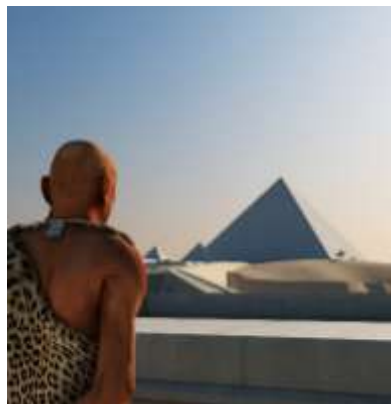




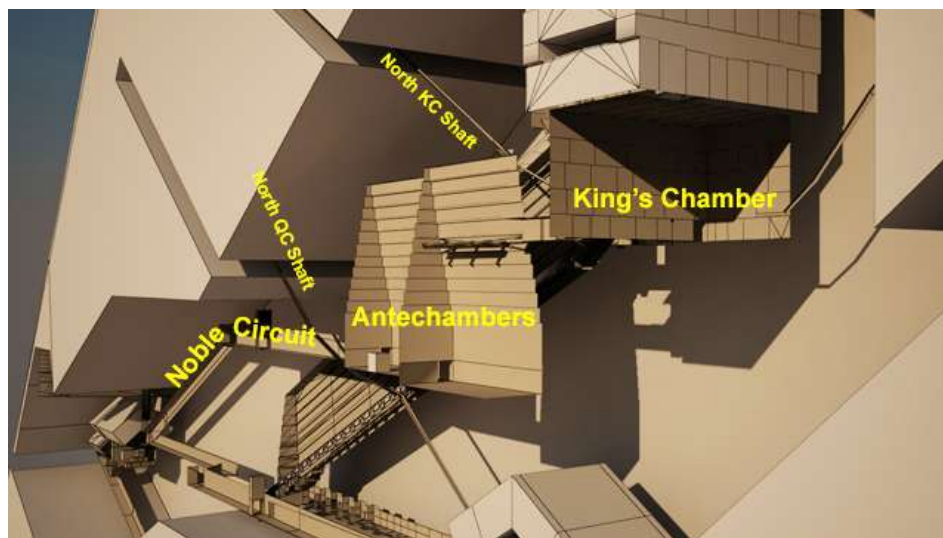
Monday February 7, 2011

“Khufu’s Inheritance”, according to Jean-Pierre Houdin



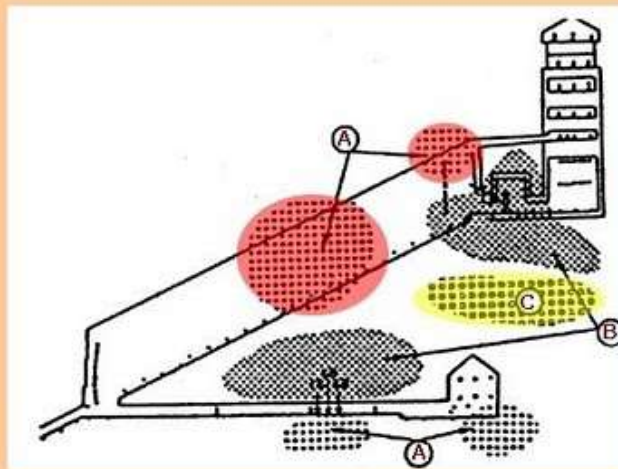
In his studies of the Great Pyramid, presented in *Khufu Reborn* (read the exclusive interview given by the author to *Pyramidales*), Jean-Pierre Houdin has identified a “Noble Circuit”, namely the ritual route inside the monument followed during the Pharaoh’s funeral. One stage of this circuit did not pass unnoticed, and for good reason: two antechambers with corbelled vaults, a few meters before the entrance to the King’s Chamber, designed to shelter the sovereign’s goods and personal possessions.

Here Jean-Pierre Houdin contributes a few remarks in addition to the interview mentioned above, for readers of *Pyramidales*.



In the summer of 2003, when Jean-Pierre Houdin had already invested several thousand hours in 3D computer modeling, he made an observation that led him to suspect the existence of two antechambers in the pyramid of Khufu. A “dark zone” in the middle of the known internal structures kept coming up in his research. He could already distinguish this zone by analysis of micro-gravimetric readings that were in his possession but, oddly, had been overlooked. Now comparative observations of pyramids from the IIIrd and IVth dynasties provided an answer to this dark zone.

