlike Huni's appears in texts at the site, all point to the former as the builder of Meidum from start to finish."

The problem I have is the reliance on 'texts' at the site. Not all tombs on the site are as forthcoming as the decorated tomb of say Nefermaat. There are numerous tombs at Meidum devoid of decoration and texts, such as the northern tomb and mastaba 17 for example; these tombs are all silent witnesses, we know little about these people; the early tombs are often bare and without inscription. As the tombs evolve, the introduction of text and decoration come to the fore; but are we over relying on the few tombs with texts and what they tell us. If Sneferu chose to honour his respected ancestor with a smooth pyramid, it would have taken many years to complete E3; his name would have been intricately linked to the structure and the memory of the people.

In the modern world I can think of many examples of a building being renamed to honour an individual; not that I am suggesting that Sneferu in anyway tried to usurp the Medium pyramid, more a case that Sneferu's great works were more remembered throughout Egyptian history; while some Pharaohs slipped from memory: Sneferu endured.