Are there any Astronomical Observatories evidences in ancient Egypt?

Abstract

Ancient Egyptians precisely direct their temples and tombs to specific astronomical points, as attested in the designs of the Old kingdom pyramids and related temples. Likewise, the same approach was used in many religious and funerary buildings across the sequential historical epochs of ancient Egypt. This research introduces what can be called "astronomical design improvements" conducted by ancient Egyptians to secure a precise orientation for a specific direction of religious and funerary monuments. Moreover, this precise orientation requires observatories used for the orientation and monitoring of geographical directions. Therefore, this paper discusses the inquiring; are there any Astronomical Observatories evidences in ancient Egypt?

Keywords: Observer, Monitoring, Astronomical improvements, Observatories, Solstice, Axial precession, Azimuth.

1. Introduction

Ancient Egyptians depended on the Nile flood to get careful, accurate and to control the schedule calculation. This was an important reason to look forward to the sky and try to control the stars [(1)]. In ancient Egypt, the process of stars monitoring used to be conducted by the senior high officials in the state, especially Ministers or the greatest priest who was bestowed an important title. [(2)]

(1) Parker.R.A., The Calendars of Ancient Egypt, Chicago, 1950, pp.7,§21;31-32, §155-157; Wells.R.A.,Sothis and the Satet Temple on Elephantine, SAK.12, 1985,pp.255-257.; Kees, H., Der Götterglaube im alten Ägypten, Berlin, 1956, pp.112; 408; White.M., Ancient Egypt its Culture and History, New York, 1970, p.94; Von Bomhard, S. A., The Egyptian Calendar, in: Egyptology at the Dawn of the Twenty-First Century, Proceedings of the Eighth International Congress of Egyptologists, vol. 2, Cairo, 2003, pp.141-142; Spalinger, A. J., Calenders, In: Redford, B. D.(Ed.). Oxford Encyclopedia of Ancient Egypt, vol.I. AUC Press , Cairo, 2001, p. 224; Caminos, R. A., Notices of Recent Publications, JEA.37,1951, pp.116-117; Belmonte. J., On the Orientation of the Old Kingdom pyramids, JHA.32, Archaeoastronomy, No.26, 2001, pp.1-3, 17-20.

(2) Seth,K.,Ein Ägyptisches Denkmal des Alten Reiches von der insel Kythera mit dem Namen des Heiligtums dse könig Userkaf , ZÄS. 53, 1907, pp.54-55; Kess, H., Das Priestertum in Agyptichen staat vom Neaen Reich bis zur Spatzeit, Leiden, 1958 , pp.4-6, 7; Sauneron, S., Priests of Ancient Egypt, Translated by Ann Morrissett, New York,1960, pp.39,53,55,60,78-88,114,116.

This title is "the great observer of Heliopolis/*Iwnw* [3], which is considered one of the most important centers of the sun worshiping [4], and one of the universe creation theories in ancient Egypt [5], and the capital of the XIII Nome of the Lower Egypt. [6]

2. Discussion

Ancient Egyptians insisted to precisely direct temples and tombs to specific astronomical points (four cardinal points of the world) [7], as clear from the design improvements of the Old kingdom pyramids and its related temples [8]. So, the researcher suggests that it can be called the astronomical improvements of designs of the Old kingdom pyramids and related temples [9]. Mostly, Ancient Egyptians temples built along River Nile were oriented on an east-west axis, according to local cardinal directions as determined by River Nile. Likewise, Topography of Egypt was the

(3) Moursi.M.I., Die Hohen Priester des Sonnengottes von Frühzeti Ägyptens bis zum Ende des Neuen Reiches, MÄS. 26, 1972, pp.130,138-139; Baines, J., & Melek ,J., Atlas of Ancient Egypt, New York, 1984, p. 173; Fitzenreiter,M.& Herb,M., Dekorierte Grabanlagen im Alten Reich Methodik und Interpretation, Ikonographie – Schreiben mit Bildern Ein Essay zur Historizität der Grabdekorationen des Alten Reiches, IBAES, Vol. VI, 2006, Berlin , p.167.

(4)Černy,J., Ancient Egyptian Religion, London,1958,pp.270-271.

(5) Jeffreys,D., Regionality, Cultural and Cultic Landscapes, Egyptian Archaeology, edited by:Wendrich,W.,London,2007,p.102;Baines,J.,Bnbn, Mythological and Linguistic notes, OR .39,1970,pp.389-391;Frankfort,H., Kingship and the Gods,Chicago,1978,pp.153,380, note.26; Breasted, J.H., The Development of Religion and Thought in Ancient Egypt , Philadelphia, 1972, pp.70–72; Edwards,I.E.S., The Pyramids of Egypt,England,1993,pp.281-282.

