Why the pharaohs built the Pyramids with fake stones

Joseph Davidovits
Geopolymer Institute
ISBN 9782951482043

20 years after the best seller book: *The Pyramids: an enigma solved,*
after 20 years of new researches, and new discoveries,
you will understand why the theory is more alive than ever, why more and more scientists agree, **simply because it is the truth.**

Chapter 1

Why a new theory on how the pyramids were built?

Professor Davidovits, you are a research scientist and you are described as the father of a new branch of chemistry. Throughout the world people are doing research in various fields to extend your work on what you have called "geopolymers"; what exactly are these?

Geopolymers are mineral substances obtained synthetically, i.e. by chemical processes that are actually also found in nature, but which there take millions of years.

So you are able to make all kinds of rock and stone identical to that found in the natural state?

Yes and no. These synthetic stones are in fact re-agglomerated materials. The process is explained in more detail later in the book. Basically, the principle is as follows: starting with a mineral substance such as eroded, disintegrated or naturally disaggregated rock – such as the limestone found everywhere in northern France – we give it a compact structure using a binder, a geological glue that will agglomerate (or re-agglomerate) the mineral particles. The result is a rock that looks perfectly natural: in our case, for example, an extremely solid limestone similar to certain types occurring naturally. A geologist would notice nothing unusual. Only a very close observation of the binder can reveal the synthetic nature of the rock, because the particles themselves are without question limestone – or granite or whatever you like.

So the fine statues in your laboratory, all depicting the same human head in various stones – these are made of geopolymers?

Yes, they are. They were all cast in the same mould from different mixtures as an example of what we can do.

Very interesting. But what took you from geopolymers to the Pyramids of Egypt?

It was partly chance. My work as a research chemist really started in 1972. For two years, in my first laboratory in Saint-Quentin in Picardie, I worked first of all on the chemical reactions of clay minerals. Nobody took any notice of us and with my team we developed the first applications, for the building industry. But in June 1974, I realised that what we were producing were materials that are very close to natural cements, such as rocks based on feldspars, the feldspathoids. One

day, as a joke, I asked my scientific partners at the Muséum d'Histoire Naturelle de Paris what would happen if, we buried in the ground a piece of the product that we were synthesising in the laboratory at the time, and an archaeologist were to discover it in 3000 years' time. Their answer was surprising: the archaeologist would analyse this object disinterred from the garden of a ruin in Saint-Quentin, and the analysis would reveal that the nearest natural outcrop of the stone was in Egypt in the Aswan region! It was on that day that I realised that if I did not reveal the synthetic nature of the product we had developed, it would be taken for natural stone.

Figure 1: Examples of moulding in geopolymer stones
(limestone, granite, sandstone, arkose, …)

I see where you are going: why not surmise that this same science gave the pyramids?

Not only the pyramids, but other megaliths from antiquity too often present us with the same puzzles: quarries that are always several dozen kilometres away, for example, posing huge transport problems; the problem of carving these enormous blocks of stone in an age when iron was still unknown. The more I think about it, the more absurd I find the idea. Superficial analyses of the stone megaliths have been made, to be sure, and up to now nobody has questioned their natural character. Searching for precise information, I went to UNESCO. There I obtained a report on the 1972 expedition to Easter Island. In this report were geological and mineralogical data on the statues. Now, in the light of my new knowledge, some of these data – on the oldest statues – strongly suggest that they were made by an agglomeration process. The most recent statues, on the other hand, were clearly carved out of volcanic rock.

Are you giving us the subject of your next book?

Yes and no, because not one, but several books will have to be written. A whole series, in fact, because the information that I had gathered (we are still in 1974) was sufficient to justify in-depth studies of several sites apart from Easter Island, scattered throughout the world. The reason why I preferred to concentrate on Egypt at the time was that I had already built up a whole scenario: blocks of soft limestone extracted from quarries, when broken up with water, could give a limestone mortar easily transportable in baskets. This mortar, mixed with ingredients including

kaolin, natron salt and chalk, could be poured out and compacted into moulds just as concrete is, directly on the site of the pyramids.

You make this operation sound quite simple to carry out.

Absolutely!

The idea is certainly a novel one, and appears interesting from what you say. I assume that, back in 1974, you didn't wait long to publish it.

At that stage, I had to make my theory known so that, in return, I could come by certain information I still needed. Thus, after an article appeared in *Agence France Presse*, and was taken up by the French and foreign media, I was able four years later to publish my first book, ahead of the second International Congress of Egyptologists, in Grenoble, organised in 1979 by the CNRS. I gave two talks. In one I described the hypothesis of the technique by which Egyptian hard stone vases were made by agglomeration using binders, i.e. special cements. In the other talk, I described how the technique was applied to the pyramids, using the action of natron salt (chemically, sodium carbonate).

Something tells me that your theories did not generate much enthusiasm.

What exactly?

Because otherwise they would have become well known.

So you want to know what happened?

Yes, I do.

Well, during the discussion that followed, it was acknowledged that my hypothesis on the making of vases in artificial stone was feasible. The Egyptians had the necessary chemical and technical knowledge to mould them in this way (knowledge of copper, alkalis and ceramics). But transposing this alchemy to the building of the pyramids was described as inconceivable.

So that was the start of the polemic?

Yes, but I will not go into all that now, but will come back to it later. If you read the note at the end of this chapter you will understand the atmosphere of the time, particularly during the Toronto congress (figure 3).

But couldn't the matter simply be decided by analysis? You said at the beginning of this interview that by studying the binder, the nature of the rock could be determined.

