XXIV
Summary and Conclusions

I will conclude this work by proposing a collection of "topics" of the proposed elements in support of my thesis.
Wanting to settle all the details in a single design, it will be necessary to establish as the focal point the continuous concern of the architect during construction.
He is aware that at any moment can occur settling, twisting and sagging.
Despite having taken all possible precautions, Hemiunu knows he cannot sleep well and this will affect all of his work.
Failing to understand how he could solve complex structural calculations, I imagine that he had the help of the sort of artistic sensibility which certainly also belonged to the great architects of the Renaissance.
Without being able to calculate everything, if very gifted with ingenuity and aided by imagination, a mental model can be created, applying to it one's own common sense and experience of things.
Thanks to this ability, I think Hemiunu was able to "see" that a structure, apparently rigid, could deform under stress before collapsing.
Probably, studying the failures of his father, he has acquired a special understanding of pressure and its effects, so he realized that even limestone and granite, before yielding undergo a small deformation.
The magnitude of this deformation is almost infinitesimal, but within certain limits, it is partially elastic, so Hemiunu knows that no material is perfectly rigid and everything in nature behaves like a fluid.
This can explain the particular structure of the Antechamber of the Portcullises.
The pressure will deform in a small, but real, way the whole device, especially the parts filled by mortar (obviously much more flexible than the granite), distributing the stress on the parts able to bear it.
I'm talking about the six side ribs and the double divider subjected to great effort.
I will elaborate here on the two little holes, having omitted it in the first part of the book, so as not to plague the readers, whose minds were already so much burdened.
Now we are at the end, so it is time and, furthermore, I hope to have earned credibility.
Let us see why the two little holes are centrally located and are arranged on two blocks.

If the copper bracket had been positioned lower, we could take advantage of the whole surface of the double divider and not just the top half, having in this way a bigger mortar closure.
We would have rather been able to use a single monolith, but Hemiunu certainly knew that two holes, drilled in a single stone, would have created a weakness point, causing it to yield suddenly under effort and the failure would have occurred without any small previous elastic deformation.
Much better then to drill the holes in two separate blocks, but it would be more convenient to have a big block at the top and a smaller one below it.
Bad solution this. I cannot imagine what kind of tests Hemiunu performed, but certainly the stones had no secrets for him.
He knew that even a single hole, drilled in a modest stone, would have been fatal to the latter because, depending on the ratio between the block surface and the hole diameter, as well as the location of the hole itself, the collapse would change, and very much so.
I want to note that both holes were made very close to the edges: obviously not by chance.
The right compromise requires two blocks having almost the same size and so the lower part of the double divider will be unused.
On my part I thought that two notches on the sides of the groove stone could be better, allowing the pouring of a larger cast of mortar inside the cavity.
For a long time I was convinced that it would be a good idea, but now I realize that it is not.
Such a solution would have created two weaknesses in the worst place: the third pair of ribs is thinner than the others and right there, at the height of the passage, a flexure under stress would have caused the structural failure.
Ultimately, the only workable solution is the one put in place by Hemiunu.
I imagine he feared the event that occurred: according my hypothesis, checking out photos and planimetries, it is possible to detect that the collapse of the entire structure started initially breaking the portcullises and uprooting from the walls the lower part of the guides.
Beware though: the architect conceived a well-proportioned device.
Without the impact from the sarcophagus, there would have been no problem.
Skilled and knowledgeable though Hemiunu was, he was never presumptuous. He feared the instability of the colossus to the very end. I guess he lived a very worried life.

As I said before, grasping this point is essential to understanding the rest of the work.
In this way we can explain the Subterranean Chamber, almost finished and then abandoned, but also other details, such as the doubling of the ducts and the limestone yielding joints, knowingly arranged at critical points.
The incompleteness of the Subterranean Chamber testimonies the concern about the looters. There are in fact a whole series of deceptions built-in: a niche outside, a blind corridor, an attempted shaft... all tricks intended to be completed later, a sign of a widespread fear requiring a great caution. We will never know how much.
The second essential issue is to accept that the whole project was fully developed, since the beginning, complete in all details, by a single architect: Hemiunu. Changes during construction by different architects, is ruled out.
In support of my thesis, first of all, the common sense: we should not blame the intelligence of an entire civilization imagining that their leaders did not have the due respect for the social cost of such a project, not to mention the fact that, since the relationship between their fathers, probably child Hemiunu played with the young Cheops.
It is reasonable to expect that the children of Pharaoh, at least in childhood, should have interacted with some very selected of their peers...
For this reason Hemiunu enjoyed the trust of Cheops, but he still had to show and explain his project against numerous competitors and detractors. Like a tender today...
I have already spoken about the "trial passages." I cannot understand how it is possible to doubt that this reproduces, in detail, the intersection point of the two corridors, sketching even the beginning of the Grand Gallery, including the two lateral platforms and the entrance of the Horizontal Corridor. However the last might have been built to create a functional niche where one or more operators could work, for example to test the changing of the towing device, already described with regard to the Quadrivium.
There are four lateral holes, suggesting the insertion of two large beams to hold the block going up.
The architect, cautiously, first wanted to try out, in a full-scale model, the most delicate part of his project (free to do not share the hydraulic hypothesis, but the facts speak for themselves).

