



Thursday January 27, 2011

“There is no reason to abstain, especially when you are an architect, from studying the construction of the pyramids, on the pretext that you don’t have the ‘certified Egyptologist’ badge” (Jean-Pierre Houdin)

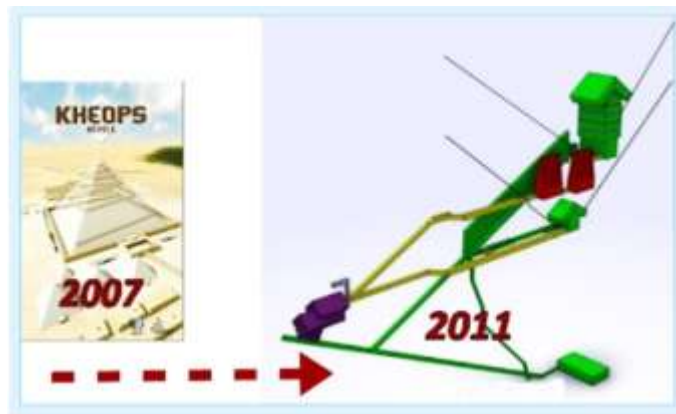


It was on March 30, 2007, a significant date for the architect-researcher Jean-Pierre Houdin: on this day he publicly “revealed”, in the futuristic setting of the Géode, (la Villette in Paris), what it is advisable to call his “theory” on the construction of the Pyramid of Khufu.

Today, January 27, 2011, for the preview of *Khufu Reborn* (also known as *Khufu Renaissance*), still the same venue, the same décor. But while the same people are involved (the Dassault Systèmes “Khufu Team” is still at the controls), the contents of the paper have developed considerably, as would have been expected. Since 2007, when it was essentially a question of an internal ramp and of the Grand Gallery as a track for a gigantic counterweight inside the Great Pyramid, Jean-Pierre Houdin has taken his inventory of the monument much further, in its internal structure and its topographic environment. New elements in the reading and understanding of the pyramid, the results of numerous observations made by the architect, represent not only a development but, in his mind, a real revolution – the word is not too strong – that could well cause shudders, or even the grinding of teeth, in (elevated) spheres and among all ranks of pyramidology. From *Khufu Revealed* (2007), the first formulation of Jean-Pierre

Houdin's "theory", to *Khufu Reborn* (2011), there is not only a four year gap, but above all a radical change in perspective, already underlying *Khufu Revealed*, but here expressed in full maturity.

Jean-Pierre Houdin has actually broadened the scope of his research. He has probed deeper into the bowels of the Great Pyramid. He also went to see the Red Pyramid and the Bent Pyramid, always with his eye on gaining a better understanding of Khufu's Pyramid. And there it was, the surprise appeared, in his view, as an obvious fact: common points between these pyramids emanated from the same architectural "school", to the point of making room for the "copy-and-paste" technique to configure the main structures of the monuments. This is what Jean-Pierre Houdin call "inheritance".



With this approach, major structural elements appear inside the Great Pyramid that have been oddly left in the shade for many centuries: two antechambers to the King's Chamber, a second (in fact: the real) entrance to this very chamber, a second access corridor to the Queen's Chamber, a second ascending corridor starting at the (T-shaped) entrance to the monument, followed by a second horizontal corridor leading to the antechambers, an evacuation shaft for the end of construction, connecting the upper space of the pyramid's entrance to the internal ramp... all these elements making up a "Noble Circuit" reserved for the Pharaoh's funeral. As far as the other known structural elements are concerned (descending and ascending corridors, Grand Gallery, portcullis chamber, service shafts, etc.), in Jean-Pierre Houdin's analysis, they only had a functional role, serving no purpose once the construction of the King's Chamber was finished. *Pyramidales* will examine the results of this substantial addition to the inventory in detail. As a preview, here is an exclusive interview that Jean-Pierre Houdin gave us, during which he discusses his working method and the essential skills learned from some twelve years of his research in the shadow of the monument, which he still considers as an absolute architectural masterpiece: the Pyramid of Khufu. Below is the first part of the interview.

### **Pyramidales:**

"Jean-Pierre Houdin, you have already been kind enough to answer my questions, for readers of *Pyramidales*. During this interview, you announced a major continuation of your research into your reconstitution of the construction site for the Great Pyramid of Giza.

