

A Study on Pyramids in Egypt

B.Alekhy¹, J. Sree Naga Chaitanya² Dr. K. Chandramouli³

¹B. Tech student Department of civil Engineering, NRI Institute of Technology, Perecherla, Guntur, AP, India.

²Assistant professor of civil Engineering, NRI Institute of Technology, Perecherla, Guntur, AP, India.

³Professor and HOD of civil Engineering, NRI Institute of Technology, Perecherla, Guntur, AP, India

Abstract: In ancient Egypt the pyramids are the burial places for kings, queens, and other people wealthy enough to afford them. When most people think of Egypt they think of the pyramids, these monuments remain thousands of years after they were built. To build pyramids Egyptians needed an understanding of engineering, mathematics, science, and technology. Slaves were originally thought to have built the pyramids. Today because of a recent discovery (2002) of a “workers village” found in Giza, we know that most work on the pyramids was done during the flooding of the Nile when people could not farm. It is estimated that it took 100000 workers about 20 years to move the 2 million stone blocks to construct a pyramid. Places of the dead (pyramids and cemeteries) were built on the west bank of the Nile because it was believed that the sun “died” there every night. Technology used to produce the pyramids include: plumb line, set squares, mallets and chisels.

KEYWORDS: Mallets, Chisels, Nile



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INTRODUCTION

The Egyptian pyramids are ancient pyramid –shaped masonry structures located in Egypt were constructed during 2500BC, As of November 2008, there are sources citing both 118 and 138 as the number of identified Egyptian pyramids. Most were built as tombs for the country's pharaohs and their consorts during the old and middle kingdom periods.




The last remaining of the seven wonders of the ancient world, the great pyramids of Giza are perhaps the most famous and discussed structures in history. These massive monuments were unsurpassed in height. These massive monuments are of much importance Egypt's history and culture, if we analyze and think deeply from the heights of these pyramids, forty centuries look down on us" great pyramids of Egypt" like pyramid of Khufu, Khafre and Menkaure, the sphinx and workers village, their historical background some facts and construction process is completed in a systematic manner.

The many facts and reasons behind the pyramid structure and whole construction phase, their shape is thought to represent the primordial mound from which the Egyptians believed the earth was created, the shape is thought to be representative of the descending rays of the sun and most pyramids were faced with polished and highly reflective white lime stone, in order to give them a brilliant appearance when viewed from a distance and are created in such a way that in spite of the enormous heat outside, the temperature inside the pyramids actually stays relatively constant, around 20 Celsius (60F).

Most historians and scientists agree that the pyramids were made as a monument for a deceased pharaoh. The pyramids would serve as the ruler's palace in the afterlife, so they were made with highly decorated rooms and passages filled with worldly possessions. The reason for this custom is mostly attributed to beliefs of the ancient Egyptians about the life after death (Cunningham & Reich 12). This paper provides a history and the evolution of the rituals and the customs of the ancient Egyptians regarding afterlife. Also, the history and the origins of the earliest pyramids could provide explanations for the pharaohs' obsession of building the grandest pyramids. The evolution of the

burial tombs will be discussed in the context with how pyramid building became a trend to the pharaohs.

PYRAMID SYMBOLISM:

Hieroglyph	Sign	Egyptian	English
	O24	myr	Pyramid
	O24	benben	Primeval Mound
	O24	benbent	Pyramidon

The shape of Egyptian pyramids is thought to represent the primordial mound from which the Egyptians believed the earth was created. The shape of a pyramid is also thought to be representative of the descending rays of the sun, and most pyramids were faced with polished, highly reflective white limestone, in order to give them a brilliant appearance when viewed from a distance. Pyramids were often also named in ways that referred to solar luminescence. For example, the formal name of the Bent Pyramid at Dahshur was The Southern *Shining Pyramid*, and that of Senusret II at El Lahun was Senusret Shines.

While it is generally agreed that pyramids were burial monuments, there is continued disagreement on the particular theological principles that might have given rise to them. One suggestion is that they were designed as a type of "resurrection machine.

The Egyptians believed the dark area of the night sky around which the stars appear to revolve was the physical gateway into the heavens. One of the narrow shafts that extend from the main burial chamber through the entire body of the Great Pyramid points directly towards the center of this part of the sky. This suggests the pyramid may have been designed to serve as a means to magically launch the deceased pharaoh's soul directly into the abode of the gods.

All Egyptian pyramids were built on the west bank of the Nile, which, as the site of the setting sun,

was associated with the realm of the dead in Egyptian mythology.

