FROM UMM AL QAB TO BIBAN AL MULUK: THE ORIENTATION OF ROYAL TOMBS IN ANCIENT EGYPT

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Abstract

This paper presents a preliminary approach to the problem of royal tomb orientation in ancient Egypt from the early dynastic mausoleums at the necropolis of Umm al Qab to the impressive subterranean chambers of the tombs at the Valley of the Kings (Biban al Muluk). This clearly shows that the correct orientation of the monuments, from the earlier mastabas to the later hypogea, was mandatory and that the sky plays a key role in understanding ancient Egyptian funerary monuments.

Key words: archaeoastronomy, Umm al Qab, pyramids, Valley of the Kings, orientations.

Introduction

Since November 2003, we have been working for the "Egyptian-Spanish Mission on the Archaeoastronomy of ancient Egypt" under the auspices of the Supreme Council of Antiquities and with the financial support of the Spanish Ministry of Education and Science under the project *Orientatio ad Sidera*. So far, we have undertaken five field campaigns all over the country performing systematic, statistically significant, studies on Egyptian archaeoastronomy. This is the first study of this type ever performed in Egypt.[1]

One of the main objectives of the project was to provide a definitive answer to the question: were ancient Egyptian sacred buildings astronomically orientated? This had been a very controversial topic between Egyptologists and archaeoastronomers for decades (see, for example, Lockyer 1993; Hawkins 1973; Krupp 1988; Lehner 1997 and Lull 2004). Most of the Egyptologists supported the idea that the sacred buildings (and especially the temples) were topographically orientated in accordance with the course of the Nile, but this had never been proven. Our preliminary results on the temples of Upper Egypt (Paper 1) have demonstrated statistically that this was indeed the case. However, we have also shown that certain astronomical phenomena were also of concern to the ancient Egyptians temple builders. In fact, we are discovering that landscape, in its broader sense that includes both terrestrial and celestial aspects, played a key role in the location and the orientation of different sorts of sacred buildings in ancient Egypt throughout all of its history (for the temples, see Papers 1 to 4).

One of the most interesting groups of monuments we have studied is that of the royal necropolises of ancient Egypt. Fieldwork was undertaken at Umm al Qab near Abydos, where the royal necropolis of the proto-Dynastic period is located; in the extensive area near Cairo, where the huge fields of pyramids of the Old and Middle Kingdoms can be found; and at Biban al Muluk (the Valley of the Kings) at Thebes, where the underground tombs of the kings of the New Kingdom were excavated. In addition, we visited the sites of Tanis and Mendes and took measurements at the royal necropolises of the 21st–22nd and 29th Dynasties, respectively.

Discussion

The necropolis of Umm al Qab, close to the sacred city of Abydos, covers a wide area of several hectares running from the base of the desert cliffs, where the tombs themselves are located, to the limit of cultivated land where the funerary precincts were built. It includes the tombs of all the kings of the 1st Dynasty, a few of the 2nd Dynasty and several of the pre-Dynastic period (the so-called 0 Dynasty). The area has been extensively excavated on several occasions but most of the tombs, excluded that of Den, have been covered over again (mostly for protection) using sand from the desert. However, there are detailed plans of the site and the perimeter of various tombs has been carefully marked by rows of small stones so that the orientation can be

[1] The results of these campaigns on the temples have been published in a series of papers: Shaltout and Belmonte (2005), Belmonte and Shaltout (2006), Shaltout, Belmonte and Fekri (2007, Part I and II) and Belmonte, Shaltout and Fekri (2008), hereinafter Papers 1, 2 ,3 and 4 respectively.

Fig. 1. The area of Umm el Qab where the necropolis of the first kings of Egypt is located. A series of stones marking the outline of the chambers of the tomb of King Narmer can be seen in the foreground. The chamber axis is orientated with an azimuth of 314¾º similar to the other monuments of the necropolis, making Umm al Qab an early example of the intercardinal family of orientations as defined in Paper 3.

Fig. 2. The entrance to the underground chambers of the tomb of Hotepsekhemuy, the first king of the 2nd Dynasty, in Saqqara. Orientated with an azimuth of 1½º, it is one of the first monuments in Egypt to be oriented close to the Meridian line. Photographs by Juan A. Belmonte.

