



Mechanical Engineering in Ancient Egypt, Part 92: Tomb Inscription During the Old Kingdom

Galal Ali Hassaan

Emeritus Professor, Faculty of Engineering, Cairo University, Egypt

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Abstract

This work is based on a previously published hypothesis which proposed that the solid matter of the universe can be represented as a vibrational wave of energy propagating over an ether or matrix through a mechanism that scrambles the degree of duality in matter: x% localized (solid), y% delocalized (wave). The main purpose of this paper is to present a two-dimensional approximation of the three-dimensional structure of the shape of the energy distribution of an atomic orbital to propose a mechanism through which the orbital can be transported as a vibration from a point A to point B in the matrix. This process requires cycles or oscillations of mounting-dismounting-remounting in which what travels from point A to point B is the energy forming the orbital and not the solid matter that it can form. The atomic seven-dimensional f orbital of hydrogen-like atoms is used as a model to show an analogy to the transformations that it can be submitted to when transported over the matrix.

Keywords: Mechanical engineering history; Ancient Egypt; Tomb inscription; Old kingdom of Egypt.

1. Introduction

Inscription of the ancient Egyptian tombs is one of the mysteries of their civilization that everybody is wondering how they could generate such wonderful scenes and reliefs in rock-cut tombs and mastabas. They inscribed their tombs and mastabas as one of the too many means they used to authorize their history and acquaint the coming generations with their achievements and their believes [1-12]. This work is a continuation of the series of research papers aiming at exploring the development of mechanical engineering in ancient Egypt focusing on the inscription of tombs during the Old Kingdom.

Fischer [13], in his paper about two Old Kingdom inscriptions restored investigated in details some inscriptions in the tomb of Miy during the reign of King Phiopts II (probably Pepi II) of the 6th Dynasty. He analyzed also the inscriptions on a massive false door from a mastaba at Saqqara located in the Egyptian Museum at Cairo [13]. Manuelian [14], in his study of the papyrus documents in tomb scenes of the Old Kingdom presented relief from the tomb of Merib at Giza for an Official presenting a papyrus document. He presented also a line drawing for a scene in the tomb of Kaninisut (High State Official from the 4th Dynasty) for an office of Scribes writing on papyri. He presented reliefs from the tombs of Meresankh III, Khufu-khaf I and Khafre-anekh [14]. Altenmulter [15] in his study of funerary boats and boat bits of the Old Kingdom presented boat-based scenes from the tombs of Seneb (High Ranking Court Official from the 4th Dynasty), Fetekty and Kakhent (Prince from the 4th Dynasty) [15]. Kanawaty [16], in his study of the decoration of burial chambers in the Old Kingdom presented scenes for musicians in the burial chambers of Kaemankh (from the 4th or 5th Dynasty), food supplies scene from the tomb of Remni. He announced that until late 5th Dynasty, reign of Djedcare Isesi, walls of burial chambers were bare of any decoration [16].

Dawood [17], in his study of animate decoration and burial chambers of private tombs during the Old Kingdom presented four scenes from the tomb of Kairer including: scene for boats, ducks and trees, scene for the owner fowling in the marsh, scene for the owner sitting behind an offering table with text written in bounded columns and a scene for food offerings [17]. Garcia [18], in his paper about new inscription from Giza presented the inscription on a limestone panel belonging to a false door in the tomb of Nfr and Ftj-sn at Giza. He presented a relief on the false door of the owner showing the owner and his wife sitting on chairs with an offering table between them [18]. Karmysheva and Malykh [19], in their paper about lepsiis tombs in Giza Necropolis presented line diagrams from Tomb 11 of Tjenty I including inscription on its Western Wall, scene for the owner on the Northern Wall, scene for the owner and his wife on the Eastern Wall. He handled also the inscriptions of Tomb 12 belonging to Tjenty II [19]. Hsu [20], in his paper about the development of ancient Egyptian Royal inscriptions examined the development of

ancient Egyptian Royal inscriptions from the Old Kingdom to the 18th Dynasty. He studied the Royal labels, annals, decrees and orders, Konigsnovellen, self-praise and biographics [20].