The time has come to publish the results of this new research, which you have called Episode 2.

Does this mean that in your opinion Episode 1 was incomplete, despite the very large audience that this first work met, as much among the general public as with informed researchers, in numerous countries?"



### ***“A two-stage tactic”***

#### **Jean-Pierre Houdin:**

*“I’ll say right away that already in the summer of 2003, so nearly eight years ago now, my work on the Pyramid of Khufu had provided a much more comprehensive explanation for this construction project than that prevailing at the time.*

*“In June 2005, during my first meeting with my friends at Dassault Systèmes, Mehdi Tayoubi and Richard Breitner, of course I decided to tell them everything about this work. They felt the extent of the theory and the overturning of “The Single-mindedness” aspect of what I had just revealed to them appeared too important, and above all too explosive, to be placed in the public domain in one go. We therefore agreed on a two-stage tactic: Episode 1 covered the whole theoretical part of the theory dedicated to construction of the pyramid and Episode 2 covered everything relating to the architecture of the funereal apartments. The intention was to target the largest possible audience and present the theory in the most scientific and credible way possible, through virtual validation using Dassault Systèmes’ software, in order to gain unassailable credibility on this point.*

*“Once the theory was established, we thought we could rapidly put it to the critical test by obtaining authorization to undertake a research mission on site using non-destructive tests. The great advantage of the theory lies in the fact that it is irrefutable: the discovery of the internal ramp would close debate over the question of the monument’s construction.*

*“The Khufu Revealed presentation at the Géode on March 30, 2007 elicited considerable response from around the world. In one morning, the theory was recognized as the most plausible on the subject. Unfortunately, afterwards, as far as real validation was concerned, things did not go as planned; submission of an application for a scientific mission remained impossible despite several meetings at the highest level. In the end, this additional period ‘granted’ to us turned into a real godsend: Episode 2, version 2011 has gained considerable weight compared with Episode 2 as first imagined in 2005, and we have been very successful in collecting clues on the ground.”*

#### **Pyramidales:**

*“Before coming to the real content of your new developments on the Pyramid of Khufu, can you give us an insight into your research method? Looking at your previous publications and presentations, I think I see at least three principal working themes in your approach to the Egyptology ‘thing’: meticulous observation of the site, a builder’s logic (we haven’t forgotten you are an architect), enabling you to ‘talk’ across time with the Egyptian builders, and an awareness of construction techniques specific to several pyramids from various eras.*

*Do you recognize yourself in this description? If necessary, how would you add to it?”*



With the technical support of Dassault Systèmes (in the foreground: Richard Breitner)

**“More than 5,000 hours spent modeling my ideas in 3D”**

**Jean-Pierre Houdin:**

*“First of all, there was a ‘founding’ event that led me to devote more than twelve years of my life, full-time, to Khufu and, by extension, to all the large smooth pyramids. It was the intuition my father had on January 2, 1999 and that I love to recall: ‘If I had to construct the Pyramid of Khufu’, he told me, ‘I would build it from the inside’. With a single sentence, ‘The Single-mindedness’ was blown apart! At the time, I was approaching fifty and Bulle, my wife, finally convinced me that we don’t live forever, that routine is the enemy of passion, and so I was looking for an ‘idea’ worth devoting myself to. Khufu ‘landed in my lap’! The architect in me told me quite simply that this was my path. The Pyramid of Khufu was worth it!*

*“Starting from this intuition, slowly and surely I unwound the ball of thread that nobody had been able to untangle, because they didn’t have the right code to find one of its ends.*

*“And then, after spending my whole childhood immersed in building and civil engineering, having qualified as a professional architect and having worked in the profession for more than twenty years, being initiated into computer-aided design, I had the ‘necessary qualifications’ to enable me to succeed in seeing through a serious and probing study of the ‘why’ and the ‘how’ of the pyramids, and then publish proposals in this field.*

*“Between 1999 and 2005 (before meeting Dassault Systèmes), I thus spent more than 5,000 hours modeling my ideas in 3D, with the unique advantage of being able to visualize whatever came into my mind, practically in real time. I also had the possibility of finding out the precise relationships in space between the various elements that I had in front of me on the computer screen.*