Referred to this excavation, I remember now something that happened when I started this task, wondering how the device could have operated during the descent of the block.
I remember, when the picture began to take shape in my mind, that if I had to achieve this feat, I would have dug a trench model in the rock, having the real size to test on a true scale the whole device.
For several times I wanted to ask Agnese if he knew something similar, but I always gave up, figuring that, even if such a thing had really been made, who knows where and what could have happened to it...
You can imagine what I felt when Giorgio, at a evening meeting, showed me the plan of Maragioglio Rinaldi with the detail of the "trial passages", as if it was just an additional quirk. I would have gladly cheered and disclosed my vision but, fearing it could look like an empty boast, I kept quiet. But within, my satisfaction remains.
If this book is ever to be published, I confess belatedly this small detail to my friend Giorgio.
Even the great-trussed vaults rising up from the main entrance to the top of the Grand Gallery confirm, in case of a positive control, the hypothesis of a complete unique project. Too bad that this will be extremely difficult, even if not impossible, to prove. To check whether this structure rises to the Zed, it would probably be enough a modest drilling near the external vaults.
I want to remember the opening angle of the vaults overlooking the zed: the correct vector solution requires the vaults aligned with the north and south bottom edges of the pyramid (actually at the north side it is a bit '"short", but the important is not to go beyond). This is the perfect vector solution, but only if the vaults are exactly positioned at half height, as it is, which brings us to a project started very far back.
The "girdle stones" of the Ascending Corridor clearly speak of great weights, first going up, to descend later in dynamic conditions.
The corridor floor has been designed to not be dragged up during the ascent of the blocks nor be undermined during their descent; I have spoken about the asymmetrical “girdle stones” shape, allowing them to recover spontaneously the correct position, under rapid stress.
Having these blocks installed, it means the Grand Gallery, and its purpose, had already been planned, like the small protrusion, at the end of the Horizontal Corridor, preventing its floor to slide forward during the statue towing.

The corridor intentionally ends at this point and it will be completed after the statue will be housed within its own niche.
Without any doubt, something very heavy would have had to be towed along this corridor.
The weight of the statue would have to be close to three tons: to pull it up along the Ascending Corridor at least 100 men would have been necessary, of course located into the Grand Gallery: due to this the presence of the small steps inside the groove of the Grand Gallery.
Also the great monoliths of the Zed were put onto the pyramid, starting from the bottom level and taken up, floor-by-floor, with its construction.
This is the only way to lift the large, well finished monoliths up to their actual location: a traumatic journey, along an impossible ramp, is impractical.
I'll try now to summarize the issues that, in my opinion, confirm the hydraulic hypothesis.
First the obvious fact that the three granite blocks slipped down from the grand gallery (the only place having the necessary space to park them) and that somehow the operation must have been made.
Someone say that a team was in charge of this job to exit then through the service shaft.
This option is not credible since the downhill shaft was blocked, as witnessed by Caviglia.
The access was so impassable and the alternatives were: a suicide team or a device activated from the outside. Al Mamun say nothing about human rests found inside the pyramid, nor it is credible a suicide squad. That was the "Egyptian civilization": a true civilization, compassionate towards the needs of the poor, where justice rarely took away the lives of the offenders: so a device operating from outside just remains.
This is my proposal; if someone has something better to offer...
Now the Zed: the whole structure is ineffective from a structural standpoint, being poorly undertaken to counteract the compressive stress, due to the vaults above it.
It worked just as additional weight onto the King's Chamber, pressurized up to three atmospheres.
The pressure cannot expand the chamber walls, within the body of the pyramid, but it could lift its ceiling, free from the weight above by the presence of the vaults.
The pressurization of the King’s Chamber will start when the water level is above the ducts exit; the volume of the room, water free, will become the middle half (up