Chauvet [21], in her paper about tomb inscriptions as a source of historical information stated that the inscriptions from private tombs constitute the largest body of textual sources available for the study of the Old Kingdom. She presented a photo for two columns in Tomb CG1432 (Tomb of Kaemfofret) [21]. Ezz [22], in her paper about animal motherhood scenes in the private tombs in ancient Egypt outlined that most of such scenes appeared in the tombs of Saqqara and Giza during the Old Kingdom. She presented scenes from mastaba of Axt Hri from the 5th Dynasty, mastaba of Ni Anx Xum from 5th Dynasty and scene from the tomb of Anti from the 5th Dynasty [22]. Bruke [23], in his thesis about the application of statistical analysis to dating Old Kingdom Memphite Tombs showed that his study indicated that using cluster analysis had some validity in dating tombs. He used 113 Memphite examples showing tomb owner seated before an offering table [23]. Mahran and Kamal [24], in their paper about physical disability in Old Kingdom tomb scenes studied the representation modes related to physical disability in Old Kingdom tomb scenes. They presented a relief for dwarfs working in Goldsmiths from Mereruka's tomb at Saqqara (6th Dynasty). They presented a relief from Ptahhotep's tomb (5th Dynasty), relief from Ihy and Idut's tomb (5th/6th Dynasties), a scene from Iymer's tomb (5th Dynasty), relief from Nikauises's tomb (5th Dynasty), scene from Ti's tomb (5th Dynasty), scene from Nykahem's tomb and other scenes [24].

Beck and Mehr [25], in his book chapter about the mastaba of Hetepherakhty of the 5th Dynasty presented nicely prepared relief from the mastaba chapel of Hetepherakhty, a decoration relief in the mastaba for a man holding a long staff in his right hand and a bird in his left hand, a scene from the mastaba including trees, animals, birds and hunting men [25]. Flentye [26], in his article about art and archaeology of the Giza plateau declared that the use of nummulitic limestone at Giza for reliefs in the 5th and 6th Dynasties necessitated the use of plaster. He presented a boats scene from the mastaba of Nesutnefer from Early 5th Dynasty and a fowling scene from the mastaba of Senedjemib Inti, Vizier during the 5th Dynasty [26]. Soleiman and Atef [27], studied the scenes of the procession of linen bearers carrying straps in both hands in the private tombs of the Old Kingdom. They presented a scene from Neber's tomb, Akhthetep's tomb from the 5th Dynasty, colored scene from Ptahshepses's tomb from the 5th Dynasty, colored scene from Kagemni's tomb from the 6th Dynasty, scene from Mereruka's tomb from the Dynasty, relief in Nikauisesi's tomb from the 6th Dynasty, scene in Ankhmahor's tomb from the 6th Dynasty and a relief in Tetiankh's tomb from the 6th Dynasty [27]. Thaualt [28] in his study about some remarks on the dating of 12 Old Kingdom tombs at Giza presented a colored scene in Merib's mastaba from the 4th Dynasty, relief on Senuhem's false door from the 4th Dynasty, scenes for offering tables in Seshemnefer I from the 4th/5th Dynasties, scene for an offering table in Kapunesut Kai from the 4th Dynasty, hieroglyphic inscription in Kanynnesut's mastaba from the 4th Dynasty [28]. Soleiman and Atef [29], in their study of the offering table scene with an empty chair in the burial chamber of Ptahshepses at Saqqara stated that the walls of the burial chamber of the owner were cased with fine limestone slabs covered with thin layer of plaster and decorated with colored scenes and inscriptions. They presented scenes from the burial chambers of Ptahshepses and Ankhmahor [29].

2. Inscription of Third Dynasty Tombs

The Third Dynasty, the first dynasty of the Old Kingdom of ancient Egypt covered a timeline from 2686 to 2613 BC and ruled by five Kings [30]. Evidences indicate that the ancient Egyptians practiced the inscription of some of their tombs during this dynasty. Here are two examples:

- The first example is a relief on a wooden pained from the tomb of Hest-Ra, the 'Great Dentist' during Early Third Dynasty, 2600 BC in display in the Egyptian Museum at Cairo and shown in Fig.1 [31]. The relief depicts the tomb owner seated in front of an offering table, holding his long staff in his left hand and his titles are inscribed in front of his face above the table.
- The second example is a relief from the tomb of Aa-Akhtu, 'Governor' and 'Chief Architect of the King' during Late Third Dynasty in display in the Louvre Museum at Paris and shown in Fig.2 [32]. The relief depicts the tomb owner striding and holding a long staff in his left hand and a sekhem scepter in his right hand. A hieroglyphic script was inscribed in bounded vertical columns and one un-bounded horizontal row below the text-columns.

