

The Astronomical Orientation of the Seven Minor Step Pyramids

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Abstract

The seven minor step pyramids are a group of small step pyramids, similar to the pyramids of the third dynasty, which are consisted of accretion layers, they were appeared as a several Mastabas above each other, all of them are smaller than the great giant pyramid of Djoser, but they are took the form of the step pyramids, but without funerary complex or surrounded walls suggested that these pyramids dates back to the 3rd dynasty, but without strong evidence confirming that. This research is clearing the orientation of the seven minor step pyramids to the four main cardinal points, also their alignment with the river Nile, their related to natural phenomenon and the relation with constellations as attempt to solve the enigma of this group.

Keywords: The Minor step pyramids, The orientation, The Pyramids and Astronomy, Hypothesis, Meskhetyu, Constellations, Seila, Hebnu, Sinki, Nbut, El-Kûla, Gheonimiya, Elephantine.

Introduction

The seven minor step pyramids: is a group of small step pyramids, similar to the pyramids of the third dynasty, which are consisted of accretion layers, they were appeared as a several Mastabas above each other, all of them are smaller than the great giant pyramid of Djoser, but they are took the form of the step pyramids, but without funerary complex or surrounded walls suggested that these pyramids dates back to the 3rd dynasty, but without strong evidence confirming that. Except the pyramid of Seila which existed in El-Faiyum and the pyramid which existed on Elephantine island, the first dates back to the reign of king Snefru, the first king of the fourth dynasty. Although the name of this king was found on the fragments close to this pyramid, some of archeologists considered this is not an evidence confirms the date of these pyramids. The name of king Huni was found on the cone bearing the name of this king close to the pyramid of Elephantine. These pyramids are extended in Egypt from the North to the South or the opposite, where the pyramid which in El-Faiyum named Seila pyramid in the north, till Aswan south of Egypt where the pyramid of Elephantine.

This group named the seven minor step pyramids, they are named as the following, Seila pyramid in El Faiyum, Hebnu in El-Minia, Sinki in Abydos, Nbut at Naqada, both of El-Gheonimiya and El-Kula are in Edfu, the last pyramid in Aswan is on the Elephantine island, Each pyramid in this group has a special orientation and aligned the river Nile. some of them oriented to the four main cardinal points and the others not, also each one of them follow a star or constellation in the sky, this research will discuss in details.

I- The Pyramids and the Astronomy.

The astronomy is different from the astrology because it depends on accurate measurements but the astrology depends on the magic and spells¹. Actually, the role of the stars disappeared because they could not be seen by naked eyes due to the light and the pollution. The ancient Egyptians were observing them by naked eye during the 4th dynasty and were orienting the pyramids of Giza to the four main cardinal points by observing the stars. Some of these stars were mentioned in the ancient Egyptians texts like the stars *Sah* (it is part of Orion as a head at the Belt) and the brightest star *sopdet* (It is Sirius now). It is obvious that the 4th Dynasty pyramids have a connection with the stars, especially the imperishable stars or Sirius and Orion².

The ancient Egyptians saw that there was similarity between the sky and the land in Giza region that the sky is original and the land is a copy, the galaxy of milky way in the sky is the original while the river Nile in the land is a copy and the stars widespread in the sky and the pyramids of Giza were copies on the land but the most wonderful that the three stars of Orion exactly were identical with the three famous pyramids of Giza³.

For example: the pyramid of Menkaure wasn't constructed near the Nile although this would save the time and efforts. The reason was the idea of the sky was the original and the land was a copy, so the pyramid was constructed according to its place in the sky and it was orienting to the smaller and less brightness star in the Orion group⁴.

The Great Pyramid of Khufu at the land of Giza was a copy of Alnitak, the pyramid of Khafre was the copy of Alnilam and the less brightness was Mintak represented by the smaller pyramid on the three famous pyramids of Giza with the same order in stars in milky way in the sky and the pyramids in the land of Giza (fig.1). Also the unfinished pyramid of Zawiyat Alariyan represented in the land the Gamma star in the sky, the stars kappa is the pyramid of Abu Rawash, the star Tori was the bent pyramid and Aldebran star was the red pyramid of Snefru, these pyramids belonged to the 4th dynasty⁵.

It is known that pyramids of the Old kingdom were established as tombs for the king. They oriented with accurately towards the cardinal points especially at the great pyramid of Khufu. But there is not any information about the method of orientation in this period, Nowadays there is no texts related with this subject. The stellar method was used in this time was accepted nowadays, and

خزعل الماجدى، الدين المصرى القديم، عمان، دار الشروق، ١٩٩٩، ص ٢٧٢-١

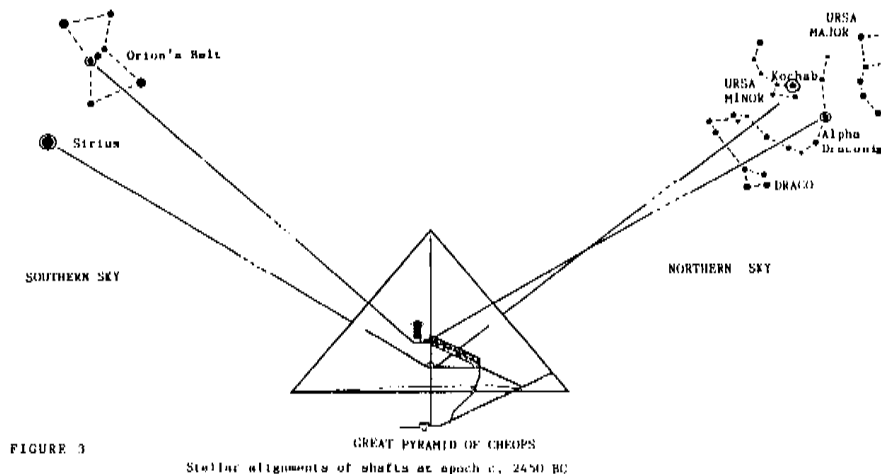
² Giulio Magli and, Juan, Antonio Belmonte, "Pyramids and stars facts, conjectures and starry tales", in *In Search of Cosmic Order, Selected Essays on Egyptian Archaeoastronomy*, Cairo, 2009, p. 305-306.