Microgravimetry survey - EDF Foundation 1986



Areas marked A are lower density areas:
 2 smalls, beneath the Queen Chamber horizontal corridor,
 another one beneath this chamber;
 1 small on top of Grand Gallery (in red) which
 could be linked to the well built for the passage of the ropes
 of the counterweight system;
 1 very important next to Grand Gallery (in red)

Areas marked B are higher density areas:
 some reinforcements beneath Grand Gallery,
 beneath the King's Chamber and North of it

The area marked C (in yellow) is a possible lower density area:
 Results in this area could have been influenced
 by the adjacent area B and by the lack of microgravimetry
 measurements on a large part of the northwestern edge.

The architect did not in fact consider the pyramid of Khufu as an isolated monument, even if it was the most famous in ancient Egypt. He placed it in a lineage, in an architectural scheme in which, from the stepped pyramid of Djoser to the smooth pyramids, each pyramid designer built on the innovations used in previous ones, while further developing the architectural concept. This is what Jean-Pierre Houdin sums up with the term “inheritance”. And Khufu did not escape the rule.

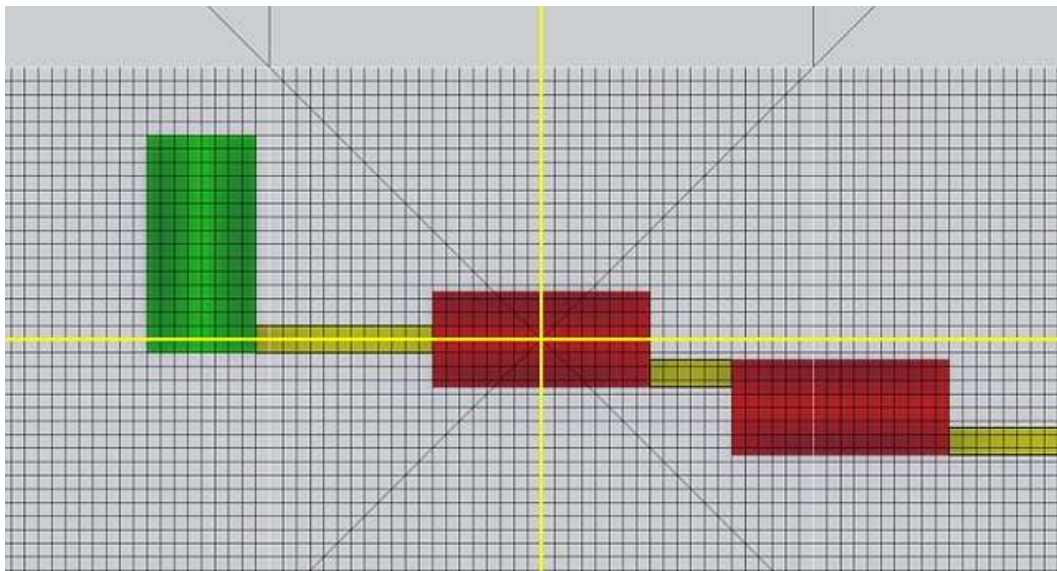
Two observations

Two observations in particular captured the architect's attention.

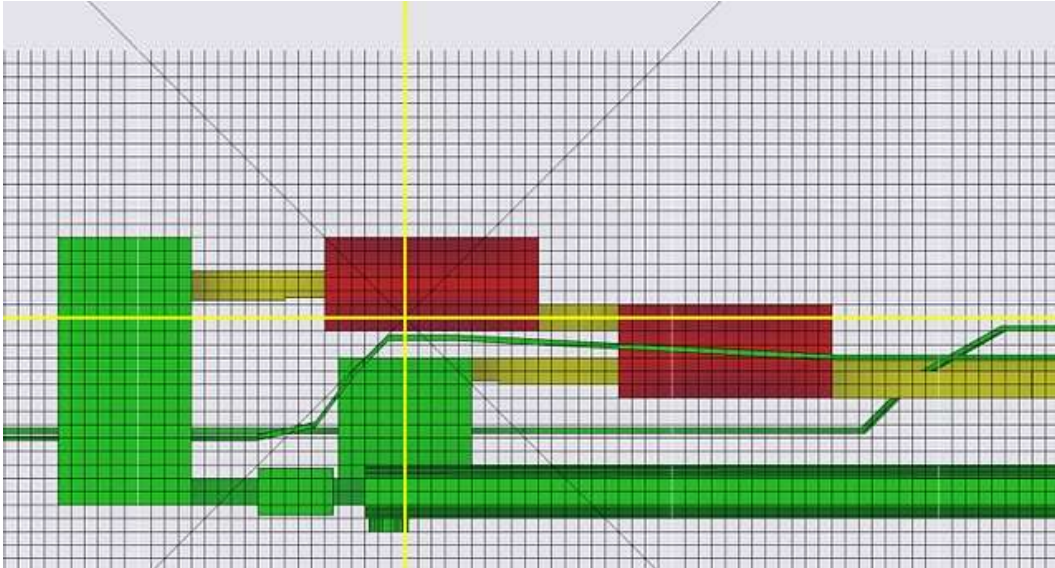
Firstly, the strange misalignment of the corridors and the Grand Gallery in the pyramid of Khufu, relative to the north-south axis. Such an offset could not be the result of chance. Nor could it be a "mistake" made by the Egyptian architects: they knew their job perfectly, based on solid tradition. So this could not possibly be an error, but a project, a plan, even if it is not necessarily easy to grasp at first glance, especially when we are bogged down in what Jean-Pierre Houdin calls "consensus thinking".