HISTORICAL PART OF PYRAMIDS

The design of Egyptian pyramids, especially the stepped designs of the oldest pyramids (Pyramid of Zoser at Saqqara, 2600 BCE), may have been an evolution from the ziggurats built in Mesopotamia, dated to as early as 4000–3500 BCE.

Preceded by assumed earlier sites in the Eastern Sahara, tumuli with megalithic monuments developed as early as 4700 BCE in the Saharan region of Niger.^[13] It is also possible that these megalithic monuments in the Saharan region of Niger and the Eastern Sahara may have served as antecedents for the mastabas and pyramids of ancient Egypt. During Predynastic Egypt, tumuli were present at various locations (e.g., Naqada, Helwan).

From the time of the Early Dynastic Period (c. 3150–2686 BCE), Egyptians with sufficient means were buried in bench-like structures known as mastabas. At Saqqara, Mastaba 3808, dating from the latter part of the 1st Dynasty, was discovered to contain a large, independently built step- pyramid-like structure enclosed within the outer palace facade mastaba. Archaeological remains and inscriptions suggest there may have been other similar structures dating to this period.

The first historically documented Egyptian pyramid is attributed by Egyptologists to the 3rd Dynasty pharaoh Djoser. Although Egyptologists often credit his vizier Imhotep as its architect, the dynastic Egyptians themselves, contemporaneously or in numerous later dynastic writings about the character, did not credit him with either designing Djoser's pyramid or the invention of stone architecture. The Pyramid of Djoser was first built as a square mastaba-like structure, which as a rule were known to otherwise be rectangular, and was expanded several times by way of a series of accretion layers, to produce the stepped pyramid structure we see today.^[18] Egyptologists believe this design served as a gigantic stairway by which the soul of the deceased pharaoh could ascend to the heavens.



Though other pyramids were attempted in the 3rd Dynasty after Djoser, it was the 4th Dynasty, transitioning from the step pyramid to true pyramid shape, which gave rise to the great pyramids of Meidum, Dahshur, and Giza. The last pharaoh of the 4th Dynasty, Shepseskaf, did not build a pyramid and beginning in the 5th Dynasty; for various reasons, the massive scale and precision of construction decreased significantly leaving these later pyramids smaller, less well-built, and often hastily constructed. By the end of the 6th Dynasty, pyramid building had largely ended and it was not until the Middle Kingdom that large pyramids were built again, though instead of stone, mud brick was the main construction material.

NUMBER AND LOCATION OF PYRAMIDS

In 1842, Karl Richard Lepsius produced the first modern list of pyramids—now known as the Lepsius list of pyramids—in which he counted 67. A great many more have since been discovered. At least 118 Egyptian pyramids have been identified.^[3] The location of Pyramid 29, which Lepsius called the "Headless Pyramid", was lost for a second time when the structure was buried by desert sands after Lepsius's survey. It was found again only during an archaeological dig conducted in 2008.

Many pyramids are in a poor state of preservation or buried by desert sands. If visible at all, they may appear as little more than mounds of rubble. As a consequence, archaeologists are continuing to identify and study previously unknown pyramid structures.

The most recent pyramid to be discovered was that of Sesheshet at Saqqara, mother of the Sixth Dynasty pharaoh Teti, announced on 11 November 2008.

All of Egypt's pyramids, except the small Third Dynasty pyramid at Zawyet el-Maiyitin, are sited on the

west bank of the Nile, and most are grouped together in a number of pyramid fields.

CONSTRUCTION TECHNIQUES

PYRAMID STONES ARE MAN MADE:-

- Lime stone in quarries are man made
- Chemicals and clay mixed with limestone to form a geopolymer lime stone and cement
- Mixture carried to pyramids in 50 pound baskets mixture put into forms
- Harden on site in less than 24 hours
- Davidovits has made this claim for more than 40 years this makes lifting 6 million tons possible

PYRAMID CONSTRUCTION EXPLAINED BY EGYPTOLOGISTS:-

- It took 200000 slaves to build the great pyramid they cut 2.5m perfectly shaped stones in the quarry
- Total weight of stones was 6 million tons
- They hauled them from the quarry to the pyramid they raised them up to each level of the pyramid

DISCOVERY OF LIME STONE CEMENT:-

- Egyptians
- Lechatlier was the first to identify chemicals in the vases and the pyramid stones, and to state they were man-made
- Davidovits was the first to make pyramid stones from the local lime stone as well as chemical binder that became a polymer, increasing the stones strength and longevity.
- These stones are identical to the pyramid stones

PROOF OF MAN-MADE STONES:-

- Science solves every problem.
- Experimentation
- Egyptian religion
- Hieroglyphic writing

METHODOLOGY OF EGYPTIAN PYRAMIDS:

Geological Knowledge of the Pyramid Plateau, hard limestone and soft limestone

The Figure displays a simplified cross-section of the Giza Pyramids Plateau. The Giza Plateau is an outcrop of the Middle Eocene Mokkatam Formation.