*“From the start, I understood that I had to think as an ‘Egyptian of the time’ and not as a modern builder. I therefore did a lot of research on the subject, both in books and on the Internet (having spent a year in New York from 1996 to 1997 and experienced it first-hand, I had grasped the huge revolution that this tool would bring), to find out about the techniques, materials, tools and expertise of the ancient Egyptians. This enabled me to notice in passing that the literature about the pyramids was fairly thin, padded with rehashed quotations passed from one author to the next, with no personal analysis and particularly very often missing the point. Finally, starting 2004, thanks to help from sponsors, I was able to make regular trips to Egypt and do my own research on site; every time, I found a clue to support my proposals.”*

## Pyramidales:

“Among your working tools, 3D now occupies an essential place, thanks to the skills and intellectual proximity you have found with your friends at Dassault Systèmes. What extra benefit does this virtual presentation bring to your work?”



From left to right: J-P. Houdin, Medhi Tayoubi, Richard Breitner

## Jean-Pierre Houdin:

*“As I told you before, 3D has an essential place in my research. My meeting with the engineers from Dassault Systèmes was extraordinary: we spoke the same language and they offered me the Rolls-Royce of the computer-aided design field. At once my work took giant leaps forward, scientific simulations underpinning virtual modeling. For example, simulations performed by the Khufu Team in connection with the cracking of the beams over the King’s Chamber provided the precise answer enabling me to confirm that the Egyptians mastered the situation very well at a moment of disarray and did not abandon this room during construction. The best proof: 45 centuries later, the damage has not got worse.”*

## Pyramidales:

“There’s no point burying your head in the sand! The logistics established around your work, with the media impact we have seen, have aroused envy and will do so again. Unfortunately, it seems that the microcosm of Egyptology, no doubt like other areas of scientific research, cultivates an innate sense of controversy. How do you explain this observation?”

**“I had to take up my pilgrim’s stick”**

## Jean-Pierre Houdin:

*“Research is not a class prerogative; freedom of thought is fundamental and there is no reason to abstain, especially when you are an architect, from studying the construction of the pyramids, on the pretext that you don’t have the ‘certified Egyptologist’ badge. The pyramids were designed and built by men like Hemiunu and Ankh-haf, Viziers of all Khufu’s Great Monumental Works, a title that can be compared nowadays with that of an architect or an engineer.*

*Egyptology was born during Napoleon Bonaparte's Egyptian Campaign and, from the start, was directed towards the archaeology of measurements, excavations and collection of relics. University studies in this field are based principally on the understanding of hieroglyphs, documents, history and religion; they provide no particular training in the understanding of construction techniques. The result: no theory put forward by Egyptologists bears analysis, right from the first lines. I think that my architect's background qualifies me as much as an Egyptologist, if not more so, to investigate the problem of the construction of the pyramids.*



Photo from *Khufu Revealed* documentary (Gédéon Programmes)

*Now, my position as an 'outsider' closes the door to many facilities: not being an insider, it was out of the question for me to be supported by public bodies. I had to take up my pilgrim's stick and go to convince sponsors in France and Egypt (because I have some there too). The commitment by Dassault Systèmes is exemplary, as part of a sponsorship program (Passion for Innovation). Sponsorship is particularly oriented towards sport and the arts; in my case, it is to support research into our past, into an admirable civilization that still has a lot to teach us. Nothing could be more normal than for sponsors to mediatize this action. Let those who are envious understand this: my breakthrough in the world of Egyptology has not been an 'overnight success', the fruit of this wide media exposure alone, but the result of a great deal of effort, privation, passion and conviction on the part of my contacts.*

*"I don't think I need advice from people (very few incidentally) who have proved incapable of making objective and substantiated criticism of my work."*

### **Pyramidales:**

"To come now to the heart of the matter, namely the content of Episode 2, what are the main points, what are the structures or components of the Pyramid of Khufu that formed the subject of your complementary analyses and interpretations? In other words: what have you observed in what, until now, remained silent or secret from the fantastic 'language of the stones' that the pyramid offers to those who know how to decode it?"