After years spent 3D-modeling numerous potential solutions, illumination – the second observation, the real turning point of *Khufu Reborn* – was finally provided by another pyramid: the Red Pyramid, the last construction of Snefru, Khufu's father. So, what was observed? This pyramid, built just before that of Khufu, encloses two magnificent antechambers with corbelled roofs, in front of the entrance to the funeral chamber. They are level with the base of the pyramid, although the chamber is nearly 8 m higher. This was a change in pyramid architecture: the funeral apartments had gained in height.

"Why, all of a sudden," Jean-Pierre Houdin wondered, *"did Khufu's architects abandon this type of antechamber? They already had a lot to tackle, with the new roofing technique (flat ceiling) for the King's Chamber, and they were not going to change everything from one pyramid to the next. They had a duty to respect their tradition, thus to 'develop' but not 'revolutionize'".*



The 2 antechambers and the funerary chamber of the Red Pyramid



The 2 antechambers and the funerary chamber of Khufu's Pyramid: a perfect copy and paste

Jean-Pierre continued his reasoning thus: *“An experiment was called for: one of taking the antechambers from the Red Pyramid of Khufu's father and quite simply ‘pasting’ them into his son's pyramid, on a ‘design grid’ made up of one-cubit-sided squares. (1 cubit = 52.36 cm.) The funereal apartments of the Red Pyramid then appeared perfectly positioned in the pyramid of Khufu.”*

“My investigation was making clear progress,” adds the architect-researcher. *“I had a perfect antechamber model, similar to those we can visit today in the Red Pyramid at Dahshur. And using CATIA 3D design software from Dassault Systèmes, I merely had to paste this model onto the Khufu grid, taking into account various factors already known or that I had found:*

- *for the Queen's Chamber: a second entrance, a section of the ‘Noble Circuit’ and a marked deviation in the northern shaft;*

- *for the King's Chamber: a very precisely located second entrance and a bizarrely routed northern shaft. And here again: surprise! The model fitted perfectly. Not only did both the antechambers from the Red Pyramid ‘fit’ the grid perfectly, but they were centered on the north-south axis. The two antechambers from the Red Pyramid and the associated ‘Noble Corridor’ fit perfectly into the pyramid of Khufu. The interior architecture of the Great Pyramid was finally beginning to look like the funereal architecture of Egypt's IVth dynasty.”*

The Red Pyramid and the pyramid of Khufu: look for the similarity!

The press release summarizing Jean-Pierre's research and conclusions and issued at the official presentation of *Khufu Reborn* on January 27, 2011, provides further explanations:

“The Red Pyramid,” we read, *“has the purest plan. The funeral chamber is in the edifice, preceded by two antechambers. The access corridor, antechambers and the chamber are perfectly aligned along the monument's axis. The antechambers served to store the funeral belongings left to the deceased. This very pure plan and these antechambers, led Jean-Pierre Houdin to wonder about Khufu's inheritance. No antechambers in his pyramid, strangely offset corridors? Why this apparent inconsistency in the plan for the Great Pyramid? Why was the technique of antechambers with corbelled vaults, long since perfectly mastered, not used again? Would Khufu have had no goods? Hard to imagine for a king who left us the most imposing monument of all!”*