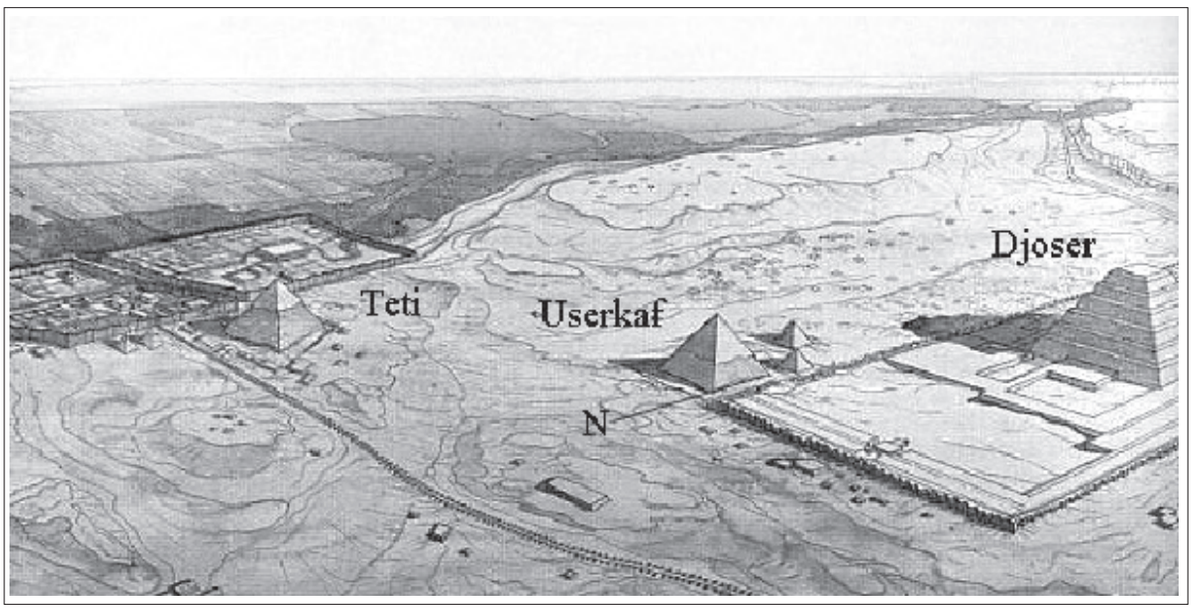

Fig. 3. The central area of the northern sector of the necropolis of Saqqara in the Late Period. The ruins of the pyramids of Djoser, Userkaf and Teti dominate the landscape. The picture is quite precise and shows that the pyramid complex of Teti is the worst orientated of the burial complexes of the Old and Middle Kingdoms. Skewed round to face an azimuth of 80¾º, the anomalous orientation of the temple of the pyramid could have interesting topographic and time-keeping connotations. See the text for further discussion. (Adapted from Aufrère and Golvin 1997).

Fig. 4. The mountains of Thebes in the vicinity of the Valley of the Kings. The latter is located at the centre of the image, at the bottom of the impressive pyramid-shape peak of El Qorn. In such a place, it would be logical that tomb orientations would be dictated by the local topography. Photograph by Juan A. Belmonte.

measured with a reasonable degree of confidence. Figure 1 illustrates one of those cases, showing the tomb of King Narmer, the founder of the 1st Dynasty. The axes of the two chambers of the tomb are oriented with an azimuth of 314¾º.

Indeed, this is the general pattern of orientation for the axes of most of the 1st Dynasty tombs. In Paper 4, we have argued that a good many of the temples in Abydos would be paradigmatic examples of the intercardinal family of orientations as defined in Paper 3 (see also, Miranda, Belmonte and Molinero 2008), where a north-south line was determined astronomically and the axis of the monuments was then obtained by rotating the meridian or quasi-meridian line by 45º clockwise or anti-clockwise. Our results at Umm al Qab (including Narmer´s tomb) suggest that this custom can be traced back to the earliest phases of Egyptian history and was followed not only at the earliest kings' tombs but also in nearby funerary cult enclosures. The complex of Khasekhemuy, last king of the 2nd Dynasty, at Shunet el-Zebit is another good example (see Paper 4).

The first kings of the 2nd Dynasty (notably Hotepsekhemuy, Ninetjer and Raneb) were not buried at Abydos, but rather in a new royal cemetery at Saqqara, to the SW of the huge mud-brick mastabas of nobles and members of the royal family of the 1st Dynasty. These mastabas had an axis orientated in a not very precise north-south direction, possibly dictated by the local topography of the cliff overlooking the Nile Valley. However, a substantial change was introduced at the beginning of the new dynasty when the kings started to construct large complexes of underground chambers that would presumably have been covered by superstructures of the corresponding type. However, these superstructures were later dismantled to make space for new constructions (notably Unas' pyramid complex) and only the subterranean chambers and the entrance corridors have survived.