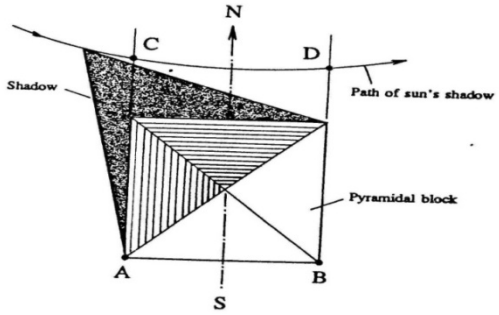
(6) Moursi.M.I., Die Hohen Priester des Sonnengottes von Frühzeti Ägyptens bis zum Ende des Neuen Reiches, MÄS 26, 1972, pp.130,138-139; Bauval,R., The Egypt Code London, 2006, pp. 80-81; 105-106; Lehner,M., The Complete Pyramids, Solving the Ancient Mysteries ,London, 1997, p.29;Grimal,N., A History of Ancient Egypt, Oxford, 1994, pp. 164-165;Bauval,R., & Brophy,T., Imhotep, The African Architect of the Cosmos ,San Francisco , 2013, pp.30-31; 52-53; Lindahl,C.B., Axis Mundi,Charleston, South Carolina,USA ,2012, p. 146; Huxley,J., From an Antique Land: Ancient and Modern in the Middle East, Boston,1966, pp.58-59; 61-62; Preece, E.W.,& Goetz, W. Ph., Encyclopaedia Britannica, vol.I,Fifteens Ed., Chicago, 1979, p.704; David, G.A., Mirrors of Orion, Star Knowledge of the Ancient World, USA, 2014, pp. 113-114; Bagnall, R.S., Egypt in Late Antiquity, Fourth ed., Princeton,1996, p.333;Grajetzki,W., The Middle Kingdom of ancient Egypt, history, archaeology and society, London , 2006, pp.109-110; Baines, J., & Melek ,J., Atlas of Ancient Egypt, New York, 1984, p. 173.

(7) Montet, P., Le Rituel de Fondation des Temples Égyptiens, Kemi.17,1964, pp.75-77, 83-84; Wilkinson.R.H., The Complete Temples of Ancient Egypt , London.2000, pp.36-37; Lehner, M.,The Development of the Giza Necropolis, The Khufu Project, MDAIK.41, 1985, pp.109-111; 142-143; Hoyle,F., On Stonehenge, San Francisco,1977, p. 66; Wells.R.A.,Sothis and the Satet Temple, SAK.12,1985,p.301,note 46.

(8) Edwards,I.E.S., The Pyramids of Egypt,England,1993,pp.21,27,36,47,75,78,152; Lehner, M.,The Pyramids,Chicago,1975,pp.97-99;100;102-103; Verner,M., The Pyramids, New York,2001,pp.160,163,165,175,177-178,180-181,462; Lehner, M.,The Development of the Giza Necropolis, The Khufu Project, MDAIK.41,1985, pp.109-111; 142-143; Hoyle,F., On Stonehenge, San Francisco,1977, p. 66;Wells.R.A.,Sothis and Satet Temple,SAK.12,1985, p. 301,note.46; Belmonte, J., On the Orientation of the Old Kingdom pyramids,JHA.32, Archaeoastronomy,No.26, 2001,pp.1-3,17-20.

(9) Researcher viewpoint.

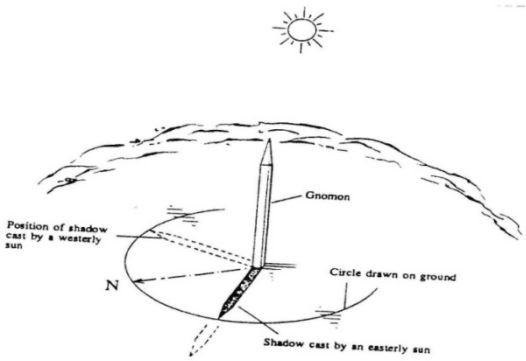
controlling reason for orienting temples. Occasionally, the orienting of temples towards sun or to significant stars [10]. Similar cases exist in many religious and funerary buildings across the later historical epochs of ancient Egypt, such as the temple of *Ỉmn-Rᶜ* at Karnak which is turned to the west side of the River Nile, *Ḫnsw* temple located in south of Karnak temple and directed to the south, the temple of *Mntw* located in the north of Karnak temple and directed to the south, the temple of *Ỉmn-ḥtp* II located between the two IX and X pylons of Karnak temple and directed to the west, and Luxor temple which was directed from the south to the north [11], putting in mind that the entrance of Karnak temple was oriented to receive the procession of *Ỉmn* from Luxor and to Karnak during the *Ỉpt* feast [12]. Moreover, Medamud temple located in northeast of Karnak and was almost oriented along an east-west axis. And before reaching to the first intermediate period structure of Medamud temple there are remains of a mudbrick temple was oriented over a north-south axis [13]. Thereupon, the precision in directing temples and tombs also must have been achieved through using observatories in monitoring of geographical directions and orienting to specific astronomical points. [14] (Figs.1-2)



(Fig.1): Ancient Egyptian Orientation and Monitoring of Geographical Directions as Neugebauer suggested.