The very sophisticated analyses required needed specialists and equipment that we did not have at the time.

And today?

The analyses were carried out not long ago by an international team.

And the outcome?

The proof is there. The samples given to me by the Egyptologist Jean-Philippe Lauer in 1982 are indeed fragments of geopolymers (see chapter 8), confirming my own X-ray analyses in 1982-84.

So you're a happy man?

Finally, it was not such a bad thing that these analyses were unfeasible twenty or thirty years ago, since, lacking any "incontrovertible proof", I was forced to venture outside my own initial field of study in order to become familiar with the equally vast field of Egyptology. And I have learned a great deal. First and foremost, I was convinced that if the pyramids had been built as I thought, there must necessarily be, among all the writings left to us by the Egyptians, some trace somewhere. I therefore had to comb through and compare many translations in many languages. And I found what I was looking for: the texts exist and are even well known among specialists. But because they failed to understand what they were transcribing, the translators were forced to use imprecise terms in translation, and sometimes the translation of a passage was completely erroneous. So I went right back to the original writings and began a linguistic investigation on a series of technical words. And you will see in the book that a similar approach was necessary to the history, the religion and even the economy; in short, everything is connected.

If I am to understand, it appears that the implications of your discovery open up a vast field of investigation for archaeology and perhaps place a question mark over many things that we thought we knew. Did this worry your detractors?

As far as future work is concerned, you're probably right. As for my "detractors", I don't know. As a chemist, I was considered above all as an "amateur" in the eyes of many Egyptologists and hence not to be taken seriously. And it is this "handicap" which has led me to give more and more depth to my arguments, and which has resulted today in my theory being held in regard by the scientific community, with many ready to defend it.

Apart from the Pyramids, can you give us an example which shows the utilisation of this chemical science?

Yes, and quite a spectacular one. In 1999 at the Grand Palais in Paris, there was an exhibition on the ancient Egyptian empire "*L'art égyptien au temps des pyramides*". Exhibited there were objects from the Ancient Empire (3000 to 2400 BC), such as hard stone statues (granite and gneiss). And among other remarkable objects, I noticed a vase, or as it was called in catalogue number 99 "*coupe*" resembling an ashtray (figure 2). The shape of the vase was curiously evocative of ceramic, whereas in fact, it was made in one of the hardest rocks that exist, anorthositic gneiss. It was described thus in the catalogue:
"*... the walls are astonishingly thin, and the folding of the edges is so natural that anybody not knowing that it is made of stone would believe it to be of some flexible material ...*"

With its beautifully shaped curves and its wafer thin walls, how could such a vase have been fashioned? How could such a hard and crystalline material have been worked without being broken by the sculptor's chisel? To this, the experts have no answer, and are content to suggest that the craftsmen would have worked extremely slowly and minutely, chipping away at this very hard material millimetre by millimetre for a whole lifetime. No, clearly, the craftsmen used a technique similar to that of a potter, using instead of clay a stone paste developed through chemical knowledge and worked in a similar way.

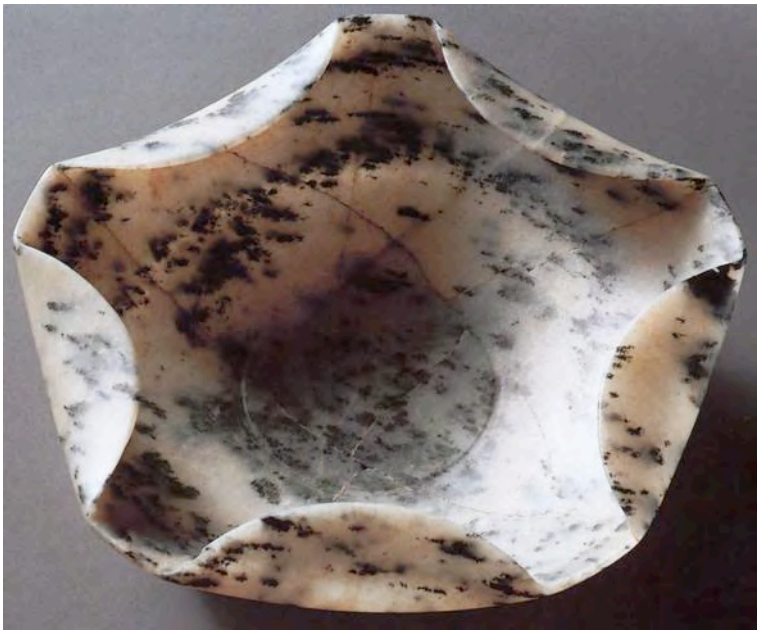


Figure 2: cup #99 in anorthositic gneiss, Catalogue of the exhibition: l'Art Égyptien au Temps des Pyramides, RMN 1999.

Maybe, but you must admit that to suggest that a people of nearly 5000 years ago had knowledge of the very latest science and technology of today appears unlikely.

Perhaps, but we can approach things differently. Is it finally so surprising that a civilisation, that so venerated stone, the symbol of eternity (and we shall see that the act of agglomeration is indissociable from religious practice), should turn some of its energy to the observation, study and experimentation of minerals? Their knowledge did not appear from nowhere. It is the product of history, i.e. a long transmission from initiate to initiate, with discoveries, failures and technicians, one of whom, Imhotep, probably the wisest of all, is known to us. This is real science. And this science, like others, has been lost. The history of progress is not a linear history, whether scientific or not. And is it not paradoxical that our modern Western society, which has invested so much in the study of the animal and vegetable kingdoms (from which have come oil chemistry), has done so little with minerals? In other words, your perplexity stems perhaps more from our own ignorance than to the incontestable genius of the ancient Egyptians.