³ -Boutros, Antoine, *The Mystery of the Great Pyramid*, London and Beirut, 1998, p.61

⁴ - Magli and Belmonte, *Pyramids and Stars facts*, p.313-315.

⁵ -Boutros, Antoine, *The Mystery of the Great Pyramid*, p.89.

the recent research revived the possibility of solar alignment¹. It is possible to know the date of building the great pyramid by using astronomical calculations and it must have been back to (2425-2475 B.C), not only for the monument orientations².



(fig.1) The orientation of air shaft with stars

after the Great Pyramid and the Astronomy, Baval, 1993

II- The Orientations in Ancient Egypt

The ancient Egyptians determined the north to fix the four cardinal points by using the natural landscape, and it had relation with the Nile in the daytime sun and at night the stars movements, where the Nile starts from the south to the north and they thought that the life started from there, the right of the side was the west bank of the Nile, it was related with the darkness of the sunset, the left side related with the brightness of the sun rise, it metaphor that the death in the west bank and the life east bank of the river Nile, it means they had chosen the locations of the pyramids and temples according to religious beliefs³.

II.1- The Orientations Hypothesis

From the observations of the circumpolar stars in the north, Petrie suggested that they determined a star near by the celestial pole and erected vertical column and someone from south observed the stars from the east and the west. Edwards suggested building observation wall to determine the stars shadow.

¹ -Spence , Kate, *Ancient Egyptian Chronology and the Astronomical Orientation of Pyramids*, Macmillan Magazines ,Vol 408,2000, p.320.

² - Bauval, Rebort, *Discussions in Egyptology Guideline*,1993, p.5.

³ -Clark, Rosemary, *The sacred magic of ancient Egypt*, U.S.A, 2003, p.28, 29

Spence suggested that the ancient Egyptians were determined two circumpolar stars to align with great pyramid represented in Kochab and Mizar. Probably the high priest and the king were hanging a big tool till the small star reached to under the position of it, the big star directly took the true north of the shadow.

Belmonte Criticized the suggestions of Spence and Petrie and suggested that Megrez and Phecda were aligned to the pole star in that time was Thuban that achieved the accuracy required. Also, there are two other methods to determine the orientation, they

About The stars there are many that are not referred to as symbols for the souls of dead¹.

III-The Astronomical Orientations of the Seven Minor Step Pyramids

In 2005 Nabil Swelim, under the title of the layer monuments and river and related the Nile course with the seven minor step pyramids, he made a list including geographical maps and utm (The universal transverse Mercator) coordinate cleared and some information like the distance, deviation from the course of the Nile and the orientations of these pyramids².

In 2006 a more accurate research was made by Belmonte, Shaltout and Fekri aimed to discover anything about the Enigma of the SMPs. They used high technique to determine the orientations of these minor pyramids by using high function's compass, and they observed the stars movements and the alignment of these pyramids with the Nile.

But they didn't determine the orientations of these pyramids one hundred percent but there were errors $\frac{1}{4}^{\circ}$ in the theoretical measurements and $\frac{1}{2}^{\circ}$ in azimuth and angular height was probably nearer to reality, they used high technical compass in the pyramid of Sinki and it was a possible error $\frac{1}{4}^{\circ}$ in the theoretical measurements, the latitudes of Egypt were suitable for observing the solar and bright stars nearer from the horizon in case of the fainter stars, and they put some topics to identified this group: latitude and longitude, Then it showed azimuth, angular height, the corresponding declination for the pyramid face closest to the north and angular distance towards the north of the course of the Nile on site³.

خزعل الماجدى، الدين المصرى القديم، ص ٢٠٧-٣

² -Swelim, Nabil, "Layer monuments and the river", in *CASAE*, volume II, 2005, p.377

³ - Belmonte, Juan, Antonio and Shaltout, MosalamandFekri, Magdi, "Astronomy and Landscape in Ancient Egypt", in *Trabajos de Egiptologia, (TdE 4) Papers on Ancient Egypt*, Tenerife – Islas Canarias, España, 2005, p.3.

According to the visit of Pochan Andre 1937 this pyramid was located to in 29° 23' north latitude and 31° 03' long east¹.

Lauer mentioned that the orientation of Seila pyramid looked like orientations of all the Memphis pyramids towards the cardinal points with noticeable deviation to the west².

Ahmed Fakhry saw that, this pyramid was located in a place very hard to reach, so no archeologist visited it until 1937 Andre Pochan, where this pyramid was found at intersection 28° 23' latitude north with 31° 03' with longitude east³.

According to the general survey between Kaiser and Dreyer the orientation of Seila pyramid was 12° North West, the faces of this pyramid corresponded the Nile water follow and its angles oriented to the cardinal points, and the structure still as Borchardt found, and the most best preserved was the northern- west angle⁴.

The orientation of Seila according to Mark Lehner is 12° north-west⁵.

According to the modern research of Belmonte, Shaltout and Fekri, the orientation of Seila pyramid follow the latitude of 29° 23'.

Longitude 31° 03'.

The azimuth equal zero.

Angular distance from due-north for the

Course of the Nile -2.

The angular height zero .

The pyramid face to north 60° (fig.2).

Nabil Swelim fixed it in the Google Earth as a following

29°22° 57.17 // north.

31°03' 13.27 // East .

With axis bearing 356.5°⁷.

¹ - Pochan, "Pyramide de Seila" in *IFAO* 193, p.161.

² - Lauer, Jean, Philippe. "Les pyramides à degrés (III dynastie)" in *BIFAO* 1962, p.225

أحمد فخري، الأهرامات المصرية، القاهرة ونيويورك، ١٩٦٣، ص ٩٠، ٩١-٤.

⁴ - Dreyer, Gunter and Kaiser, Werner, "zu den kleinstufen pyramiden ober –und mittelagyptens", in *MDAIK*, 1980, p.53.

⁵ - Lehner, Mark, *The Complete Pyramid*, London, 1997, p.96.

⁶ - Belmonte, Shaltout, and Fekri, "Astronomy and Landscape in Ancient Egypt", in *TdE* 4, p.9.