to the four stone row) and the pressure inside will be four times the atmospheric pressure: subtracting it we have the three additional atmospheres.
One more reason suggesting this pressure device is the height of the "ventilation" ducts, starting at the bottom with a smaller section up to more than 30 meters and then suddenly increasing it to nine times like two large "funnels".
Where the ducts widen indicates, in my opinion, the pressure value and as it is almost 31m high.
How Hemiunu could know an atmospheric pressure is equal to 10.33 meters of a water column (measured in cubits of course), I really cannot imagine...
Even the tunnel to the first of the Zed "chambers", in my opinion, has been dug to check if the crack in the ceiling of the King's Chamber was through or not, for pressure reasons.
Nor should we forget the whole device of the Antechamber of the Portcullises.
The small vestibule, or "crawlspace," has no explanation in the hypothesis of the three portcullises, decreasing the effectiveness of the device.
If this vestibule did not exist, it would still have been possible to lower the portcullises.
In the double slope pyramid Nefermaat installed a massive granite gate (actually two, but the second never lowered) dropped down diagonally to seal the corridor without any vestibule.
This passage can only be explained by the need to send someone above the shutters once they have been lowered.
The semicircular protuberance inside was carved in the granite to help the raising of other blocks, for example the three round end blocks to be inserted into the saddles in the west wall.
The great monolith with carved grooves: a unique block totally redundant from the structural point of view and well protected by the lintel of the King's Chamber, safe from any vertical compressive stress due to the small limestone gasket.
In this way, any failure would not have affected the pressurized part below.
Even the long grooves, so meticulously protected, can only be explained by the necessity of a hydraulic flow, with the clever sealing system, using just four wooden wedges.
No rope would have had to use across the portcullises: their installation was carried out using sand in the way I told you.
Again about the flooding of the lower part of the pyramid up to the original entrance.

The plans show, in this way, the water would reach the level of the highest of the three "girdle stones" and not by chance, since this is exactly the point where is essential the hydraulic brake starts working.
The hypothesis of hydraulic brake may seem like science fiction, but it is the only plausible explanation for the obvious fact that the blocks are slid down into the Ascending Corridor to stop in place, without any damage.
In the absence of this water brake, there would be a undoubted wedge effect which, multiplied by 25 blocks...
I'm amazed no one ever raised this problem, so obvious, about the stopping block.
Further confirmation about the hydraulic theory, and the related brake, comes from the "trial-passages" with its water cap-block.
Nor forget the niches and the limestone pillars inside, to be dislodged when the dam beams have to be installed.
I made a series of miniature wooden beams to demonstrate how, starting from three basic elements (obviously left and right) suitable for all 50 niches, it is possible to quickly fix the blocks sideways, keeping the hydraulic seal to get the cascades, to eradicate the wooden wedges.
We know that this part of the device has never been used, but I tested it in my model and it works: this was the system.
Different matter the disaster during the closure.
Briefly: the four wooden plugs, inserted into the grooves, have fulfilled their task too well, the required pressure was reached, although the violent discharge effect through the siphon of the Antechamber of the Portcullises was hardly predictable.
The turmoil has dragged the large sarcophagus by rotating it until one of its stronger edges hit the south wall of the King's Chamber, exactly at the duct inlet, literally blowing up the granite wall: the impact point, as well as the shape and size of the ablation, are perfectly consistent with the sarcophagus shape, including its lid, the disappeared granite slab.
Carried away by the current, the sarcophagus has also affected the east wall, then hitting the edge of the King's Chamber lintel, thus cracking it along the south-north direction, close to the east side.
The broken part of the sarcophagus edge was sucked, by a chaotic vortex, into the corridor, hitting and breaking a large portion of the ceiling, as evident by the photo of Edgar mentioned earlier and, at the same time, damaging the big monolith at the west wall.