(10)Wilkinson.R.H., The Complete Temples of Ancient Egypt, pp.36-37.
(11) Montet.P., Le Rituel de Fondation des Temples égyptiens, Kêmi.17,1964 ,p.84; Neugbauer.O.,& Parker.R.A.,Egyptian Astronomical Texts, vol.III, Decans, Planets, Constellations and Zodiacs, London,1969, p.5; Lauer.J.P.,& Žába.Z., L'Orientation Astronomique dans l'ancienne Égypte, et la Précession de l'axe du Monde, BIFAO.60,1960 , pp.171-172.
(12) El-adly,A.S., Das Gründungs und Weiheritual des Ägyptischen Tempels von der frühgeschichtlichen zeit bis zum Ende des Neuen Reiches,Tübingen,1981,pp.238-239; Murnane, W.,Opetfest, LÄ IV, Wiesbaden,1982, cols.574-576; Altenmüller, H., Fest, LÄ II,Wiesbaden,1977,col.180; Kruchten,J.M., L'année où la fête d'Opet n'eut pas lieu en Paophi, JEA.77, 1991 , pp.182-184;Kemp, B., Ancient Anatomy of A Civilization, New York,1989,p. 206;Sethe, K., Die Beiden alten Lieder von der Trinkstätte in den Darstellungen des Luksorfestzuges, ZÄS.64,1929, pp.1-3; Fitzenreiter,M., Totenverehrung und Soziale Repräsentation im Thebanischen Beamtengrab der 18. Dynastie,SAK. 22,1995,pp. 95-97,127-130; cf: Junker,H.,& Erich Winter,E., Das Geburtshaus des Tempels der Isis in Philae, Wien, 1965,pp.304-305; cf: Spaliger, A.J., Notes on the Ancient Egyptian Calendars, OR. 64,1995, pp.17-19,30-32.
(13) Badawy.A.L.,Le Dessin Architectural chez les anciens Egyptiens,Étude comparative des Représentations égyptiennes de Constructions, Le Caire, 1948, p.183; Wilkinson. R. H., Complete Temples of Ancient Egypt, pp.36-37.
(14) Researcher viewpoint.

After: Isler, M., An Ancient Method of Finding and Extending Direction, JARCE.26, 1989, Fig.2.



(Fig.2): The Orientation and Monitoring of Geographical Directions as Isler suggested.

After: Isler, M., An Ancient Method of Finding and Extending Direction, JARCE.26, 1989, Fig.3.

Therefore, the first step to build a temple, ancient Egyptians would be identified the northern – southern axes by monitoring Polar stars/*Msḫtyw* located in the northern section of the sky or northern hemisphere, as well as the Non-Polar stars/ *S3ḫw* located in the southern part of the sky or southern hemisphere [(15)]. It is already clear that there must be observatories to monitor these directions accurately. It can be deduced that the northern and southern hemispheres' monitoring process started in the form of simple harbingers indicate simple notes and expectations of some astronomical phenomena including stars' movements in the northern and southern sections of the sky [(16)]. Noteworthy, there are some harbingers indicates that the astral dogma was known, prosperous and of great role both at the scientific aspect or decorative purpose since Pre-dynastic age [(17)]. Consequently, the ancient Egyptians were interested in many branches of science related to primarily the ancient Egyptian beliefs. Astronomy was one of those promoted branches of sciences; it was related to the astral dogma. Besides this there are links between astronomy and the ancient Egyptian religious aspects. So, it is believed that ancient Egyptians were well-informed of daily flight of stars [(18)]. Furthermore, several spells of pyramid texts referred to the deceased king's ascension to sky within immortal stars. Therefore, Ancient Egyptians linked between astral beliefs and deceased's ascension to sky. Thereupon, it is believed that the astral dogma preceded the solar doctrine. [(19)]

(15) El-adly,A.S., Gründungs und Weiheritual des tempels,p.324;Helck .W.,Tempelgründung, LÄ.VI,Wiesbaden,1986,col.385;Bonnet, H., Realexikon der ägyptischen Religion Geschichte, Berlin, 1953, p.566; Behlmer. H., Orion, LÄ.IV,Wiesbaden, 1982,cols.609-610.

(16)Researcher viewpoint.

(17) Lauer,J.Ph.,& Zába ,Z., L'Orientation Astronomique, BIFAO,60, 1960, p.172; Wells. R.A., Sothis and the Satet SAK.12,pp. 255-257; 301-302.

(18) Lauer,J.Ph., Apropos de l'Orientation des Grandes pyramides, BdE.42,1966, p. 9; Gonyon,G.,Nouvelles Observations relatives A L'Orientation de la pyramide de Kheops , RdE, 22,1970, p.85.

(19) Wells, R. A., Origin of the Hour and the Gates of the Duat, SAK. 20 ,1993,pp.305-306;