⁷ - <http://nabilswelim.com/minor.asp>.

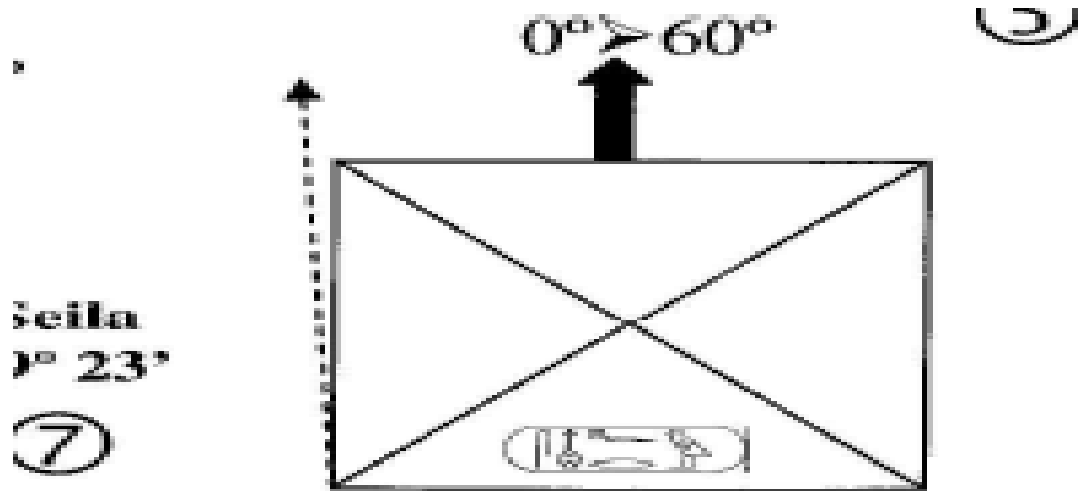
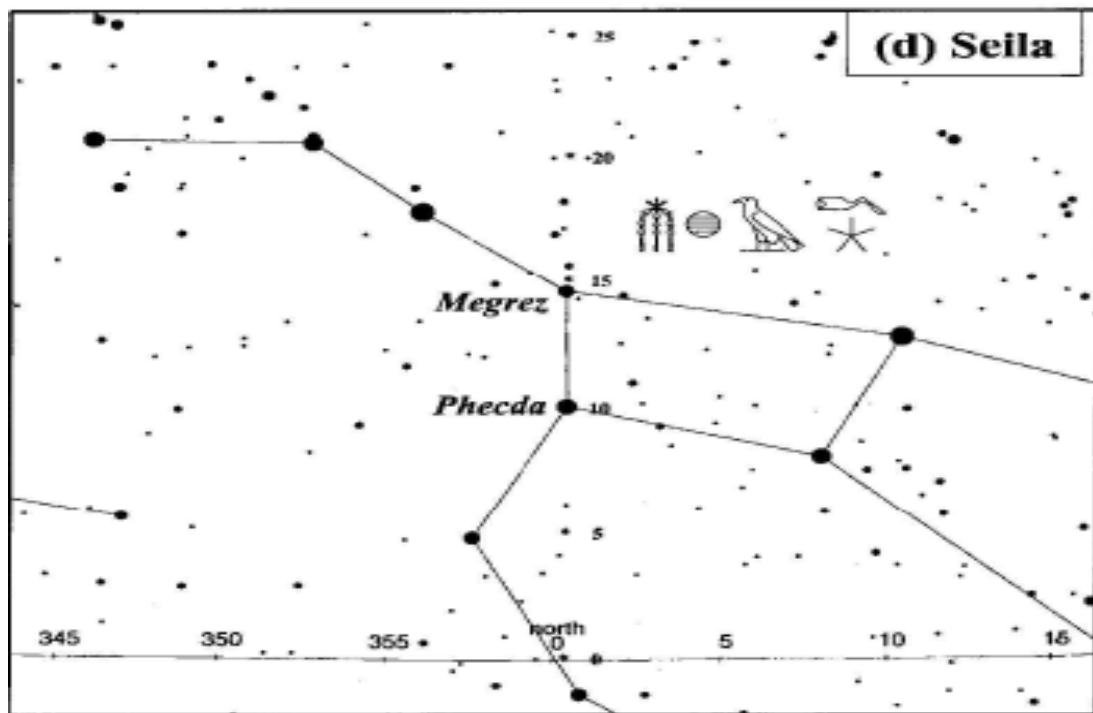


fig 2 The orientation of the pyramid of Seila
After Belmonte, Shaltout and Fekri 2005.



(fig 3) The relation of Seila pyramid with constellations
Belmonte, Shaltout and Fekri, 2005.

Synchronized meridian transit of couple of Meskhetyu, Phecda and Megrez, signaling almost accurately towards -north in the case of Seila (fig 3)¹.

¹ - Belmonte, Shaltout and Fekri, *TdE4*, p.11.

III-1- Meskhetyu

The most important constellation in ancient Egypt was Meskhetyu, it was from the imperishable stars which was dedicated to soul of the king in the afterlife, appearing as bull's foreleg, also identified as one of the celestial adzes for ceremony opening of the mouth¹.

III-1-1- The Pyramid of Hebnu

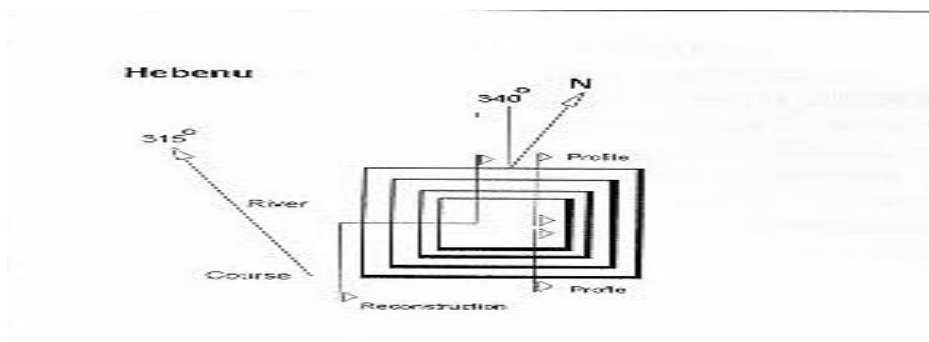
This pyramid is also called the pyramid of Zawiyet Sultan or Zawiyet el Meitin or Al Amwat. This pyramid is not aligned perfectly, where the west side aligned the Nile course by angle 20 degree to North West².