A second outcrop of the Upper Eocene Made Formation borders the Pyramids Plateau on the South-South West. A large sandy wadi separates the Mokkatam Formation from the Maadi Formation, created by the South-East dip of the Mokkatam Formation. The North side of the wadi, or the southern line of the Mokkatam Formation outcrop, and the South side of the wadi, or the northern line of the Maadi Formation outcrop, where both Formations dip into the wadi, was extensively quarried during the erection of the Giza pyramids.

Stone is the major building material of the ancient Egyptian pyramids, as many types are available within the country, particularly limestone. Pyramid cores were composed of low-quality; rough limestone, while alabaster and basalt were often used for interior floors. The outer casing of the pyramids was typically composed of fine white limestone. Limestone quarries existed near the sites of Saqqara, Giza and Dahshur. Alabaster, basalt and pink granite were typically used less, as they were brought from other locations in southern Egypt by river barge on the Nile.

Davidovits claims that during quarrying, at least as much stone is lost to damage as is useable, and he makes much of the fact that large quantities of damaged stone blocks have never been found in Egypt. He also notes that the above account speaks of the river being let into the area of the pyramid, which he says would have been done in order to soften limestone for aggregate.



Another theory of how the pyramids were built is that they were built by aliens from another planet using advanced technology or that aliens with advanced technology, working as consultants, helped the ancients with this technical feat. All I am going to say about this theory is that the fact that people have seriously considered it shows just how hard it is to imagine how the ancient Egyptians could have built such monumental structures of hewn stone.

At this point I believe that is time for a more detailed look at Davidovits' theory.

Davidovits believes that the stone blocks in the Great Pyramids are actually man made and to back up his claim he provides a workable theory and considerable evidence. Davidovits writes that the technology for making artificial stone is simple. He claims that most of the necessary ingredients are abundant in Egypt.

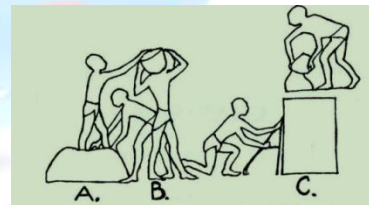
Davidovits says the aggregate consists largely of limestone which is abundant locally. Another major ingredient is water, which is plentiful in the Nile which is close by. Another ingredient is lime, which can be obtained by heating limestone. Davidovits informs us that a key ingredient of the binder is alumina, which he says is abundant in the Nile River mud. He tells us that another key binder ingredient is natron salt which he says is abundant in the desert and in salt lakes. He explains that natron reacts with lime and water to form caustic soda which he says is the main ingredient for making artificial stone. Davidovits writes that in ancient times the mines in the Sinai were rich in turquoise and chrysocolla (which are needed for the production of synthetic zeolites that are important binder ingredients) as well as the arsenic minerals of olivenite and scorodite which are needed to produce rapid hydraulic setting in large concrete blocks. He claims that the ancient Egyptians are known to have used these same minerals in other processes. Davidovits writes that Egyptologists are well aware that vast quantities of turquoise and chrysocolla were removed from the Sinai mines, but they cannot account for what happened to them.



Davidovits also writes that the ancient Egyptians are known to have made artificial stone. He says that a French chemist by the name of Henry le Chatelier (1850-1935) made this discovery in the early 1900s while studying enameled Egyptian funerary statuettes from the Thinite epoch. (c. 3000 B.C.E) le Chatelier examined

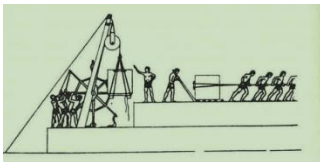
the statuettes using newly developed micrographic techniques, glass slides, thin section analysis, and photography in combination with the microscope, and was astonished to find that what had been previously thought to be natural sandstone was in fact man made artificial stone.