Figure-1. Relief of Hesy-Ra from Early 3rd Dynasty [31]



Figure-2. Relief of Aa-Akhti from Late 3rd Dynasty [32]



3. Inscription of Fourth Dynasty Tombs

The Fourth Dynasty of the Old Kingdom of ancient Egypt covered a timeline from 2613 to 2494 BC and ruled by six Kings [33]. Evidences indicate that the ancient Egyptians practiced the inscription of Royal and Noble tombs during this dynasty. Here are some examples:

- The first example is a duck hunting relief from the tomb of Itet, Wife of Vizier Nefer-Maat, Elder son of Sneferu, the Founder of the 4th Dynasty, 2613-2589 BC and shown in Fig.3 [34]. The scene depicts two hunters using a net to hunt ducks from a marsh. The event was documented using a hieroglyphic text above the two men.

Figure-3. Relief in the tomb of Itet from Early 4th Dynasty [34]



- The second example is a colored scene in the tomb of Queen Meresankh III, Great Royal Wife of Khafre, the 4th King of the 4th Dynasty, 2558-2532 BC and daughter of Prince Kawab, the Elder Son of Khufu, the 2nd King of the 4th Dynasty, 2589-2566 BC shown in Fig.4 [35]. The image in Fig.4 is a very rich and intensive one combining many activities of the ancient Egyptians in one highly professionally produced graph. First of all it depicts Price Kawab striding and holding a long staff in his right hand and a U-symbol in his left hand. Behind him a boat carrying Queen Meresankh III and one of her relatives watching a great band of papyrus. In front of the boat, there are two scenes: the top one is a procession of 13 porters and the bottom one is a team of five hunters pulling a great net full of birds hunted from a marsh. Under this group of activities, there a team of five men herding animals and birds. In the bottom, a scene comprising three boats and cattle herding scene with different level of supervision.

Figure-4. Scene in the tomb of Meresankh III from the 4th Dynasty [35]



- The third example is a relief in the tomb of Senenuka, reign of King Khafre, 2558-2532 BC in display in the Museum of Fine Arts at Boston and shown in Fig.5 [36]. The relief depicts the tomb owner seated before an offering table while some workers are showing some works. The matter was described by a hieroglyphic inscription in two horizontal rows and one column behind the owner.

Figure-5. Relief in the tomb of Senenuka from the 4th Dynasty [36]



- The fourth example is a relief for Princess Meretites III, from the reign of King Khufu of the 4th Dynasty, 2551-2465 BC in display in the Museum of Fine Arts and shown in Fig.6 [37]. The relief was badly destroyed that it is not clear what the Princess was doing in this image. Above her an inscription including the Cartouche of the King or the Princess herself. A Serekh and hieroglyphic text fills the area above the Princess's head.
- The fifth example is a scene from the mastaba of Kaninisut, High State Official during the 4th Dynasty, 2500 BC shown in Fig.7 [38]. The scene depicts the owner striding towards three registers of labors in work while holding a long staff in his left hand and a sekhem scepter in his right hand.
- The sixth example is a relief for Hetjes on the false door of Seneb, High-ranking Court Official during the 4th Dynasty, 2520 BC shown in Fig.8 [39].

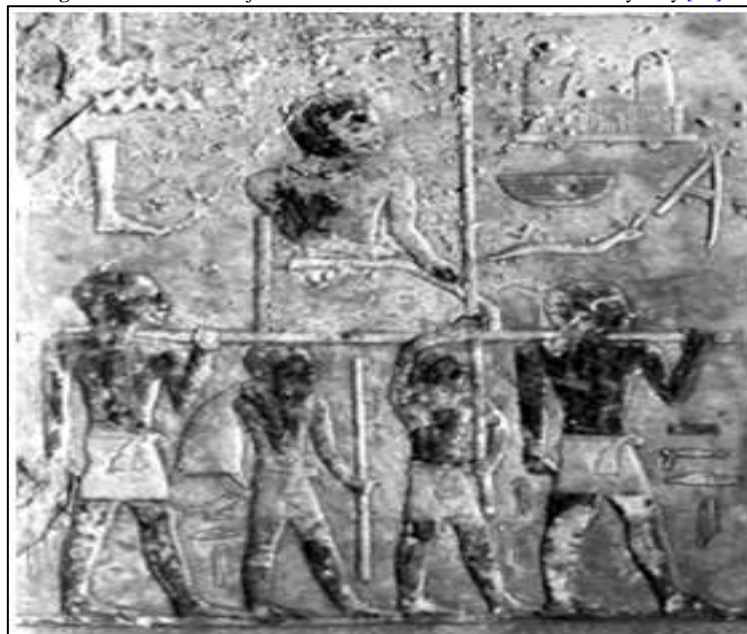
Figure-6. Relief for Princess Meretites III from the 4th Dynasty [37]