Note

Third international conference of Egyptologists,
Toronto, Canada, September 1982

The article in the newspaper, Toronto Star, on Tuesday 7 September 1982.

2 choices on how Pyramids went up

By John Munch and Kelly McParland
Toronto Star

The mystery of how the Pyramids were built has entered a new and furious phase.

Touted as the first of the Seven Wonders of the Ancient World, the Pyramids have defied researchers trying to explain how Egyptian workers were able to lug 65-ton limestone blocks to build the mammoth structures that have dotted the Nile Valley for 4,000 years.

Now two Frenchmen believe they each have the answer, they are poles apart.

Joseph Davidovits has the more bizarre theory: The Egyptians built the stone blocks on the spot from a crude variety of fossil shells. He calls the blocks a primitive type of concrete with a casing made of relatively fine shells.

Davidovits, 47, is the founder of the Geopolymer Institute, at St. Quentin, 129 kilometres (80 miles) from Paris, and freely acknowledges that he is the "enfant terrible" among researchers in the field.

Opposing his theory is Jean-Philippe Lauer, 80-year-old Dean of European Eyptologists. Ridiculous, says Lauer, of the artificial stones theory. "There are many ridiculous surveys, not stupid, but impossible. Not many are serious."

300 experts

Lauer, who has spent 56 years laboring over a single pyramid, now believes that Egyptians building the pyramid of King Zoser at Saqqara, near Cairo, built short, sharply angled ramps to lift blocks as high as 70 metres (210 feet).

Davidovits and Lauer are among 300 experts attending the International Congress of Egyptology at the Skyline Hotel until Saturday. The two researchers are to present their opposing theories during lectures this week.

"I am the first person who has ever said the stones are man-made. All the analysis, all the arguments so far were based on the supposition that the stones are natural," Davidovits said in an interview yesterday.

He says that researchers have disagreed on where the stones came from. Traditional archeologists said they came from the far side of the Nile; geologists have pinpointed their source close to the site of the pyramids; while one team of researchers believed they came from all over Egypt.

"The principle of artificial stone obtained by agglomeration of fossil shells allows me to use all these results and to interpret them correctly," Davidovits says in his newly-published book.

Mysteries remain

Davidovits believes that ancient Egyptians could have produced synthetic stone at temperatures as low as 80 degrees C. He has constructed his own version of a stone chipping given him by Lauer. "We are totally opposed in our theories but we converse and are friendly towards one another," Davidovits says.

Lauer, officially retired from France's national research centre, scoffs at Davidovits' approach. He believes that a moveable lever was placed on a ramp of about 250 metres (820 feet) in length, ahead of the limestone blocks. Ropes ran from the block to the lever, then reversed and ran past the block to workers further down the ramp. Workers could raise the block by pulling downhill, rather than upwards.

Extended Abstract of the Theory
(simplified list of arguments)

In his books, *They built the pyramids* (2008), Professor Joseph Davidovits presented a theory on the pyramids' construction: they were built by using re-agglomerated stone (a natural limestone treated like a concrete and then moulded), and not by using enormous blocks, carved and hoisted on ramps. Initially published in New York in 1988 under the title *The pyramids: an enigma solved*, this thesis has recently been released in several books with an important update of facts missing in the first American edition.

The theory is based on scientific analysis, archaeological elements and hieroglyphic texts as well as religious and historical aspects. Contrary to other theories that only seek a technical explanation for the Giza Plateau pyramids, and often looking only at Kheops itself and ignoring the others, his theory encompasses the building of **all** the pyramids of Egypt for 250 years, from the first of Zoser to those in crude bricks.

Theory

1. The formula and materials used:

The most important material is limestone. Analysis done by the German geochemist D.D. Klemm [1] showed that 97 to 100% of the blocks come from the soft and argillaceous limestone layer located in the Wadi, downwards the Giza Plateau. According to the Egyptologist Mr. Lehner [2], the Egyptians used a soft and crumbly limestone, **unusable for hewn stones**. The workmen did not choose the hard and dense limestone located near the pyramids, with rare exceptions for later restorations. The geologist L. Gauri [3] showed that this limestone is fragile, because it includes clay-like materials (in particular kaolinite clay) sensitive to water which explains the extreme softness of the Sphinx body, whereas its head, cut in the hard and dense geological layer, resisted 4000 years of erosion.

This soft argillaceous limestone, too fragile to be a hewn stone, is well adapted to agglomeration. Moreover, it naturally contains reactive geopolymeric ingredients, like kaolinitic clay, essential to manufacture the geological glue (a binder) and to ensure the geosynthesis.

It was not required *to crush* this stone, because it *disaggregates easily* with the Nile water during floods (the Wadi is filled with water at this time) to form a limestone mud. To this mud, they added reactive geological materials (*mafkat*, a hydrated alumina and copper silicate, overexploited at the time of Kheops in the Sinai mines) [4], *Egyptian natron* salt (sodium carbonate, massively present in Wadi Natrum), and *lime* coming from plants and wood ashes [5]. They carried this limestone mud in baskets, poured it, then packed it in moulds (made out of wood, stone, crude brick), directly on the building site. The method is identical to the pisé technique, still in use today.

This limestone, re-agglomerated by geochemical reaction, naturally hardens to form resistant blocks. The blocks thus consist of 90 to 95% of natural limestone aggregates with its fossil shells, and from 5 to 10% of geological glue (a cement known as "geopolymeric" binder) based on aluminosilicates.