Finally, even the sarcophagus, without its cover, was dragged into the short hallway, acting like a giant battering ram, using the preceding granite fragments like chisels, concentrating the acting stresses onto the first portcullis.
These traumatic events ended up triggering the destruction of the entire portcullises system, breaking them in half, uprooting them from their guides and hurling the broken parts down the Grand Gallery.
A special look deserves the photo showing, in my opinion, like a major portion of a portcullis was expelled upward, taking away, after its transit through the Horizontal Corridor, the whole part containing the four head holes.
The picture shows, without any doubt, this rock was shot out with incredible violence, scratching the west wall with four marks, with distances between them consistent with the four holes just above. The quavering marks are parallel to each other and tend to rise. At the same time, a big portion of the step at the top of the Grand Gallery, was violently removed, from the inside out, as a impact result of the second part of the broken portcullis, apparently dragging on the floor. It is unthinkable that the violators have deliberately ruined the step edge by a terrible hit from the inside out, after having already passed through.
Even the deep crack that runs from south to north on the lower of the two granite blocks of the double-divider, separating the vestibule from the Antechamber of the Portcullises, speaks of a tremendous compressive stress along this axis, all concentrated at the bottom and headed north, an occurrence unjustifiable with conventional looting, but readily explained by the impact that ripped across the lower part of the portcullises.
The dated photos of the top of the Grand Gallery are consistent with the '"cannon's mouth effect" caused by the explosion, as well as all the devastation that forced Al Mamun to dig a way to the outside in order to empty the Ascending Corridor, found cluttered with all sorts of debris.
Another detail: Usually it is claimed that the sarcophagus was placed in the crypt during the construction phases of the pyramid. This point is shared by all, but only as a consequence of the fact that it could not, due to its width, be passed through the narrow passage of the "mouth".
After my explanation (I hope undoubted) about that, it is obvious that things should be revised, all the more as there are many and clear signs of the ascent of the sarcophagus. First and foremost the usual common sense: if the pharaoh had not been entombed, it would be useless to close the pyramid, at least by the complex method adopted.

The entire nation has witnessed his arrival at the last residence, for which the event must have been public and nothing short of monumental, culminating with the entry of the sarcophagus (without the lid) containing the king body inside the pyramid.
The sarcophagus is longer than the sealing blocks and, probably for fear of damaging it at the point where the slope reversed, the curve of the ceiling there was rounded.
The marks are obvious, but even probably done later during the transit of the statue.
At any rate, this rounding work guarantees that something big passed right below and needed to turn to change direction and climb up: the sarcophagus, the statue, and the blocks measurements are clearly incompatible with the ‘’mouth size‘’; this means we are in the presence of a device capable of opening and closing.
Someone also reported three steps in the floor at the intersection point, but they have disappeared with the restoration, so even their existence is doubtful.
The ascent of the sarcophagus inside the Grand Gallery is clear (to me, at least) by the chippings made beside the niches, all the niches up to the top, not only to the lower ones (as it would have happened for the three closure blocks only).
These ugly and later ablations were made to enhance the lateral grip of the yokes because, under stress, they tended to unseat themselves from their housing (see Grand Gallery chapter).
The sarcophagus then climbed with great difficulty, crossing the step at the top using long yokes inserted in the top rectangular pits and stuck in position by wooden logs inserted between them and transverse beams above.
The walls bear witness to these events; there is no doubt that something heavy has passed through the entrance of the King’s Chamber corridor.
To straighten the coffin and bring it horizontal to the floor level, I imagine wedges were used, stuck from behind, operating in succession, as described for the rising of the round-headed blocks in the Antechamber of the Portcullises.
In the south wall of the King's Chamber, there are two slight, barely visible, impressions carved in the granite at mid-height.
I think these two minor anomalies are related to a suitable device used to hold the sarcophagus lid waiting to slide into the dovetailed joint previously described, of course after, away from prying eyes, the sovereign body had been relocated.
There are indubitable signs even of the statue journey.

First, at a theoretical level, the transit of a heavy object, one at least 3 meters long, was scheduled otherwise the floor interruption at the Quadrivium, with the associated problems (including the removable bridge), cannot be motivated.
In this context I recall the abrasions on both sides of the Horizontal Corridor, the Z mark dug into the floor of the Queen's Chamber and the sign engraved on the wall near the entrance, due to impact with the pedestal edge.
Add to it the necessity of the edge frame around and the hollows for the levers: any doubt about the statue transit is frankly not possible.
I have, however, still some doubts about the "ventilation" or service shaft: Caviglia encountered serious difficulties in locating this path even working from the top.
The presence of the four granite blocks inside was a problem even working from the top and, certainly prevented Al Mamun's men from climb, even if it seems they have undermined the lowest block, which fell down, parked then within the "grotto", after having widened the whole diagonal stretch between the two vertical sections.
I think then Al Mamun gave up from this side, opting to dig out a tunnel under the monolith of the Ascending Corridor.
The so-called "entrance of Al Mamun" used now for the tourists, was not dug by his workers in the living body of the monument to enter.
In this case, given that this excavation ends just behind the three sealing blocks, where the Ascending Corridor begins, it is difficult to understand why he should have dug down the passage to the Descending Corridor, emerging a few meters below the intersection point.
From the records, he has dug the passage from below upwards going out at the side of the third block: Al Mamun certainly entered from the legitimate entrance. Then it is difficult to explain the horizontal excavation, unless it was necessary for a different purpose, such as getting a suitable opening to evacuate the great amount of debris, some even bulky, found along the uphill path, as Al Mamun himself reported, and this can be explained only with my hypothesis.
Were it not for the explosion occurred in the Antechamber of the Portcullises as I figured, there would have been no reason to expect the accumulation of debris, nor would it have been necessary to dig the passage that leads outside horizontally.
If my reconstruction is correct, the first stretch of the Descending Corridor (starting from the main entrance) should have ten blocks (probably granite) placed in it, held in position by a rudimentary system of stones embedded in the ten holes carved on the eastern wall.