One problem with Davidovits' theory is that although it solves the technical and engineering problems of quarrying and transporting large blocks of stone, there is still the fact that a tremendous amount of rock would have to be crushed into gravel size aggregate. In a modern quarry, explosives along with large amounts of electricity and huge machines are used to do this. Davidovits solves this problem by saying that the limestone at Giza becomes soft when it gets wet. He says canals were dug from the Nile to the limestone deposits and in flood season water was diverted through these canals to flood the limestone and soften it so it could be scraped up with a hoe and used for aggregate. If it is true that the local limestone does indeed become soft when it gets wet, this would solve the aggregate problem, but frankly, I would like to see some proof that this is in fact the case.



Davidovits claims to have found wood grain imprints on a stone sample taken from a protected area in a passage inside the Great Pyramid, which he says is evidence that the stone is in fact concrete which was poured into a wooden mold. He says that the upper several inches in each stone block is spongy and of inferior quality as compared to the rest of the block. He says that this is caused by the water in the forms rising to the top while the aggregate and binder settled to the bottom. He writes that limestone contains fossil shells and that in natural limestone these shells are found laying flat, but in the pyramid stone, the shells are all jumbled, which he says is due to the aggregate being dumped into the mold. Davidovits writes that natural limestone does not contain air bubbles, but that the pyramid stones do. He explains that natural limestone

contains horizontal layers, but that pyramid stones do not, but that some of the larger blocks have wavy lines similar to those which are sometimes found in modern concrete and are known as lift lines. He says that lift lines are caused when a pour is interrupted and later finished, as when a crew quits for the day and finishes the pour the next morning. Davidovits tells us that a research team using sophisticated equipment found that the pyramid stone in the Great Pyramid is twenty percent less dense than the surrounding bedrock. He says this is typical of manmade geopolymeric stone, and is caused by air bubbles. Davidovits writes that the pyramid stone has a very high moisture content, while the local bedrock is relatively dry. He says that concrete buildings have a high moisture content, and he speculates that blocks in the pyramid, which were soon covered with other blocks, never fully dried. Davidovits relates that he took photographs of a section of a pyramid which contained about two thousand visible stone blocks. He then made slides from the photographs and compared the lengths of the stones, and found that among the two thousand blocks there were only ten uniform lengths, which he says is evidence that they were cast in place with reusable molds. He believes that had the blocks been quarried whole, they would not be of such uniform lengths. He also mentions the paper thin layer of mortar between the pyramid blocks, which he says would be too thin to hold one block to another. He goes on to explain that these paper thin layers of mortar, are a byproduct of geopolymerization, that form when there is excess water in the slurry; the weight of the aggregate squeezes watery cement to the surface where it sets to form a skin.



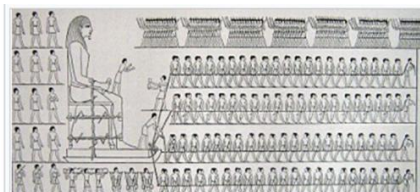
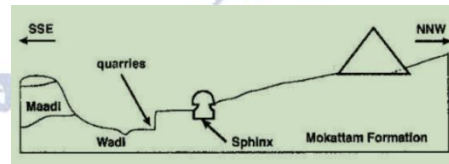
From the time of the building of the Pyramid of Zoser (the first pyramid) to the building of the Great Pyramid of Khufu at Giza, which was the largest pyramid ever built, was only about a hundred years, and within another hundred years, pyramid building had gone into decline. Why this decline happened has long been a mystery, but Davidovits claims to have the answer: he says that pyramid building went into decline because

some of the necessary minerals for making artificial stone, which had been mined in the Sinai, were exhausted.



Another point which Davidovits makes is that when the Ancient Egyptians did not yet have hard metals they built huge pyramids containing millions of perfectly shaped blocks of fairly hard limestone, but once they had hard bronze and iron, they quit using limestone, and almost exclusively used very soft sandstone. If we believe that the stone blocks for the Great Pyramids were quarried whole, this doesn't make much sense; but if we believe Davidovits' theory, it makes perfect sense.

Most Egyptologists, and archaeologists do not accept Dr. Davidovits' theory, although in recent years his idea has started to gain some traction, and a few other people working in the field have come out with similar theories.



CONCLUSION

Religious figures. The dedication of craftsmanship and accuracy hoped powerful leaders and gods continue their journey through life. In modern day, the formation and symbolism helps uncover hidden mysteries that lies deep below the ancient world. Through all the components, society is piecing together. We are continuously driven to gain and search for more information about this particular ancient world.

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