2. Why do geologists see nothing?

This is due to the geological glue, which, though artificial, is seen by the geologists either as an impurity, and therefore useless to study, or as a natural binder. At best, the analysis tools and the working methods of geologists consider the glue as a perfectly natural "micritic binder". Joseph Davidovits manufactured an artificial limestone containing 15% of synthetic binder, and submitted it to geologists who, on studying it, suspected nothing [6].
A geologist not informed of geopolymer chemistry will assert with good faith that the stones are natural.

3. The chemical formula:

The geosynthesis aims to react the kaolinite clay (naturally included in the Giza limestone) with caustic soda (see chemical formula 1). To manufacture this caustic soda, they use Egyptian natron (sodium carbonate) and lime (coming from plant ashes) (see chemical formula 2). Then, they get soda which will react with clay.

But the most interesting point is that this chemical reaction creates pure limestone as well as hydrosodalite (a mineral of the feldspathoids or zeolites family). [6]

Chemical reaction1:

$Si_2O_5,Al_2(OH)_4 + 2NaOH => Na_2O.2SiO_2Al_2O_3.nH_2O$

kaolinite clay + soda = > hydrosodalite

Chemical reaction 2:

$Na_2CO_3 + Ca(OH)_2 => 2NaOH + CaCO_3$

Sodium carbonate (Egyptian natron) + lime = > soda + limestone

Summary of the re-agglomerated stone binder chemical formula:
clay + natron + lime = > feldspathoids + limestone (**i.e. a natural stone**)

The re-agglomerated stone binder is the result of a geosynthesis (a geopolymer), which creates two natural minerals: limestone and hydrated feldspar (feldspathoids). **We understand why the geologists can easily be misled.**

4. Scientific analysis:

The analysis methods used today by geologists are not relevant. To show the artificial nature of the material, they need to work with more powerful methods (analysis by synchrotron, transmission and electronic scan microscopy SEM TEM, Nuclear Magnetic Resonance, Particle Induced Gamma-Ray Emission, Particle Induced X-Ray Emission, X-ray fluorescence, X-ray Diffraction). These tools are seldom used in this situation. Studies have been made, and all show that **the pyramid stones are artificial**. [7]

We can quote the following scientific papers:
* Paleomagnetic investigation of the Great Egyptian Pyramids, Igor Túnyi and Ibrahim A. El-hemaly, Europhysics News 2012, 43/6, 28-31.
* Were the casing stones of Senefru's Bent Pyramid in Dahshour cast or carved? Multinuclear NMR evidence, Kenneth J. D. MacKenzie, M. E. Smith, A. Wong, J. V. Hanna, B. Barryand M. W. Barsoum, Mater. Lett., 2011, 65, 350.
* Microstructural Evidence of Reconstituted Limestone Blocks in the Great Pyramids of Egypt, Barsoum M.W., Ganguly A. and Hug G., J. Am. Ceram. Soc. 89[12], 3788-3796, 2006.
* The Enigma of the Construction of the Giza Pyramids Solved?, Scientific British Laboratory, Daresbury, SRS Synchrotron Radiation Source, 2004.

* PIXE, PIGE and NMR study of the masonry of the pyramid of Cheops at Giza, Guy Demortier, NUCLEAR INSTRUMENTS and METHODS in PHYSICS RESEARCH B, B 226, 98 - 109 (2004).
* X-Rays Analysis and X-Rays Diffraction of casing stones from the pyramids of Egypt, and the limestone of the associated quarries., Davidovits J., Science in Egyptology; A.R. David ed.; 1986; Proceedings of the "Science in Egyptology Symposia"; Manchester University Press, UK; pp.511-520.
* Differential thermal analysis (DTA) detection of intra-ceramic geopolymeric setting In archaeological ceramics and mortars., Davidovits J.; Courtois L., 21st Archaeometry Symposium; Brookhaven Nat. Lab., N.Y.; 1981; Abstracts P. 22.
* How Not to Analyze Pyramid Stone, Morris, M. JOURNAL OF GEOLOGICAL EDUCATION, VOL. 41, P. 364-369 (1993).
* Comment a-t-on construit les Pyramides: polémique chez les Égyptologues, HISTORIA Magazine, Paris, No 674, fév. 2003, dossier pp. 54-79 (2003).

The Archaeological Evidence

1. The hieroglyphic texts:

We know the Egypt of the Pharaohs quite well, thanks to its numerous steles, frescos and papyrus describing all kinds of religious, scientific, technical knowledge, the craft industry, agriculture, medicine, astronomy, and so on. However, there is not a single hieroglyphic document revealing the pyramids' construction with carved stones, ramps, and wooden sledges. On the contrary, we find many texts showing that the ancient Egyptians had the knowledge of man-made stones:

The Famine Stele is engraved on a rock at Sehel island, close to Elephantine. It stages the god Khnum, Pharaoh Zoser and his architect Imhotep, builder of the first pyramid at Saqqarah. This inscription contains 650 hieroglyphs depicting either rocks and minerals, or their transformation processes. In column 12, we read: "*With these products (mineral) they built (...) the royal tomb (the pyramid)*". In columns 18 to 20, the god Khnum gives to Zoser a list of minerals needed in the construction of these sacred monuments. This list does not mention the traditional hard and compact construction stones like limestone (ainr-hedj), monumental sandstone (ainr-rwdt) or Aswan granite (mat). By studying this text, we notice that we cannot build a pyramid or a temple with simple minerals, except if they are used to manufacture the binder of a re-agglomerated stone. [8]