Funerary apartments in the Red pyramid

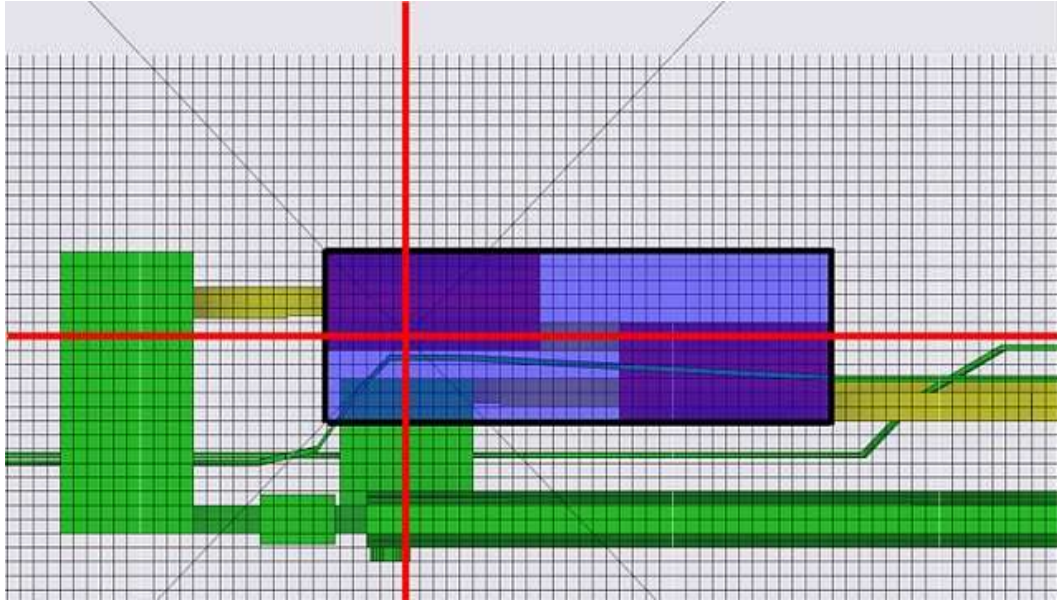


Funerary apartments in the Khufu pyramid



**Khufu architectural inheritance
from his father Snefru**

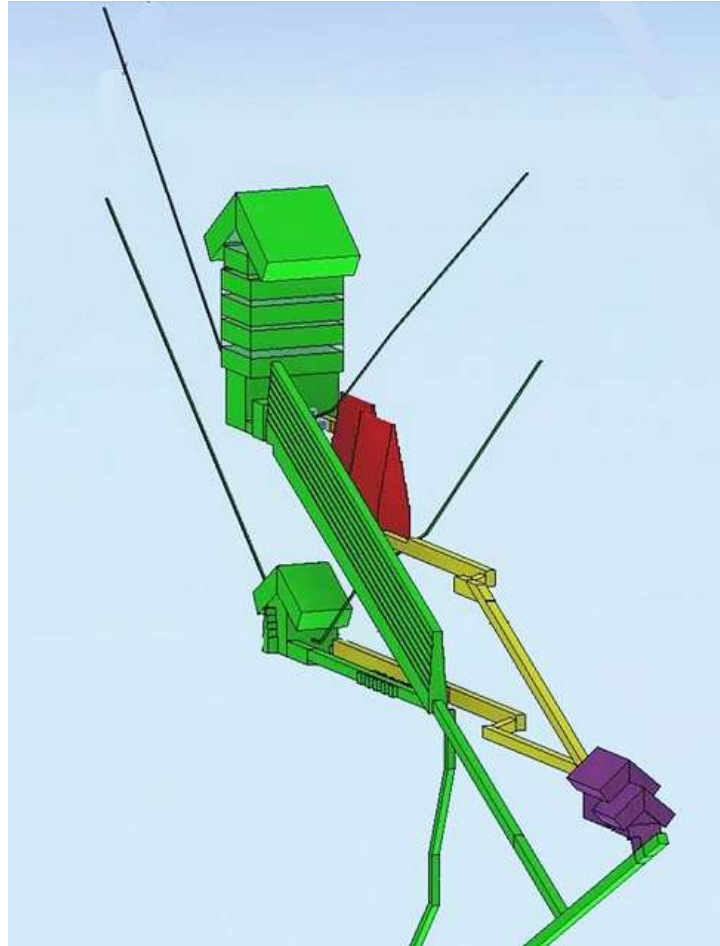
Hence the intuition by the author of Khufu Reborn to superimpose plans for the two pyramids. Let's read on: "Jean-Pierre Houdin raised the corridor from the Red Pyramid and the antechambers so that the latter became those of Khufu's chamber. They match perfectly. Better still, an explanation emerges for the well known misalignment of the descending and ascending corridors and the Grand Gallery. *On the other hand, the set of antechambers is located precisely along the north-south axis and the west wall of the second antechamber is on a perfect alignment with the west wall of the King's Chamber!*