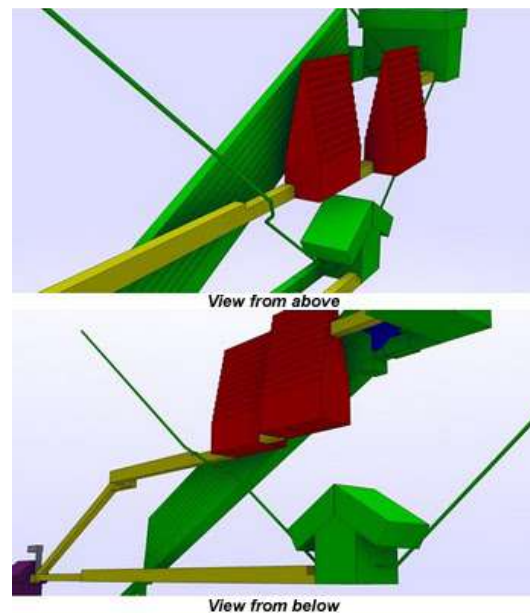
**"I was able to observe, analyze and understand spatial relationships between the various internal structures."**

## Jean-Pierre Houdin:

*"I called the content of Episode 2 'Khufu's Inheritance', that is the real funereal architecture of the Great Pyramid, a logical continuation of the sepulchral tradition and experience in construction accumulated by the Egyptians over more than a century, particularly in the reign of Khufu's father, Snefru.*

*In 2003, so after already having spent four years studying and researching Khufu's Pyramid, and the other great smooth pyramids of the 3<sup>rd</sup> and 4<sup>th</sup> Dynasties, I arrived at the conclusion that there was something that didn't 'fit' in the internal architecture of this funereal monument. I use this word 'funereal' because it is essential to come back to the 'why' of the Monumental pyramids: to serve as tombs for kings and their close family for eternity, in the belief of a life in the hereafter. This involved having a real apartment with, if I may be so bold, living room, dining room and bedroom. Also, the Egyptians paid much more attention to constructing their eternal dwelling than they did to that for their earthly life, the latter being only a brief stay.*

*By means of thousands of hours of 3D modeling, literally getting inside the volume with all the possibilities this technology offered me, I could observe, analyze and understand the spatial relationships between the various internal structures: the chambers (and their passageways), the corridors and the Grand Gallery. As far as the Grand Gallery was concerned, I was already firmly convinced that it could only have been a technical element associated with the construction and that it was pointless to try and give it a funereal function. Moreover, certain explanations linking the three chambers (the underground chamber, called the Queen's chamber, and the King's Chamber), in order to 'include' them in the funereal tradition seem to me to be mistaken, even fanciful.*



**The two antechambers of the King's Chamber, copy of these of the Red Pyramid**

*"I had already spent enough time 'in the company of' my fellow architects of the period to understand that our knowledge of this pyramid was incomplete. It had no room for their constructive logic or the simplicity of their approach to the configuration of the funereal apartments.*

*The presence of two antechambers in the Pyramid of Khufu, modeled on those in the Red Pyramid at Dahshur, constructed by the same 'college of architects' for Snefru, Khufu's father, was a foregone conclusion for me. The language of the stones did the rest, 3D modeling contributing an extraordinary 'beyond the visible' visual representation."*

## Pyramidales:

“To back up, indeed corroborate, your observations, were you able to profit from studies, assessments or experiments, to some extent made public, or even conversely perhaps kept secret... because they were too disturbing for what you call ‘The Single-mindedness’?”