The Irtysen stele (C14) at the Louvre Museum is an autobiography of the sculptor Irtysen under one of the Mentouhotep Pharaohs, eleventh dynasty (2000 B.C.). It explains the method of manufacturing synthetic stone statues (with "cast stone"). [9]

The Ti fresco, fifth dynasty (2450 front. J.-C.), illustrates the sculptors work on a wooden statue, the manufacturing of a stone statue and mixtures in vases. This fresco perfectly shows the difference between carving a statue (here in wood with hieroglyphic signs depicting the operation of carving), the fashioning of a statue (made out of synthetic stone with hieroglyphic signs representing the action "to synthesize", "man-made"), and mixing caustic chemicals in ceramic vases to work on this statue. [10]

2. The invention of re-agglomerated stone: growth and decline of a technology

Before the first pyramid built out of stone, the ancient Egyptians constructed very imposing crude brick monuments. We find large funerary temple enclosures of the second dynasty, like the Khasekhemwy one (2,730 B.C.). Its massive wall is of crude clay bricks, therefore in a moulded

material. It is generally agreed, since these bricks were worked in moulds, that their dimension must be uniform. However, this is wrong. Despite having been manufactured in moulds, the clay bricks are of approximately 5 different sizes, implying the use of several patterns. **We find these differences in proportions in all pyramids.** This heterogeneity gives the monuments the ability to resist earthquakes by avoiding the amplification of seismic waves.

20 years later, Zoser ordered Imhotep to build him a stone monument for eternity. **The scribe Imhotep is the inventor of re-agglomerated stone** (2,650 B.C.) and **the architect of the first pyramid of Egypt**. Instead of using crude bricks, he simply replaced the clay with a re-agglomerated limestone and kept the same method of moulding bricks. This is why the first pyramid is made in small bricks, which become bigger in dimension as the invention is better mastered. The bricks are manufactured where the stones are extracted, in the Wadi (at the east of the complex [11]) at the Nile flooding period, then carried and placed on the pyramid under construction.

Its invention, inherited from pisé and crude brick, improves with time during the pyramids' construction at the third and fourth dynasties. Starting from the small limestone bricks at Saqqarah, the stone dimensions increase gradually. For the Meidoum and Bent pyramids, the blocks are produced in the vicinity and are moved up to the pyramid. There is always a Wadi nearby to easily disaggregate limestone with water and to prepare the mixture at the Nile flooding time.

From Sneferu's red pyramid in Dashur, the blocks are manufactured on the spot, because the dimensions are now too large for them to be transported.

In Giza, some stones (in particular those at the Khefren temple) weigh more than 30 tons. How would they have simply carved them with soft copper tools, without wheels or pulleys?

According to Guy Demortier [12], re-agglomerating stones on the spot greatly simplifies the logistic problems. Instead of 25,000 to 100,000 workmen necessary for carving [13], he deduces that the site occupancy never exceeded 2,300 people, which confirms what the Egyptologist Mr. Lehner discovered with his excavations of the workmen's village at Giza.

The decline of the agglomerated stone technology appears with the pyramid of Mykerinos, which represents only 7% in volume of Kheops. Why is this pyramid suddenly so small? This decline would have been caused by a sudden reduction in reactive mineral resources, like the exhaustion of the principal Sinai mines at the end of the fourth dynasty. Expeditions of B. Rothenberg [4] showed that they had extracted enormous quantities of *turquoises* and *chrysocollas* (called *mafkat* in Egyptian), quantities so large as to rule out their use in jewellery and decoration, as confirmed by the Egyptologist Sydney Aufrère [14].

The decline would also result from an ecological and agricultural disaster radically limiting the production of lime coming from plant ashes burned for this purpose. If we burn more than what we can produce or renew, a famine or an ecological disaster can occur. Analyzed by D.D. Klemm [15], lime, present in mortars of the third and fourth dynasties, disappears in mortars of the fifth and sixth dynasties. Indeed, the succeeding pyramids, and in particular that of Userkaf, first king of the fifth dynasty, is ridiculously small compared to Mykerinos. In the beginning, they were covered by a limestone coating which hid the bulk of natural blocks, badly worked out. This pyramid is only an uneven stone assembly covering a funerary room made, this time, out of re-agglomerated stone and protected by enormous beams of several dozen tons. Only the core of this pyramid was carefully manufactured, the remainder being botched, because the reactive materials were rare. Thus, we are **in the presence of a very different system, which cannot be explained**

by carving stone. If the pyramids of Giza had been hewn, how can such a drop in architectural quality be explained, while stone is an abundant material? Carving would have resulted in a construction quality equivalent to those of Giza, even with pyramids more reasonable in height, but this is not the case.

With respect to a resource impoverishment, starting from the twelfth dynasty (1,990-1,780 B.C.), Pharaoh Amenemhat I and his successors built **crude brick pyramids**. But here also, only the funerary room is built, with great care, out of re-agglomerated stone. However, the Egyptians did not choose to carve stone for the body of the pyramids, preferring crude bricks, even though they had harder and more efficient bronze tools had they wished to use them.

We note, then, that the technology of re-agglomerated stone, after a formidable rise, a perfect mastery of the process, an intense exploitation of its resources, went on to an extremely rapid architectural decline. A mining exhaustion of the chemical reagent resources, and an ecological and agricultural disaster explain this decline. [16] [17]

3. Religious context:

Why did they maintain this need to build out of agglomerated stone or to preserve the agglomeration system, while they could carve stone?

For ancient Egyptians, stone had *a sacred quality*, used only for religious purposes, that prohibited its use for secular buildings (built rather out of crude bricks, clay and wood, never out of stone). It is only under the Ptolemys, 2,000 years after the pyramids, that stone became a trivial building material. The reasons for this distinction come from religion.