One of these blocks, in my opinion, is still parked outside.
Further down, we would have come across the limestone monolith placed as a plug for the water coming from the Grand Gallery, stuck by the stones that preceded the descent of the first sealing block making impossible its extraction.
At the original entrance, close to the vaults, there are obvious traces of heavy work: holes for the levers, carved steps, and other marks.
After having the first ten blocks removed, Al Mamun found the limestone plug block. It had to be shuttered and this caused the falling of the stones between it and the first sealing block.
This must have more than a little terrified the looters because the monolith finally could slid down to the actual position, producing a hardly reassuring sound, a few inches away from the next two blocks, which didn't move.
This late settling must have discouraged further direct interventions, and the looters opted for an upward excavation bypassing the obstacle.
The description of the episode refers to the falling stones, as well as this showed the correct path to follow.
I have stated on several occasions such a closure of the pyramid was not made in compliance with all procedures provided by the architect. I think I have good reasons to say so. Let's see some.
The Queen's Chamber lacks the finishing floor because the statue has to come over with the problems associated with its handling: holes for the levers, to be dug where needed, will be necessary. This requires the frame running around the room, which will disappear later, along with the limestone edge to protect the doorjamb. The final floor, a cubit thick, leveling the room floor to the corridor and hiding the base of the Pharaoh statue will be laid later.
The strange shape of the Horizontal Corridor in its north part can be explained, in my opinion, only with the need to quickly insert, pushed from behind by a heavy wooden ram and using the mortar as a lubricant, a convoy of limestone blocks, each two cubits long, already prepared outside the pyramid, staggered with the wall ones.
All this to conceal the corridor into the adjacent blocks, stacked on as per a disadvantage technique from the structural point of view, but ensuring, however, the required width of the corridor, even after modest structural adjustments, parallel to the plane of the pyramid.
In this way the Horizontal Corridor would literally have disappeared: a block (also described by Caviglia) would have the service shaft niche hidden, filling the gap in

the west platform. Lastly three large blocks would have the floor rebuilt by merging the upper part of the Ascending Corridor with the Grand Gallery.
Each of these blocks was supposed to have "standardized" measurements: four cubits long, 2 cubits wide and 33cm thick. They would fill all the space from the two side protuberances at the upper end of the Ascending Corridor to the "little step" at the beginning of the Great Gallery, the same step that had once been filled by longitudinal wooden beams.
In my wooden model the sealing of these three stones is perfect, "staggered" with respect to those underlying, resuming in this way the same construction technique used nearby.
Show compassion: the argument is really very complex: I modified the text several times but with poor results.
Returning to the theoretical project, to complete the work granite 25 blocks would have to seal the whole ascending corridor, the last three of which would be placed at the Quadrivium, to discourage any looters, who would have to start digging under them to find the hidden corridor...
Only after the entire floor had been restored, the blocks would have come down. Attempting to rely solely on the deck beams was certainly something that Hemiunu would ever have allowed under normal conditions.
The whole closure provided, in my opinion, an additional stone in the Descending Corridor ceiling to conceal the first granite plug block and some limestone (or granite) blocks to fill the entire Descending Corridor (remember that its lower end has a suitable support frame). If everything had been fully realized, perhaps today we would have found just the underground chamber, empty and incomplete (Chephren?).
This is all, at the moment.
I know something important, very important, is omitted, but I expect, sooner or later, to carry out some inspections myself and maybe, in the meantime, Dr. Hawass (or whoever) will allow to drill a hole in the ceiling of the three blocks, thus confirming the presence of the cavity that I have described about the "mouth". Then I'll have other things to say. Not before.

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