View from above

“Although the current descending and ascending corridors of the Grand Gallery are generally considered as the circuit by which Khufu’s mortal remains were transported into his pyramid, Jean-Pierre Houdin has always challenged the funereal character of the Grand Gallery. For him, it was only a slide used to house the counterweight system. Furthermore, using this passage poses an insoluble problem in connection with the sealing of the King’s Chamber. The granite block that obstructed the north-east entrance to the King’s Chamber (which entrance is not to be confused with the other one – the real one – on the west side of the chamber’s north wall), which was removed by Al-Ma’mun, could only be put back in place from the inside. And it is inconceivable to consider that a few unfortunate workers were walled up alive in the company of the dead king!

“The pyramid’s plan can now be viewed in a new light. On the one hand, a consistent architectural ‘line of descent’ between the Red Pyramid and that of Khufu is re-established; on the other, the offset in the distribution of the corridors, considered strange until now, is explained.”



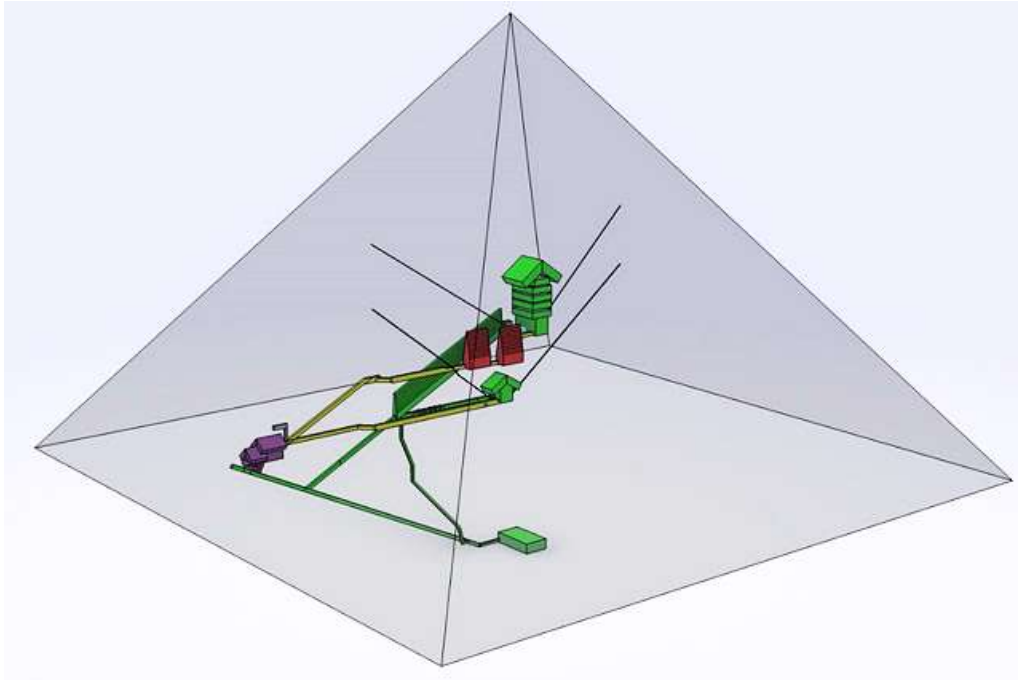
In red : the 2 antechambers
 In yellow : the "Noble Circuit"
 In purple : the "multi-purpose" entrance

As Jean-Pierre Houdin's research progressed, his intuition, nurtured by further clues and a comparative study of pyramids from the IIIrd and IVth dynasties, became a conviction: the King's Chamber in the Great Pyramid, just like the internal layout of the Red Pyramid, based on the logic of architectural "*line of descent*", was itself preceded by two antechambers with corbelled vaults.

One final observation: inside the second antechamber of the Red Pyramid, high up, three pairs of circular holes facing each other. The upper level of these holes is at exactly the same level as the floor of the corridor leading to the funeral chamber. According to Jean-Pierre Houdin, these holes were used to embed wooden beams across the antechamber and, over these beams; Egyptian builders placed a kind of "piston" made from a long piece of wood operated from below by a system of ropes. Pulling on these ropes pushed the piston forward in the corridor leading to the King's Chamber. The piston then moved a block forward, sliding on a very thin layer of sand, and ended up resting against the floor of the King's Chamber and sealing its entrance forever.