Egyptian civilization lasted more than 3,000 years and, contrary to what the general public thinks, it was not homogeneous. Thus, there are **2 geneses explaining the creation of the World**; two distinct gods claim the creation of the World and man: **Khnum** and **Amon**.

The god Khnum was worshipped during the Old and Middle Kingdoms (3,000 to 1,800 B.C.). He is depicted as a man with a ram's head and horizontal horns. He personalizes the nutritious Nile, and at Elephantine, Thebes, Heracleopolis, Memphis, he is the god of creation. In the act of creation, he "**kneads**" humanity on his potter's wheel with the Nile silt and other minerals (*mafkat*, *natron)* as in the Biblical and Koranic genesis. This does not give an unspecified clay, but a stone called "ka", i.e. the soul that is not spirit, but eternal stone. Khnum and all the divine incarnations of Râ appear by the act of manufacturing stone. His hieroglyphic sign is a hard stone vase like those of the Nagadean era (3,500 to 3,000 B.C.). Thus, under the Old Kingdom, the purpose of the agglomeration act was to reproduce the divine intervention at the time of the creation of the World and the human soul.

For the two main Pharaohs of the Old Kingdom, Zoser and Kheops, the relationship with Khnum is proven by archaeological discoveries (cf. the Famine Stele). Also, the true name of Kheops is *Khnum-Khufu* (may the god Khnum protect Kheops). **Would Kheops have attached his name to an inferior god?** No, Khnum is a major god. It is simply the perception of the Egyptian Pantheon which is not correct.

Amon is the second god of creation. In the beginning, he was only an average god. He became a dynastic god in the twelfth dynasty (1,800 B.C.), but he was not yet the god of creation, this role still being the privilege of Khnum. Then, he became the "king of the gods" and the priests gave him the ability to create the world. In the genesis myth, Amon is identified as a sacred mountain and he "**carves**" each human being in a part of himself, i.e. in this sacred mountain. Amon and all the divine incarnations of Amon-Râ appear by the act of carving stone, and are at the origin of the

New Kingdom monuments, like those of Ramses II, 1,300 years after the pyramids.

Thus, we understand why the tombs were no longer under pyramids, symbols of agglomeration, but under a sacred mountain, the Valley of the Kings, symbol of Amon. In the same way, the temples are built out of stone hewn with great care and the obelisks are called "Amon's fingers". During the Old Kingdom, where the name of Khnum ("the one who binds") is in the complete name of Kheops (Khnum-Khufu), the name of Amon ("the one who is hidden") is found in the New Kingdom Pharaohs' names like Amenhotep.

Arguments against the carving theory

Here are arguments presented by the partisans of carving to show that this technique was in use at the pyramids' time. However, these evidences are anachronous; they date from the Middle to the New Kingdom, in times when the stone was hewn, and not from the Old Kingdom, the time of the pyramids.

The extraction of blocks would have been possible by means of wooden dowels that, once in place, were wetted to cleave the stone. However, D.D. Klemm shows that the Romans only used this primitive technique very late on. Each period left distinct patterns of cut traces in quarries, thus making it possible to date them, except at the time of the pyramids, when no trace remains. [18]

The bas-relief of Djehutihotep illustrates the transport of a colossal statue on a sledge [19]. In the same way, R. Stadelman discovered that Amenemhat II workmen had stolen stones on sledges from the Sneferu pyramid, used as a vulgar quarry. These two events took place under the twelfth dynasty (1,800 B.C.), that is **700 years after the construction of the pyramids**.

The Tura stele depicts a stone block dragged on a sledge by oxen [20]. It does not constitute a proof because once again, it goes back to approximately **1,000 years after the construction of the pyramids**.

The Rekhmire fresco presents the work of masons setting up blocks with bronze tools. But these new tools were unknown to pyramid builders **1,300 years ago**.

Any ramps would have been made out of crude clay bricks, several kilometres in length (in straight or spiral lines, with the attendant problem of turning corners), representing a considerable amount of material. Each team would have sprinkled the ground with water to ease the motion of the sledge. But the action of water would have transformed the ramp into a soapy and very slippery path. After several teams had passed by, it **would have been transformed into mud where sledges and hauler would be stuck!**

There is **no official theory of carving, hauling blocks on sledges and ramps.** There are approximately **twenty or so that propose various solutions**. These theories are not based on hieroglyphic texts, do not match the technology found on archaeological sites, and do not take into account the historical and religious environment. These theories are essentially focused on the pyramid of Kheops, the most remarkable one, but not on the pyramids that precede or follow it, and even less on those made out of crude brick.

Notes and references

[1] Klemm, Steine und Steinbrüche in Alten Ägypten, Springer Verlag Berlin Heidelberg, 1993.