Figure-7. Mastaba' scene for Kaninisut from the 4th Dynasty [38]



Figure-8. Relief for Hetjes on the false door of Seneb from the 4th Dynasty [39]



4. Inscription of Fifth Dynasty Tombs

The Fifth Dynasty of the Old Kingdom of ancient Egypt covered a timeline from 2494 BC to 2345 BC (probably) and ruled by nine Kings [40]. Evidences indicate that the ancient Egyptians continued to practice the inscription of their Royal and Noble tombs during this dynasty. Here are some examples:

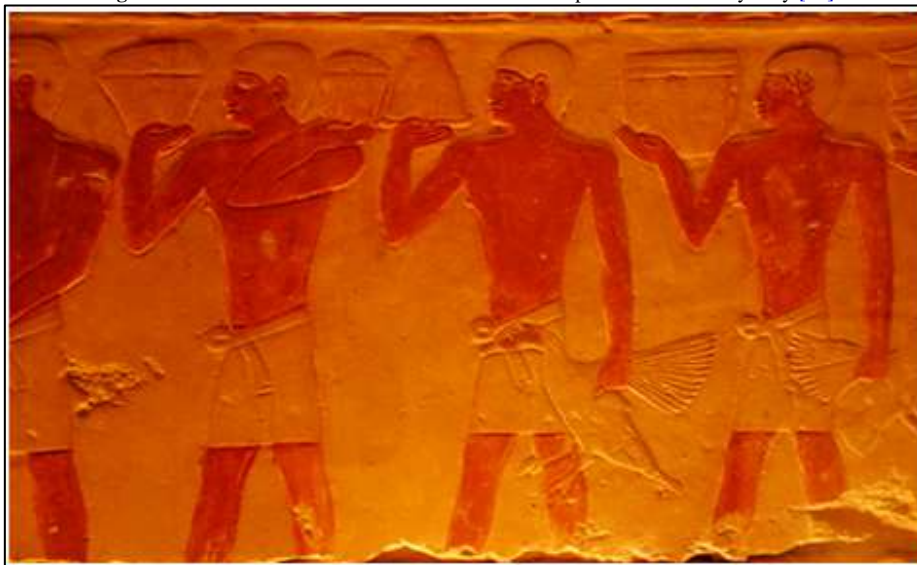
- The first example is a colored scene in the tomb of Khewi, Senior Official from the 5th Dynasty, 2494-2345 BC shown in Fig.9 [41]. The scene depicts the owner seated on a chair before an offering table with too other offerings around him with describing hieroglyphic text above him inscribed in four bounded columns. The whole surfaces around the owner were decorated with wonderful scenes of various colors that could sustain for 4000 years without deterioration.

Figure-9. Colored scene in Khewi tomb from the 5th Dynasty [41]



- The second example is a procession relief in the Mastaba of Sekhemankptah, Overseer of the Royal Works during the 5th Dynasty, 2465-2323 BC shown in Fig.10 [42]. The bearers wear a unified uniform and carry offerings by both hands and stride in a queue.

Figure-10. Colored relief in the Mastaba of Sekhemankptah from the 5th Dynasty [42]



- The third example is a metalworking relief in the mastaba of Niankhkhnum and Khnumhotep (brothers), Overseers of the Manicurists of the Palace of Nyuserre, the 6th King of the 5th Dynasty, 2445-2421 BC shown in Fig.11 [43]. The relief depicts two metalworking men in work. One of them is blowing air into the oven using a tube with special fire resisting material and the other is holding the metallic object in the oven. Hieroglyphic inscription above them is authorizing the process.
- The fourth example is a relief in tomb of Wahtye, High Priest during the reign of Neferirkare, the 4th King of the 5th Dynasty, 2448-2445 BC shown in Fig.12 [44]. The relief depicts the tomb owner and his wife seated in front of an offering table with all their offerings registered above them and a hieroglyphic text inscribed in two columns bounding the relief.