During the general survey of Kaiser and Dryer its sides deviated to 20 from the north- west not follow the direction of the Nile flowing water which oriented from the northern west ³. The orientation of the north south axis in this pyramid is 340° and it deviated 25° of the river Nile course, an important towards between the Nile course and the magnetic north at this point according to Nabil Swelim⁴. The Nile course is running for 315° along 8 kilometers between El kom Al Ahmar and el Minia city⁵. The latitude of the Hebnu pyramid is 28°03' degree while the longitude is 3°50 '. The azimuth angle of this pyramid is 331 ³/₄°. The angular height is 0B.

The corresponding declination for the pyramid face closest to north is 50 ¹/₂° .

Angular distance from due-north for the course of the Nile on site -4 ³/₄° .

Winter solstice sunset -24³/₄⁶ (fig 4).



(fig.4) The orientation of the Hebenu pyramid, after Swelim, CASAE II, 2005.

¹ - Belmonte, Shaltout and Fekri, *TdE4*, p.9.

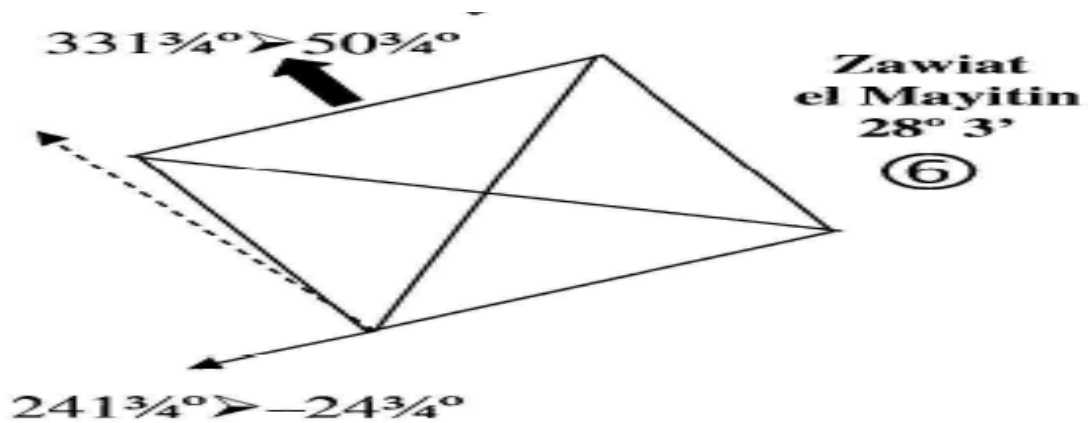
² - Lehner, Mark, *The pyramids*, p.169

³ - Dreyer, Gunter und Kaiser, Werner, *zu den kleinen stufenpyramiden*, p.48.

⁴ - <http://nabilswelim.com/minor.asp>

⁵ - Swelim, Nabil, *CASAE II*, p.381

⁶ - Belmonte, Shaltout, and Fekri, in *TdE 4*, p.5.



(Fig 4) the orientation of Hebenu

After Belmonte, Shaltout and Fekri 2006.

The orientation of this pyramid according to Mark Lehner is 20° North West¹.

This pyramid does not belong to the cardinal and quarter cardinal group, it is located in a strange place where the lowest culmination Polaris α Umi tangent to the horizon, where the stars invisible until to reach angular height nearby real size, Polaris has a visual magnitude of 2.5 and would be invisible until it reaches an angular height $2\frac{1}{2}$ ² (fig 5).

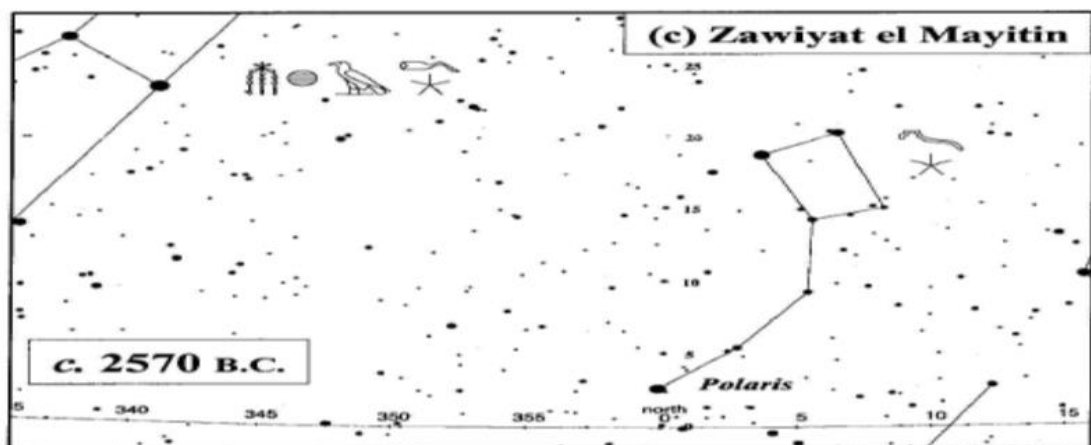


fig 5 The relation of Hebenu pyramid with constellations

After Belmonte, Shaltout and Fekri, 2005.

¹ - Lehner, Mark, *The complete pyramid*, p.96.

² - Belmonte, Shaltout, and Fekri, *TdE4*, p.4.

III-2- The pyramid of Sinki

Known also by South Abydos Pyramid .

This pyramid corresponds to the Nile water follow and oriented to the cardinal points ¹.

The latitude of the Sinki pyramid is 26°09' north.

The longitude of it is 31°57'.