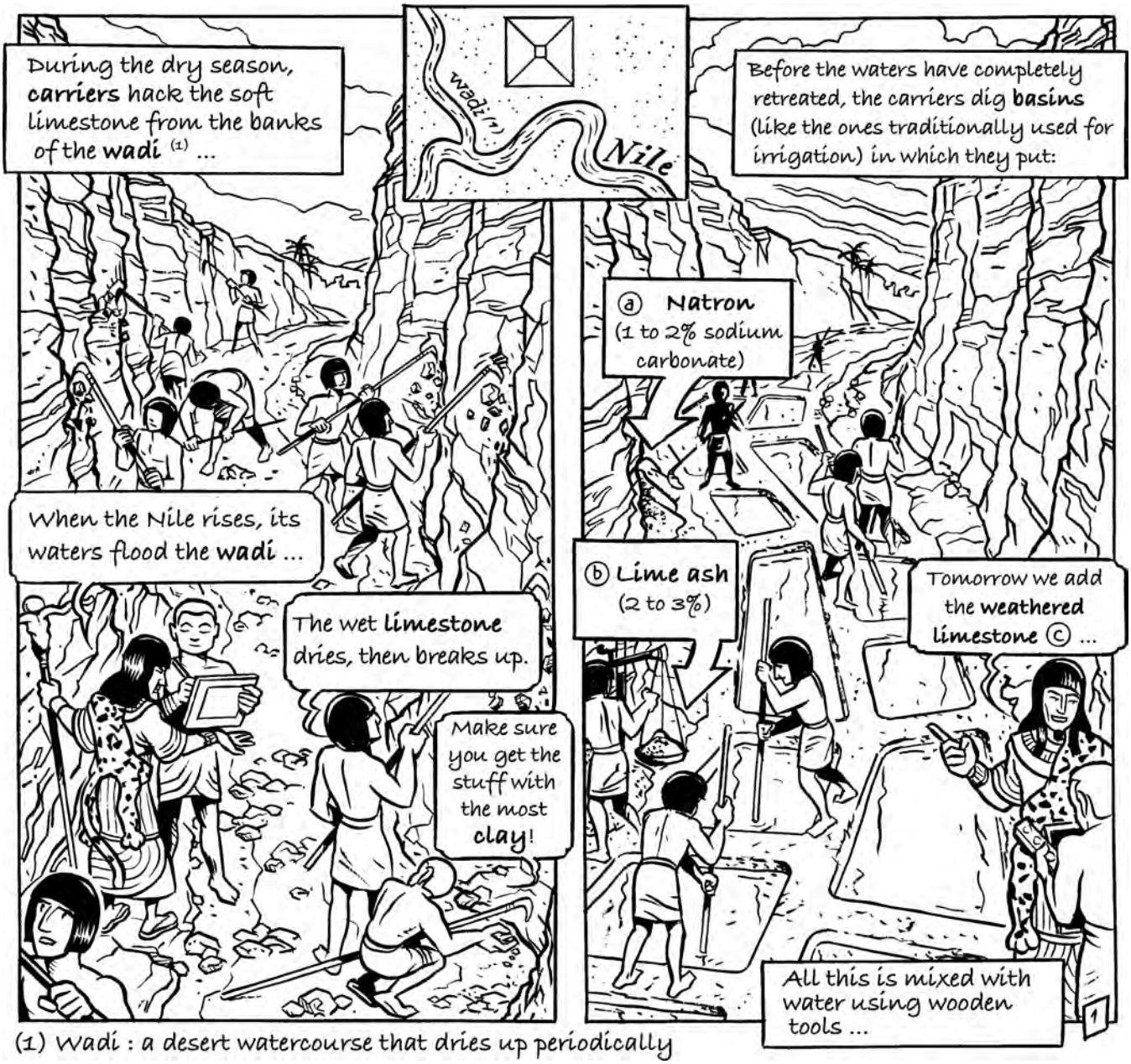
[2] M. Lehner, The Development of the Giza Necropolis: The Khufu project, Mitteilungun des Deutschen Institutes, Abteilung Kairo, 41, p. 149, 1985.
[3] L. Gauri, Geological study of the Sphinx, Newsletter American Research Center in Egypt, No 127, pp. 24-43, 1984.
[4] B. Rothenberg, Sinai exploration 1967-1972, Bulletin, Museum Haaretz Tel Aviv, 1972, p. 35
[5] J. Davidovits, Ils ont bâti les pyramides, éd. J-C Godefroy, Paris, 2002, pp. 161-162, 307-311
[6] J. Davidovits, La nouvelle histoire des pyramides, éd. J-C Godefroy, Paris, 2004, pp. 57-58 et 72
[7] See ref. [5] and [6] for comprehensive bibliographics notes and debates with geologists.
[8] Pyramid Man-Made Stone, Myths or Facts, III. The Famine Stela Provides the Hieroglyphic Names of Chemicals and Minerals Involved in the Construction , Davidovits J., 5th Int. Congress of Egyptology, Cairo, Egypt, 1988; Egyptian Antiquities Organization; EGY; 1988; pp. 57-58 in Résumés des Communications. See also ref. [5] and [6].
[9] J. Davidovits, Ils ont bâti les pyramides, éd. J-C Godefroy, Paris, 2002, pp. 229-236
[10] J. Davidovits, La nouvelle histoire des pyramides, éd. J-C Godefroy, Paris, 2004, pp. 145-150
[11] M. Lehner, The Complete Pyramids, Thames and Hudson, 1997, p. 83
[12] G. Demortier, La construction de la pyramide de Khéops, Revue des questions scientifiques, Bruxelles, 2004, Tome 175, p. 341-382
[13] M. Lehner, The Complete Pyramids, Thames and Hudson, 1997, p. 224
[14] Sydney Aufrère, L'univers minéral dans la pensée égyptienne, IFAO, Le Caire, 1991, Volume 2, p. 494
[15] D.D. Klemm and R. Klemm, Mortar evolution in the old kingdom of Egypt, Archaeometry '90, Birkhaüser Verlag, Basel, Suisse, 1990, pp. 445-454
[16] J. Davidovits, Ils ont bâti les pyramides, éd. J-C Godefroy, Paris, 2002, pp. 297-328
[17] J. Davidovits, La nouvelle histoire des pyramides, éd. J-C Godefroy, Paris, 2004, pp. 207-228
[18] Klemm, The archaeological map of Gebel el Silsila, 2nd Int. Congress of Egyptologists, Grenoble, 1979, Session 05.
[19] J. P. Adam, l'Archéologie devant l'imposture, éd. Robert Laffont, Paris, 1975, p. 158
[20] Vyze-Perring, The Pyramids of Gizeh, Vol. III, p. 99