This closure block had quite simply been stored in the corridor's east wall, in a small perpendicular passage in which its "twin" was also stored; a clever system, based on a pushing block and derived from a closure technique by drop-stone trap in the Bent Pyramid at Dahshur, pushed the two twinned blocks from a notch, once a wedge has been removed: the closure block was located in the corridor ready to be pushed by the piston and its twin took its place in the wall. This system can be observed in the Red Pyramid.

For Jean-Pierre Houdin, the transfer of this technique to the pyramid of Khufu seems to be a logical conclusion. Why – in what quest for originality – would the Great Pyramid's builders have refrained from what, as a means of sealing a pyramid, was without any doubt the fruit of an architectural legacy, which, moreover, nothing would have allowed them to disregard?



Many centuries of archaeological myopia

Even if it meant facing the wrath of the higher echelons of Egyptology or researchers with various degrees of training in the vast and inexhaustible field of pyramidology, Jean-Pierre Houdin could no longer escape his own convictions: in his view, a structural analysis of the monument sheds new light on the real route of the funeral procession inside the Great Pyramid.

In this approach, without claiming to play the killjoy or, worse still, the kamikaze, he expects to have to confront many centuries of archaeological myopia. But his new plan of the Great Pyramid, in his opinion, has the merit of being based on history and sound reasoning, and, as well as being geometrically correct, explaining the many strange features in the pyramid's design.

Above all, in the architect's view, it provides King Khufu with the antechambers for the royal funeral goods, a logical deduction far removed from the fantasies of the treasure hunters.

In connection with these antechambers, Jean-Pierre Houdin likes to quote something a friend wrote to him in congratulation: "You have filled a historic void with a hole that dates back several millennia..." That sums it up...

Clues from the Red Pyramid

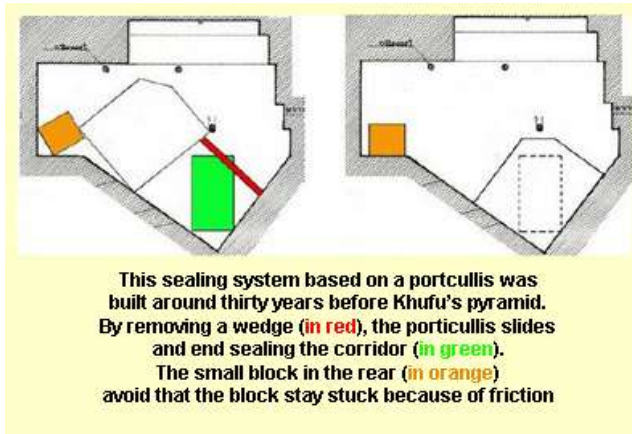
"The Red Pyramid at Dahshur has two antechambers. Inside the second, high up, three pairs of circular holes facing each other. The upper level of these holes is at exactly the same level as the floor of the corridor leading to the funereal chamber. I considered that these holes had been used to embed wooden beams across the antechamber and over these beams, Egyptian builders had placed a kind of 'piston' made from a long piece of wood operated from below by a system of ropes. Just pulling on the ropes was enough to advance the piston into the corridor. Thus it

pushed the block, sliding on a very thin layer of sand, ending up resting against the floor of the King's Chamber and sealing its entrance forever.

This scenario was perfect, but still needed one most important answer: how do you push a block that could not have been lifted high enough, and that could not have been stored in the corridor because it would have prevented the funeral procession from passing. This squares the circle!

I have found part of the answer in another pyramid of Snefru: the Bent Pyramid, built just before the Red Pyramid.”
(Jean-Pierre Houdin)

Clues from the Bent Pyramid



“To block the passage and prevent access to Snefru's funereal chamber, the architects had installed two enormous portcullises in the corridor leading to it that, were retained in very narrow and inaccessible recesses before being lowered. The most interesting thing for me was the way in which these portcullises were released to block the passage:

- firstly, in the raised position, they were held leaning on a small block that prevented them remaining stuck in place at the moment they were released;

- secondly, a simple wooden wedge (in red) held them in this raised position.

To close the passage, the workers just had to remove the wedge and the portcullis was lowered automatically.”