Fig-11. Relief in the Mastaba of Niankhkhnum and khnumhotep from the 5th Dynasty [43]



Fig-12. Relief in the tomb of Wahtye form the 5th Dynasty [44]



- The fifth example is a colored relief from the tomb of Singer Kahai and Priestess Meritetes from the reign of King Niussyre of the 5th Dynasty, 2445-2421 BC, shown in Fig.13 [45]. The relief depicts the tomb owner and his wife standing and looking to each other. The Artist succeeded to reflect the feeling of the married couple towards each other. The wife is putting her right hand on his left shoulder. Their story was inscribed inside a frame surrounding the scene from three directions.

Figure-13. Colored relief in the tomb of Kahai and Meritetes from the 5th Dynasty [45]



- The sixth example is a colored relief in the tomb of Nefer, Supervisor of Artisans during the reign of King Niuserre of the 5th Dynasty, 2445-2421 BC, shown in Fig.14 [46]. The relief depicts the supervisor striding and holding a long staff in his right hand and a Sekhem Scepter in his left hand while looking forward to workers operating under his supervision. The matter is register in a hieroglyphic text inscribed in a bounded column in front of him.
- The seventh example is a scene in the tomb of Senedjemib Inti, Vizier during the reign of Djedkare Isesi, 8th King of the 5th Dynasty, 2414-2395 BC shown in Fig.15 [47]. The relief depicts the Vizier striding while holding a long staff in his right hand and his Wife Tjefi catching his left hand by her left hand and putting her right hand on his right shoulder. The pose indicates the great sympathy and love of the Egyptian woman to her husband.

Figure-14. Colored relief in the tomb of Nefer from the the 5th Dynasty [46]



Figure-15. Relief in the tomb of Senedjemib Inti from 5th Dynasty [47]



- The eighth example is a scene in the tomb of Senedjemib Mehi, Vizier during the reign of King Djedkare Isesi of the 5th Dynasty, 2414-2395 BC shown in Fig.16 [48]. The relief depicts the Vizier striding while

holding a long staff in his left hand and a Sekhem Scepter in his right hand. He is followed by his wife putting her left hand on her chest and wearing a diadem of the same design as her husband's diadem. Their three children are shown striding with them. Everyone in the relief is identified by a hieroglyphic text in front of him for the Vizier and his wife or above his head for the children.

- The ninth example is tomb chapel of Hetepherakhety, Judge and of Ma'at during the 5th Dynasty, 2400 BC in display in the National Museum of Antiquities in Leiden since 1902 and shown in Fig.17 [49].

Fig-16. Relief in the tomb of Senedjemib Mehi from the 5th Dynasty [48]



Fig-17. Relief in the tomb of Hetepherakhety from the 5th Dynasty [49]



What is frustrating is that tomb-chapel was sold in Cairo for only 200 LE and arrive to Leiden in 1902 where it was donated to the Museum! The relief on the chapel depicts the owner striding and holding a long staff in his left hand. The whole are is covered by a hieroglyphic text carved in columns except the top block carved in bounded rows.

- The tenth example is a text inscription in the Pyramid of Unas, the 9th King of the 5th Dynasty, 2375-2345 BC shown in Fig.18 [50]. The hieroglyphic inscriptions are carved in uniform bounded columns including the Cartouche of the King in a number of columns.

Figure-18. Hieroglyphic inscriptions in the Pyramid of Unas from the 5th Dynasty [50]

5. Inscription of Sixth Dynasty Tombs

The Sixth Dynasty of the Old Kingdom of ancient Egypt covered a timeline from 2345 BC to 2181 BC and ruled by seven Kings [51]. Evidences indicate that the ancient Egyptians continued to practice the inscription of their Royal and Noble tombs during this dynasty. Here are some examples:

- The first example is a colored relief in the tomb of Merefnebef, Vizier during the reign of Usercare, the 2nd King of the 5th Dynasty, 2333-2331 BC shown in Fig.19 [52]. The relief depicts a procession of three bearers carrying offerings in a very productive and efficient way. The first bearer (in the right side of the relief) is supporting two large baskets on both shoulders using both hands and a hanged basket on each elbow joint. The second bearer is supporting a large basket on his left shoulder using his left hand, carrying a duck on his right forearm and a band of flowered plant on his right elbow joint. The third bearer is carrying a large basket on his left shoulder supported by his left hand, a bird in his right hand and a hanged basket on his left elbow joint. This relief design reflects the high productivity of the ancient Egyptian bearers.
- The second example is a colored relief from the mastaba of Mereruka, Vizier during the reign of Teti, the Founder King of the 6th Dynasty, 2345-2332 BC and shown in Fig.20 [53]. The relief depicts porters transmitting six large vessels, each three vessels housed in a stand on a sledge. The sledge was pulled by a rope through three men while a fourth man supporting the first vessel not to fall down due to an even pulling of the rope.
- The third example is a colored scene in the tomb of Ny-Ankh-Nefertem, Overseer of the King's Repast and Priest of the Pyramid of King Teti of the 6th Dynasty, 2345-2332 BC shown in Fig.21 [54]. The relief depicts the owner seated before an offering table with too many offerings around the table and a hieroglyphic script above the owner's head describing the matter.
- The fourth example is a colored relief in the tomb of Watek-Hethor, Wife of Vizier Mereruka and daughter of King Teti of the 6th Dynasty, 2345-2333 BC shown in Fig.22 [55]. The relief depicts 28 fishing men pulling a huge fishing net with a supervisor in the middle directing the fishing operation.
- The fifth example is a colored relief in the tomb of Mehu, Vizier and Chief Justice during the reign of King Teti of the 6th Dynasty, 2345-2333 BC shown in Fig.23 [56]. The relief depicts the Vizier seated before his offering table, putting his right hand on it and holding a symbol by his left hand.
- The sixth example is a relief in the tomb of Harkhuf, Governor of Upper Egypt during the reign of Kings Merenre I (2287-2278 BC) and Pepi II (2278-2184 BC) of the 6th Dynasty shown in Fig.24 [57]. The relief depicts the tomb owner striding and holding a long staff in his right hand and a sekhem scepter in his left hand. Un-bounded hieroglyphic texts are inscribed above and in front of him in columns.

Figure-19. Colored relief in the tomb of Merefnebef from the 6th Dynasty [52]



Figure-20. Colored relief in the mastaba of Mereruka from the 6th Dynasty [53]



Figure-21. Colored relief in the tomb of Ny-Ankh-Nefertem from the 6th Dynasty [54]



Figure-22. Relief in the tomb of Watetk-Hethor from the 6th Dynasty [55]

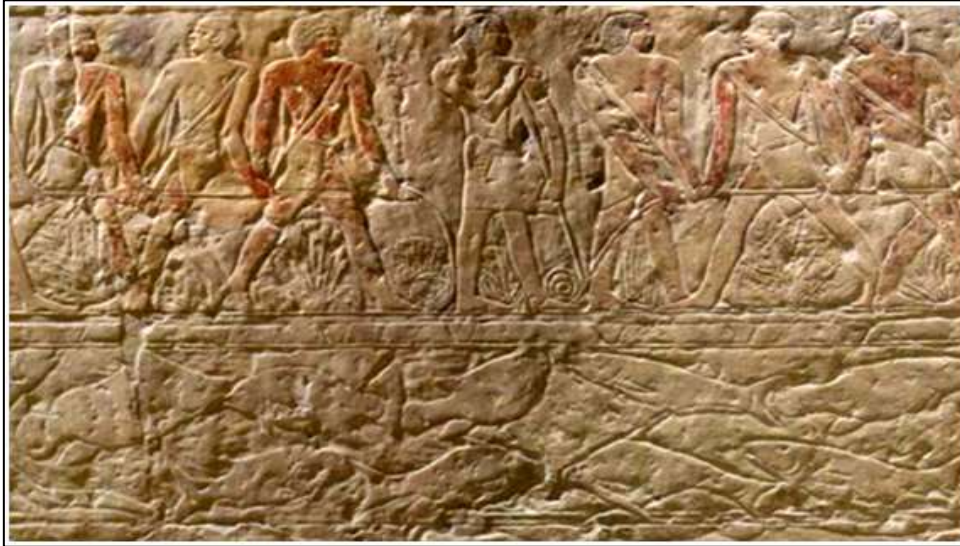


Figure-23. Colored relief in the tomb of Mehu from the 6th Dynasty [56]