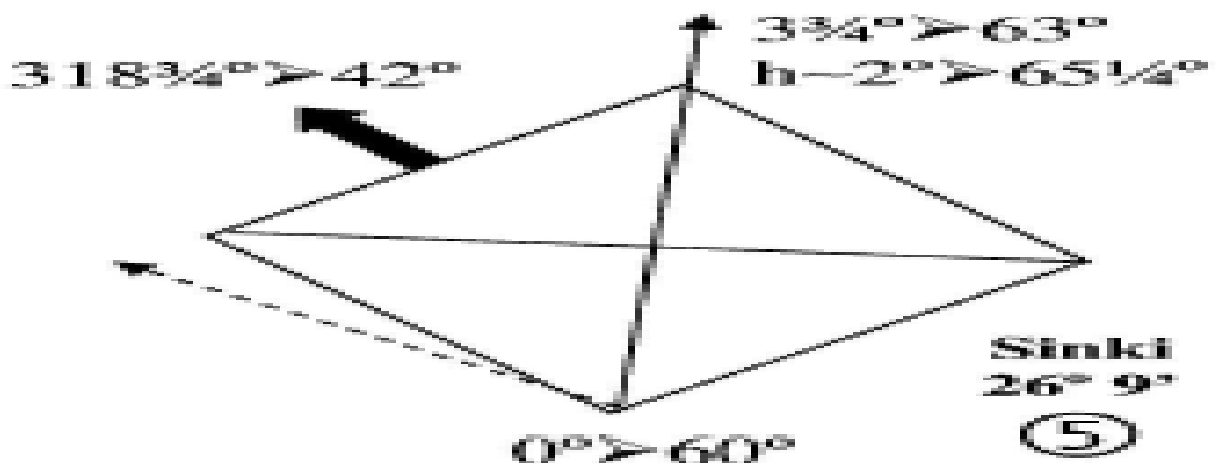
The universal transverse Mercator (Utm) is 384.5 north and 711 East².

The azimuth of this pyramid is 318¾°.

The angular height is zero degree; the corresponding declination for the pyramid side nearest to north is 42°.

Angular distance to north for the course of the Nile on site -8¼°.

This pyramid belongs to the quarter cardinal orientation when the axis is 45°³. (Fig 6). The pyramid of Sinki is oriented by its corners to cardinal points, the orientation 315° north. The river Nile course along a circular course ranging from the south- north, and it deviates to the North West along 16 kilometers between the island of Naqnaq and el Nasirat . About the deviation from the Nile is not applicable ⁴. About the relation of this pyramid by the stars is crossing less than of Merak (βUMa), and hence of Meskhetyu ⁵ (fig 6).



(Fig. 6) The orientation of the pyramid of Sinki, after Belmonte, Shaltout and Fekri 2005

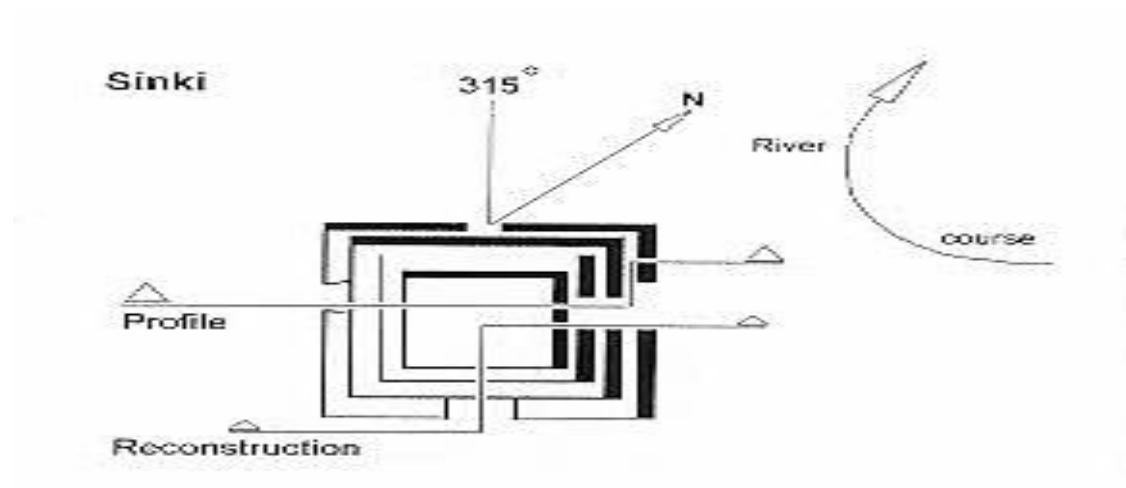
¹-Dreyer, Gunter und Kaiser, werner, *zu den kleinen stufenpyramiden*, p.47

²-Swelim, Nabil, *layer monuments and the river*, p.378

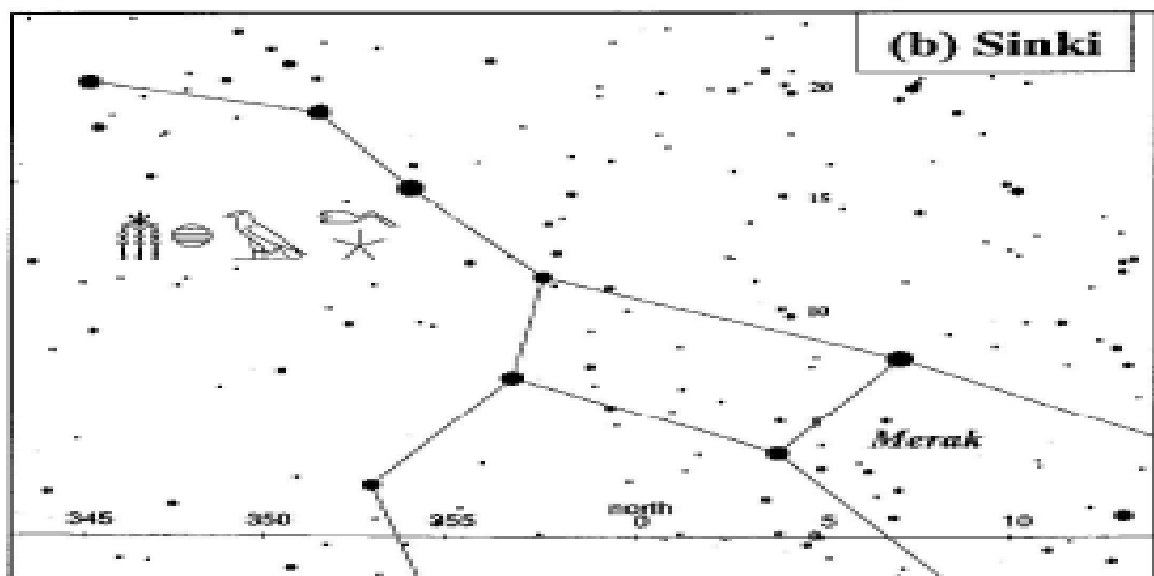
³ - Belmonte, Shaltout, and Fekri, *TdE 4*, p.3-6.