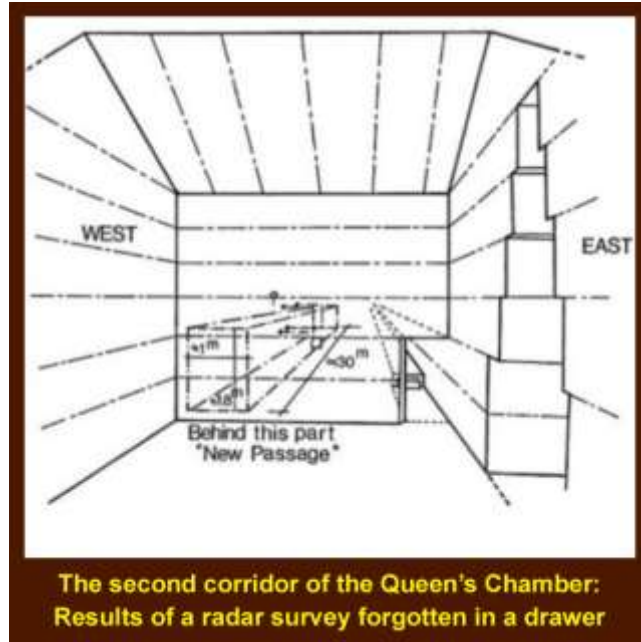


*“One must rationally analyse what has never been done since the mists of time”*

## Jean-Pierre Houdin:

*“During all these years of research, I was aware that in the end you could find a great many clues just by going ‘fishing’ in projects already carried out or studies published over the years. During the micro-gravimetric campaign performed under the patronage of the EDF Foundation in 1986/87, the results were not what was expected for at the time, namely the detection of an unknown chamber, which proves that there are many people who are not satisfied with the current status quo. The anomaly of the spiraling low-density zone would have remained at the bottom of the drawer if my curiosity had not pushed me to look much more closely at these results. The ‘catch’ had been excellent, because in my mind the probability of later finding this spiral perfectly matching that in the theory was practically zero. This anomaly can only have one rational explanation and any attempt to deflect its significance towards other constructional explanations is doomed to fail because the fundamental subject is then forgotten: how was the pyramid built? And here we have to go into detail rationally, which has not been done since the dawn of time. Moreover, during this investigation, other results concerning other anomalies that also fell into the drawer supported my latest suggestions: micro-gravimetry had also detected low-density and high-density zones at exactly the places I expected.*





*"I had also learned that at the same time, under the direction of a well-respected Egyptologist, Professor Yoshimura, the University of Waseda in Japan had undertaken two radar studies in the pyramid shortly after the French project. One very significant result, detected during each of these two missions, brought to light a corridor about thirty meters long, parallel to the horizontal corridor leading to the Queen's Chamber and finishing in the north-west corner of the chamber's north wall. This discovery was the subject of an official publication, but the establishment misunderstood it at the time. Competition between Egyptology teams appears to be fierce, with the consequence that a mass of information is closeted away without trace for simple reasons of ego. For me, science cannot and should not be hampered by clan disputes; but this example proves that the reality is quite different.*

*As for 'The Single-mindedness' I often talk about, I will summarize it with a phrase from the Greek historian Thucydides: 'Instead of taking the trouble to search for the truth, we generally prefer to adopt ready-made ideas.'"*

### **Pyramidales:**

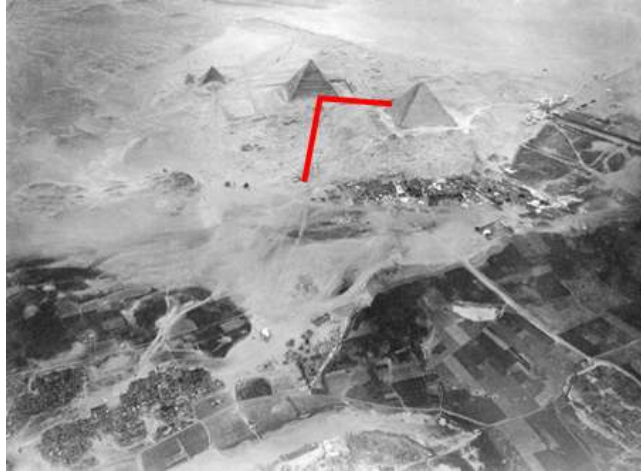
"Adding to your previous research, in order to refine your reconstitution of the Great Pyramid's construction, your new observations initially led you to focus your attention on the area around the monument, namely the Monumental Causeway intended to transport stone blocks. What are the configuration and route of this causeway?"

**"A trench in the bedrock to serve as a slide channel for a second counterweight."**

### **Jean-Pierre Houdin:**

*"I often say that by having had this sudden inspiration in 1999, 'The pyramid was built from the inside', my father had finally found one of the two ends of the thread in the ball of wool that represented the enigma of the pyramid's construction. Those who maintained 'The Single-mindedness', according to which the pyramid was constructed from the outside, were turning this ball around while themselves going round in*

*circles, with nothing (the end of the thread) to establish a plausible theory. From the start, I had this element and I pulled the thread little by little, the ball getting progressively smaller. As for the Giza Plateau, it was the thought of a reader that pushed me to examine it more closely. This reader pointed out to me that I had not explained how I transported the granite beams from the port to the base of the great external ramp; and he was right to point it out to me. Indeed, it is such remarks that help things move forward.*



**The site was organized around these two main axes (in red):  
the two pyramids of Khafre and Menkaure obviously did not exist at the time**