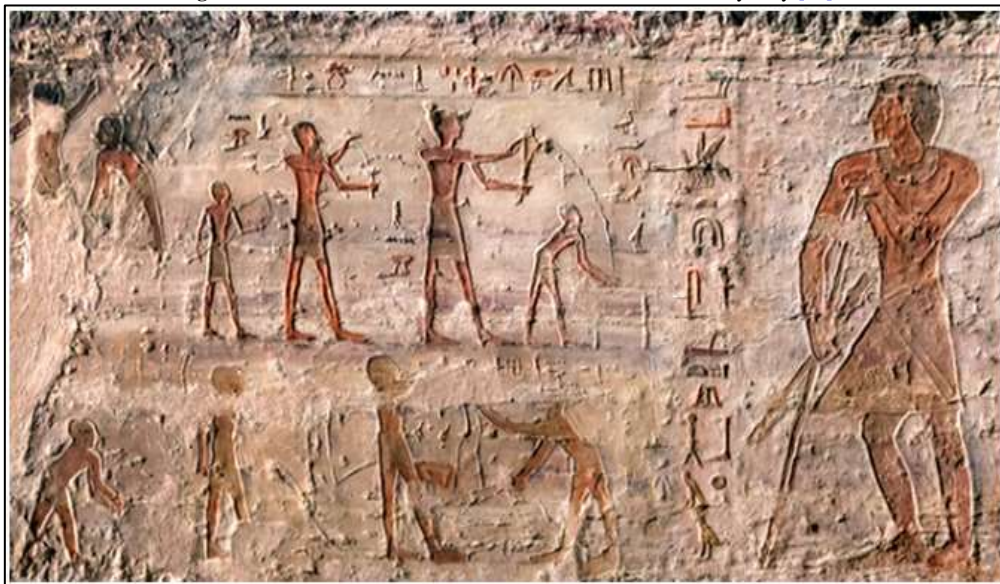
- The seventh example is a relief in the tomb of Hau-Nefer, High Priest in the Funerary Temple of Pepi I, the 3rd King of the 6th Dynasty, 2331-2287 BC shown in Fig.25 [58]. The relief depicts the owner and his wife striding while she is putting her left hand on his left shoulder and a hieroglyphic text was inscribed in a bounded row above them and in an un-bounded column in front of his face.

Figure-24. Relief in the tomb of Harkhuf from the 6th Dynasty [57]



Figure-25. Relief in the tomb of Hau-Nefer from the 6th Dynasty [58]

- The eighth example is an agricultural and sailing in the marshes relief in the tomb of Mekhu and Sabni, father and his son worked as Nomarchs during the reign of Pepi II, 5th King of the 6th Dynasty, 2278-2184 BC shown in Fig.26 [59]. The relief depicts Nomarch Mekhu supervising works in the field and in the marsh and holding a long staff using his both hands. The activities were described using the hieroglyphic script inscribed in an un-bounded row and un-bounded column and beside the different working figures as modern-days-labeling.

Figure-26. Relief in the tomb of Mekhu and Sabni from the 6th Dynasty [59]

6. Conclusion

- The development of mechanical engineering in ancient Egypt was investigated in this work through studying the inscription of the tombs of the Old Kingdom.
- The research procedure was to study the tomb inscriptions in each of the four dynasties of the Old Kingdom.
- Two examples were presented from the Third Dynasty: One of them was carved on a wooden panel for the Great Dentist, 'Hesy Ra' and the other carved on a tomb wall for the Overseer 'Aa-Akhtu'. Both reliefs depicted the tomb owner holding a long staff and a hieroglyphic text authorizing their activities.
- Six examples were presented from the Fourth Dynasty including two colored scenes.
- Ten examples were presented from the Fifth Dynasty including six colored scenes.
- Eight examples were presented from the Sixth Dynasty including seven colored scenes.
- Wonderful colored reliefs were designed and implemented in the tombs of the 5th and 6th Dynasties.
- Most scenes and reliefs were supported by hieroglyphic text authorizing the activities supervised by the tomb owner.
- Some of the reliefs incorporating different activities and many operating staff were labeled using the hieroglyphic script in a way similar the modern days presentation techniques.

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