⁴-Swelim, *CASAELI*, p.379 and 381

⁵ - Belmonte, Shaltout, and Fekri, *TdE 4*, p.11



(fig. 7) The orientation of the Sinki pyramid
after Swelim, “layer monuments and the river”, *CASAEII*, 2005.



(fig. 8) The relation of Sinki pyramid with constellations

After Belmonte, Shaltout and Fekri, 2005.

III-3- The Pyramid of Nbut (Ombos)

This pyramid oriented to 12° north–west in the direction of the river, it does not correspond to the Nile water direction¹.

The latitude of the Sinki pyramid is 25°58' north.

The longitude of it is 32°44' east.

¹ - Dreyer, Gunter and Kaiser, werner, *zu den kleinen stufenpyramiden*, p.46.

The universal transverse Mercator (Utm) is 365.2 °north and 788.3° east¹.

The azimuth of this pyramid is 24½°.

The angular height is 0½ degree; the corresponding declination for the pyramid side nearest to north is 55 north°.

Angular distance to north for the course of the Nile on site 14½°.

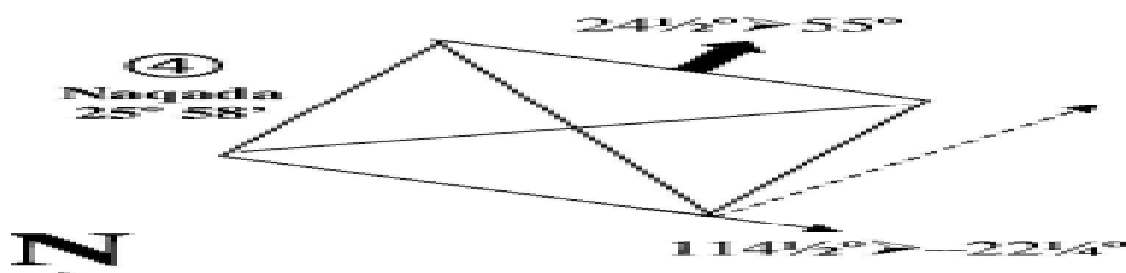
This pyramid was oriented directly to Sirius (Sopdet) in the centuries about 2820 B.C.

The winter solstice of *Sopdetis*-22¼°±¾° and -21¼°±¾° are ca. 2820±220 in 2500±220B.C².

The orientation is 12° north according to Swelim.

The river Nile course 11 kilometers between the south of Naqada and El Zawayda (in the fact this pyramid was located exactly in Hagger tukh).

This pyramid deviated from the Nile 23°³ (fig.9).



(fig.9)The orientation of the pyramid of Naqada, after Belmonte, Shaltout and Fekri, 2005.

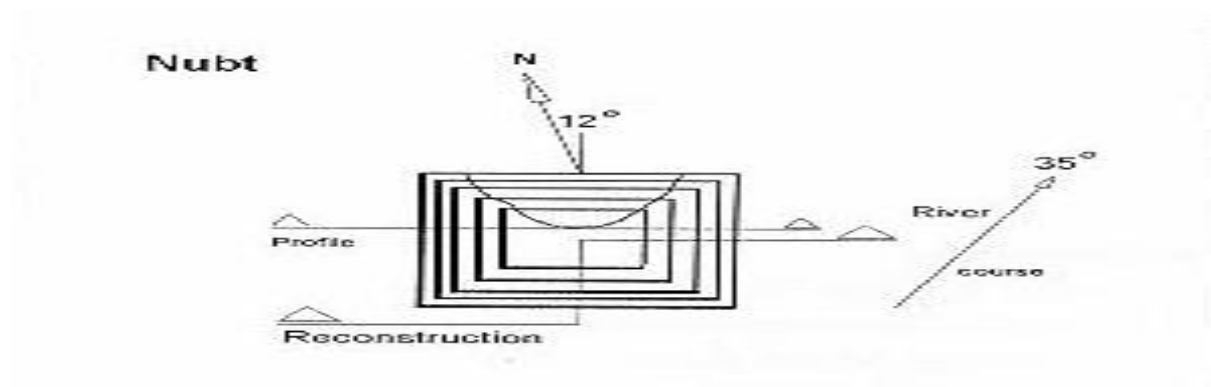


fig 9The orientation of the Nubt pyramid

after Swelim, *CASAEII*, 2005

¹ - Swelim, *CASAE II*,p .378

² - Belmonte, Shaltout and Fekri, *TdE4*, p.6.

³ -Swelim, *CASAE II*, p.381.

III-4- The Pyramid of El kula

The latitude of the EL Kula pyramid is $25^{\circ}08'$ north¹. According to Howard Vyse 1837 the latitude of this pyramid is $25^{\circ}10'$ near the village of el Boslia between Esna and Edfu².

The longitude of it is $32^{\circ}44'$ east.

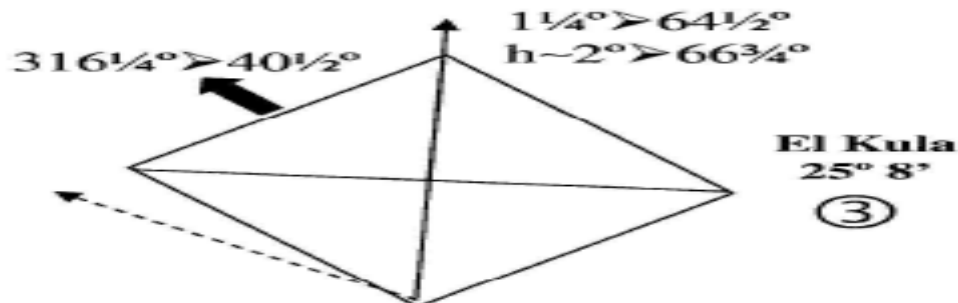
The universal transverse Mercator (Utm) is 271.9° north and 789.5° east³.