*“And, as if by a strange coincidence (?), the next day on Talking Pyramids, Vincent Brown’s blog, I saw photography from the beginning of the 20<sup>th</sup> century taken by Spelterini from a balloon. And the penny dropped: why hadn’t I thought of it sooner? The Monumental Causeway of Khafre was built on a ramp dating from Khufu’s construction project! The Egyptians always considered simplicity and economy in organizing their construction sites: first construct the pyramid in a first quarry, to supply materials over the shortest possible distance, to have as much as possible to hand, if I might say.*

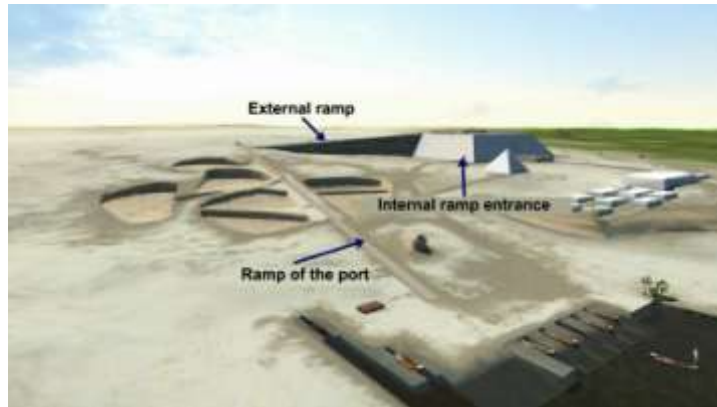


**3D rendering Dassault Systèmes**

*“Nonetheless they had two materials that came from other regions of Egypt: Tura limestone for the facing stone and Aswan granite for the walls and beams of the King’s Chamber. They needed a canal and an unloading port as close as possible: the current port in front of the Valley Temple of Khafre and the Sphinx was the ideal place. From there, the Tura blocks could follow an allowable natural slope of 8 to 9%, to be delivered at the base of the pyramid, at the entrance to the internal ramp. On the other hand, the beams having to be delivered to the level of the base of the King’s Chamber, the route had to be longer to maintain an identical slope. The hypotenuse of the triangle was not suitable and the two sides of the triangle became more logical. Khafre’s Monumental Causeway crossed my external ramp. By moving this slightly to the west, profiting from the greater altitude of the Plateau in this area (15 m higher than the base of the pyramid), it was shortened by about one hundred meters and its starting point was naturally located on an extension of the Causeway and practically at right-angles to it. The difference in level between the port and the base of the King’s Chamber is about 83 m, two-thirds (55 m) being covered with the aid of this plateau ramp, the final third (28 m) by means of the exterior ramp (the blue line below). Incidentally, I noticed the presence of several quarries along the route of the plateau ramp (the red line below). These must have been used as required and were directly linked.*



*“This ramp, which was nearly 24 m wide, was much too big to be just the foundation for Khafre’s Monumental Causeway (9.50 m), especially given that the other plateau causeways have foundations that do not extend beyond their masonry (10 m for Khufu and 8.5 m for Menkaure). This ramp sorted out the route for materials, but did not explain how the beams were brought up from the port to the base of the Khufu’s external ramp. In my theory, I say that the beams were dragged from the base of the pyramid to level +43 m using a counterweight moving inside the Grand Gallery (the green line at the top, above). Logic would therefore expect the Egyptians to have installed a first counterweight at the end of the plateau ramp to bring the monoliths to the base of the second ramp. To do this, they would have had to dig a trench in the bedrock to serve as a slide channel for this second counterweight; and this is what they did! Precisely in line with the plateau ramp, and beyond the starting point of the external ramp for Khufu’s pyramid, they dug this ditch and we had a clue we hadn’t dared hope for. Although this trench had disappeared under Khafre’s pyramid (the green line, above, left), one detail is remarkable: while all the funereal apartments and corridors were dug into the bedrock, the corridor connecting the entrance to the sepulchral chamber, with its floor more than 10 m below the level of the plateau, has indeed also been dug, but suddenly, over about ten meters exactly aligned with the plateau ramp, it is constructed in stone, floor, walls and ceiling. And this trench had a great influence on the location of the internal structures; it required the designers to move them about twelve meters to the east, in order to avoid having a significant void to fill in under the stone-built section of the corridor.”*



The Plateau and the pyramid reaching a height of 43 m (3D rendering Dassault Systèmes)