Bibliography

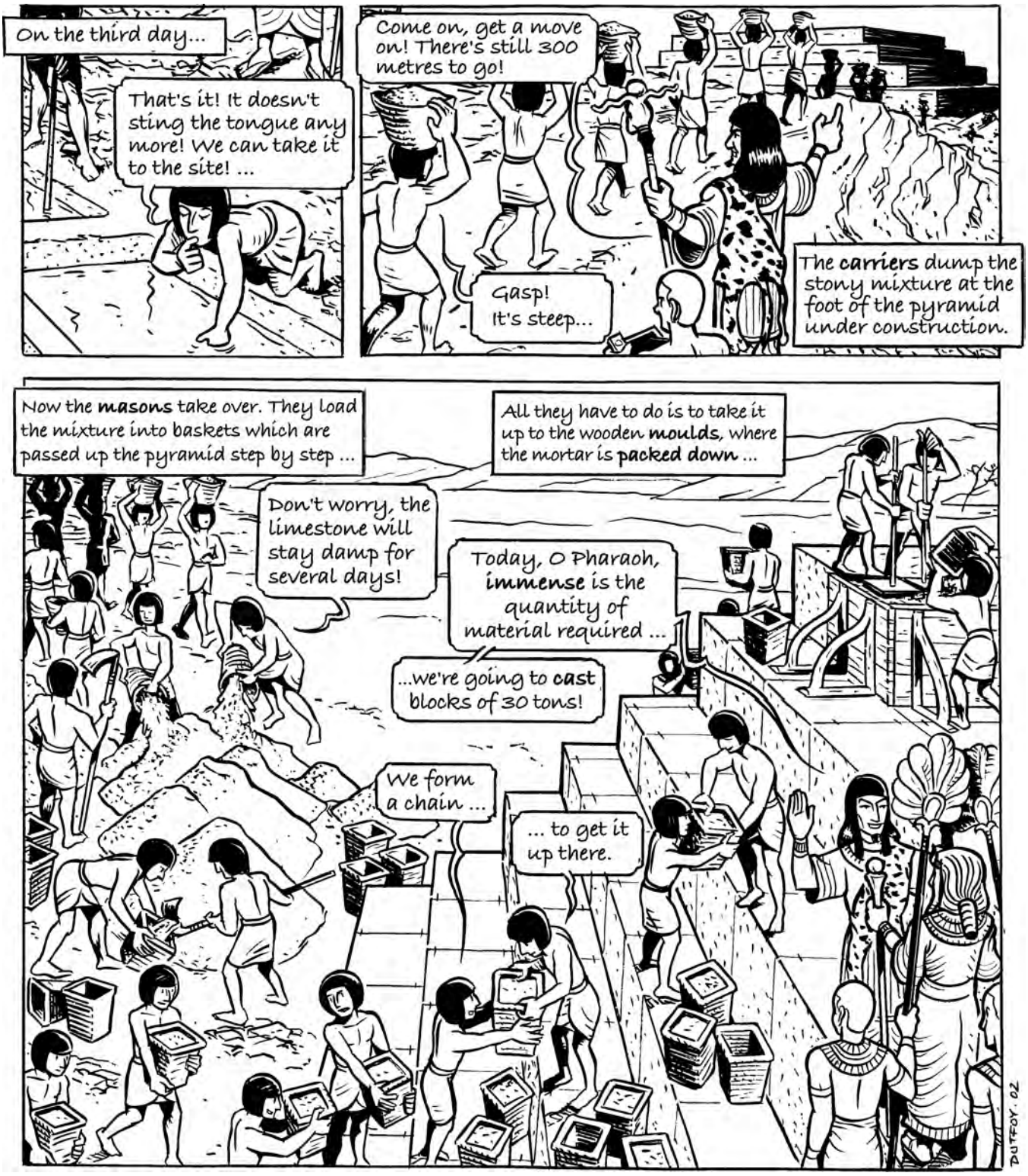
J. Davidovits et M. Morris, The Pyramids: An Enigma Solved, Hippocrene Books, New York, 1988, ISBN 0-87052-559-X
J. Davidovits, Ils ont bâti les pyramides, éd. J-C Godefroy, Paris, 2002, ISBN 2-86553-157-0
J. Davidovits, La nouvelle histoire des pyramides, éd. J-C Godefroy, Paris, 2004, ISBN 2-86553-175-9

Illustration of the Theory

Cartoon from Serge Dutfoy



(1) Wadi : a desert watercourse that dries up periodically


On the third day...
That's it! It doesn't sting the tongue any more! We can take it to the site! ...
Come on, get a move on! There's still 300 metres to go!
Gasp! It's steep...
The carriers dump the stony mixture at the foot of the pyramid under construction.
Now the masons take over. They load the mixture into baskets which are passed up the pyramid step by step ...
All they have to do is to take it up to the wooden moulds, where the mortar is packed down ...
Don't worry, the limestone will stay damp for several days!
Today, O Pharaoh, immense is the quantity of material required ...
...we're going to cast blocks of 30 tons!
We form a chain ...
... to get it up there.
DUTFOY. 02