The azimuth of this pyramid is $316\frac{1}{4}^{\circ}$.

The angular height is zero degree; the corresponding declination for the pyramid side nearest to north is $40\frac{1}{2}^{\circ}$.

Angular distance to the north for the course of the Nile on site $-8\frac{1}{4}^{\circ}$.

This pyramid is oriented to the points cardinal, the orientation is 315° , the Nile course is running about 300° along 30 kilometers between El Hella to El kûla ,the inclination from the river Nile 15° according to Swelim⁵,but the faces of this pyramid are quarter cardinal orientation⁶(fig .10).



(fig 10)The orientation of kula pyramid, After Belmonte, Shaltout and Fekri, 2006

¹ -Swelim, *CASAE II*, p.378.

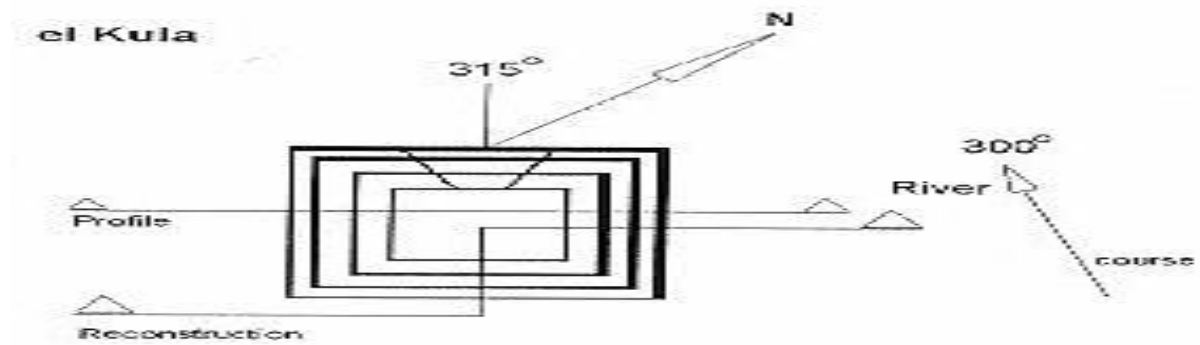
² - Vyse, Howard, *The pyramid of el koofa*, London, 1842, p.85.

³ -Swelim, *CASAE II*, p.378.

⁴ - Belmonte, Shaltout and Fekri, *TdE 4*, p.6.

⁵ -Swelim, *CASAE II*, p.379-381.

⁶ - Belmonte, Shaltout and Fekri, *TdE 4*, p.6.



(fig. 10) The orientation of the kûla pyramid, after Swelim, *CASAE II*, 2005

III-5- The Pyramid of El Ghoneimiya

The latitude of the pyramid of El Ghoneimiya is $24^{\circ}57'$ north.

The longitude of it is $32^{\circ}50'$ east.

The universal transverse Mercator (Utm) is 250.8° north and 800.9° east¹.

The azimuth of this pyramid is $3\frac{1}{2}^{\circ}$.

The angular height is 2° ; the corresponding declination for the pyramid side nearest to north is $66\frac{1}{2}^{\circ}$.

Angular distance to north for the course of the Nile on site $12\frac{1}{2}^{\circ 2}$.

The river Nile course is running for 25° along 5 kilometers between El Ghoneimiya and Edfu³ (fig. 11). The pyramid oriented to the hills which located on the northern horizon the lowest star of the plough or the big Dipper corresponding to Meskhetyu (fig. 12)⁴.

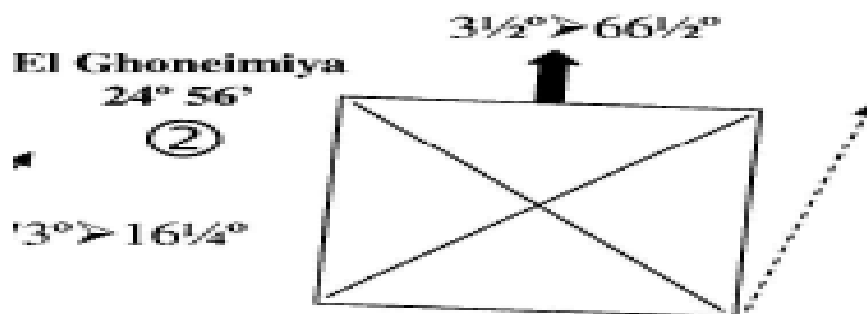


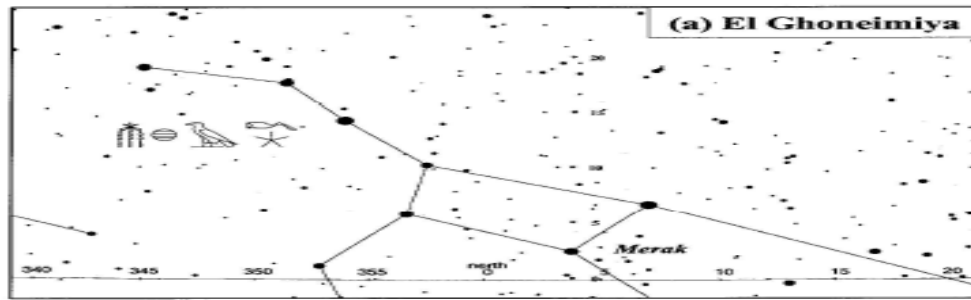
fig 11 The orientation of El-Ghoneimiya pyramid, after Belmonte, Shaltout and Fekri, 2006

¹ -Swelim, *CASAE II*, p.378.

² - Belmonte, Shaltout and Fekri, *TdE 4*, p.6.

³ -Swelim, *CASAE II*, p.381

⁴ - Belmonte, Shaltout, and Fekri, *TdE 4*, p.8.



(fig. 12) The relation of El Ghoneimiya pyramid with the constellations

After Belmonte, Shaltout and Fekri, 2005

III-6- The Pyramid of Elephantine

The average value of the difference $\frac{1}{2} \pm 1\frac{1}{2}^\circ$ in other six step pyramids all the pyramids are oriented to the river Nile, but the challenge here in this pyramid where hasn't side alignment to the course of the river Nile, the pedicu late axis of this pyramid deviated to $16\frac{1}{2}^\circ$ that corresponds to sunrise at *Wepet Renpet* was 2570 B.C, with an interval of ± 30 years due to the estimation error of $\frac{3}{4}^\circ$ for the declination, the observations of the solar in the summer solstice allow to create year from 365 days with the beginning of Snefru era ¹.

The pyramid of Elephantine not likes the other six seven minor step pyramids, this pyramid not aligned to the four main cardinal points look like the others

The latitude of Elephantine pyramid is $24^\circ 06'$ north.

The longitude of it is $32^\circ 53'$ east.

The universal transverse Mercator (Utm) is 165.5° north and 806.5° east².

The azimuth of this pyramid is 343° .

The angular height is 0° , the corresponding declination for the pyramid side nearest to north is $60\frac{1}{2}^\circ$.

Angular distance to north for the course of the Nile on site $46\frac{1}{2}^\circ$ ³ (fig13).

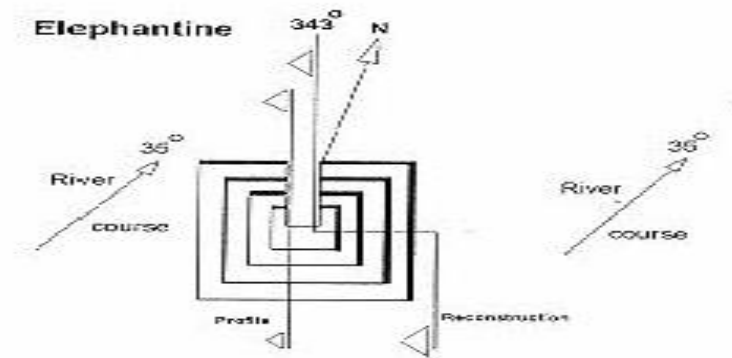
The river Nile course is running for 35° along 5 kilometers between Sluga and Qubet El Hawa, the inclination from the Nile according to Swelim in 2005 is 52° ¹.

¹ - Belmonte, Shaltout and Fekri, *TdE4*, p.2,3.

² -Swelim, *CASAE II*, p.378.

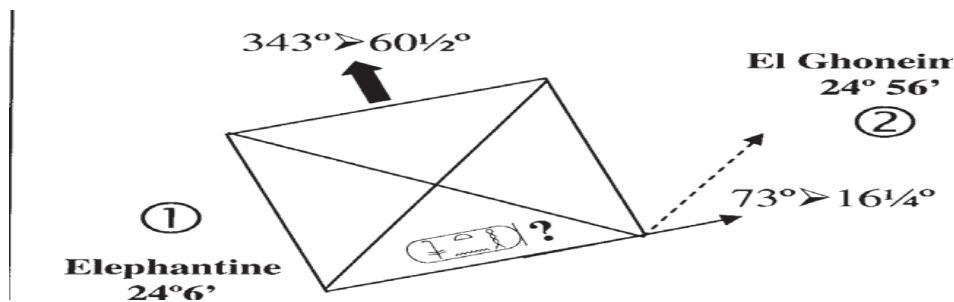
³ - Belmonte, Shaltout and, *TdE 4*, p.6.

In 2017, Manu Seyfzadeh, collected an important information, aimed to solve the mysterious of this pyramid, he proved that, the faces' alignments of the pyramid do not imitate the direction of the flow of the Nile around the island and this pyramid is not oriented to cardinal points, it is away from cardinal direction 17° towards the west, the eastern face indicate to 73° azimuth, the southeast edge incline to 118° ².



(fig. 13)The orientation of elephantine pyramid

After SwelimCASAE II, 2005



(fig. 13) The orientation of elephantine pyramid

After Belmonte, Shaltout and Fekri 2006

Conclusion

It is clearly indicated that the astronomical study is not less important of the archeological study. Sometimes the astronomical study can solve the problems which the archaeological study could not able to solve it, like the seven minor step pyramids the archeologists could not solve the enigma of them, but the astronomical study can help them to solve the enigma of these pyramids through the study of this group and its relation with the astronomical Phenomena.

¹ -Swelim, CASAE II, p.381.

² - Seyfzadeh, Manu, the mysterious pyramid one elephantine island: possible origin of the pyramid code.USA.2017, p.188and 189.

This research includes the orientation of the seven minor step pyramids to the main cardinal points, we realize each pyramid has a different orientation, and all of them not oriented to the main cardinal points, except the pyramid of Seila corresponds to the cardinal points, such as the great pyramid of Khufu. Also this research includes some details like the alignment of these pyramids with the Nile follow water, and the alignment with constellations in the sky, in addition to that contains for some other data, such as The azimuth, the latitude, longitude and The angular height for each pyramid.

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الإتجاه الفلكي للأهرامات السبعة الصغرى

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الملخص العربي

الأهرامات السبعة الصغيرة هي مجموعة من الأهرامات المدرجة الصغيرة، على غرار أهرامات الأسرة الثالثة، والتي تتكون من عدة مصاطب فوق بعضها البعض، وكلها أصغر من هرم زوسر المدرج، لكنها اتخذت شكل الهرم المدرج، تعود هذه الأهرامات إلى الأسرة الثالثة، ولكن دون أدلة قوية تؤكد ذلك. يوضح هذا البحث اتجاه الأهرامات السبعة الصغيرة إلى الجهات الأصلية الأربعة، وكذلك توافقها مع نهر النيل، وعلاقتها بالمجموعات النجمية كمحاولة لحل لغز هذه المجموعة.

الكلمات الدالة: الإتجاه الفلكي، الأهرامات، الهرم المدرج، الأسرة الثالثة.