Figure 2 shows the entrance to such substructures at the tomb of Hotepsekhemuy. It has an orientation of 1½º degrees and is perhaps the first structure built in Egypt with the intention of facing due north, towards the realm of the imperishable stars, as defined in the Pyramid Texts (Faulkner 1969; Krauss 1997). The stars in question were probably *Meskhetyu* (equivalent to the Plough). This practice of northern (cardinal) orientation was followed, with a greater or lesser degree of success, at the other royal monuments of the 3rd Dynasty in Saqqara (see Paper 3, Part II), and finally perfected at the beginning of the 4th Dynasty: the first monuments of Snefru, and particularly his minor step

Table 1.
Information on the orientation of the royal tombs of the 18th, 19th and 20th Dynasties in the Valley of the Kings in chronological order. For each tomb, the table provides its azimuth (data from Weeks, 2003), the gradient of the main corridor leading to the main chamber of the tomb and the corresponding declination (in *italics*), the altitude of the horizon as viewed from the entrance of the tomb (our own measurements on site, in boldface) and the corresponding declination, and, finally, suggested celestial targets for the corresponding orientation. See the text for further discussion

Name	**Azimuth**	**h(1c)**	**d(1c)**	**h(h)**	**d(h)**	**Remarks**
Amenhotep I (18th Dyn.)	69	-----	-----	7½	22	Solar ?
Tuthmosis I	104	-----	-----	**34¾**	**3¾**	Solar ?
Hatshepsut	274	*20½*	*12¼*	**14**	**9½**	Solar ?
Tuthmosis III	341½	*22*	*72¾*	**41**	**68¼**	Meskhetyu
Meritre Hatshepsut	358¼	-----	-----	3¼	67¾	Meskhetyu
Amenhotep II	109	-----	-----	**12**	**−11½**	Solar ?
Tiaa	83½	-----	-----	10¼	10¼	Solar ?
Tuthmosis IV	17	*16¼*	*71¾*	**4½**	**63½**	Meskhetyu ?
Amenhotep III	275¾	*16½*	*12¼*	10½	9¾	Solar ?
Tiye/Akhnaton	272¼	-----	-----	9¼	6	Solar ?
Tutankhamon	91¾	-----	-----	**14½**	**4¾**	Solar ?
Ay	116½	*16*	*−15½*	12.60	−17½	Solar ?
Horemheb	177¾	-----	-----	**6½**	**−58**	Due South
Ramses I (19th Dyn.)	60½	-----	-----	**28**	**36½**	
Seti I	38¾	-----	-----	**37¼**	**55¼**	
Ramses II	144¾	*13*	*−38½*	**15**	**−37**	
Merenptah	100¾	*15¾*	*−2¾*	**11**	**−5**	Solar ?
Amenmesses	11¼	*8*	*69½*	**8¾**	**70¼**	Meskhetyu
Seti II	43¾	*0*	*40¾*	**5¾**	**43¾**	
Siptah	352	*10¾*	*73½*	**38¼**	**75½**	Meskhetyu
Twosret & Setnakht	84	*8*	*8¾*	**8¾**	**9¼**	Solar ?
Ramses III (20th Dyn.)	358¾	*10½*	*75*	**18**	**82½**	Due North
Ramses IV	111½	*5½*	*−16¾*	**14¼**	**−12½**	Sah
Ramses V-VI	110¼	*3¾*	*−16½*	**12¼**	**−12½**	Sah
Ramses VII	147¾	*6*	*−45¾*	**8¼**	**−44**	
Ramses IX	303	*4¾*	*31¾*	**20**	**37½**	
Ramses X	6	*5½*	*69¼*	**20¼**	**82½**	
Ramses XI	248¼	*2½*	*−18¼*	**15¼**	**−12¼**	Sah ?

pyramid at Seila (Belmonte, Shaltout and Fekri 2007), would yield the first perfect cardinal alignments, accurate to a quarter of a degree.

The practice of northern (cardinal) orientation was brought to an apex in the pyramids of Giza (Haack 1984; Isler 1989; Spence 2000; Belmonte 2001), and would be followed, with a similar degree of precision and accuracy, by all the large-pyramid builders of the 4th, 5th, 6th and 12th Dynasties, with just one exception (see Paper 3, Part II). Figure 3 shows a reconstruction of the central area of the northern sector of the necropolis of Saqqara and clearly illustrates the skewed axis of the pyramid of Teti, the first king of the 6th Dynasty. With an azimuth of 80¾º, instead of the standard ~90º, his pyramid temple faced a notch in the otherwise flat eastern horizon of Saqqara. However, there is another possible explanation since the sun of the movable Egyptian New Year's Eve, *Wepet Renpet* (Belmonte 2003), would have been setting at an azimuth ~260¾º at the beginning of the reign of Teti. Actually, astronomical and topographical connections such as these are also possible at many other pyramid complexes of the Old Kingdom, the second of which has already been argued by Jeffreys (1998).

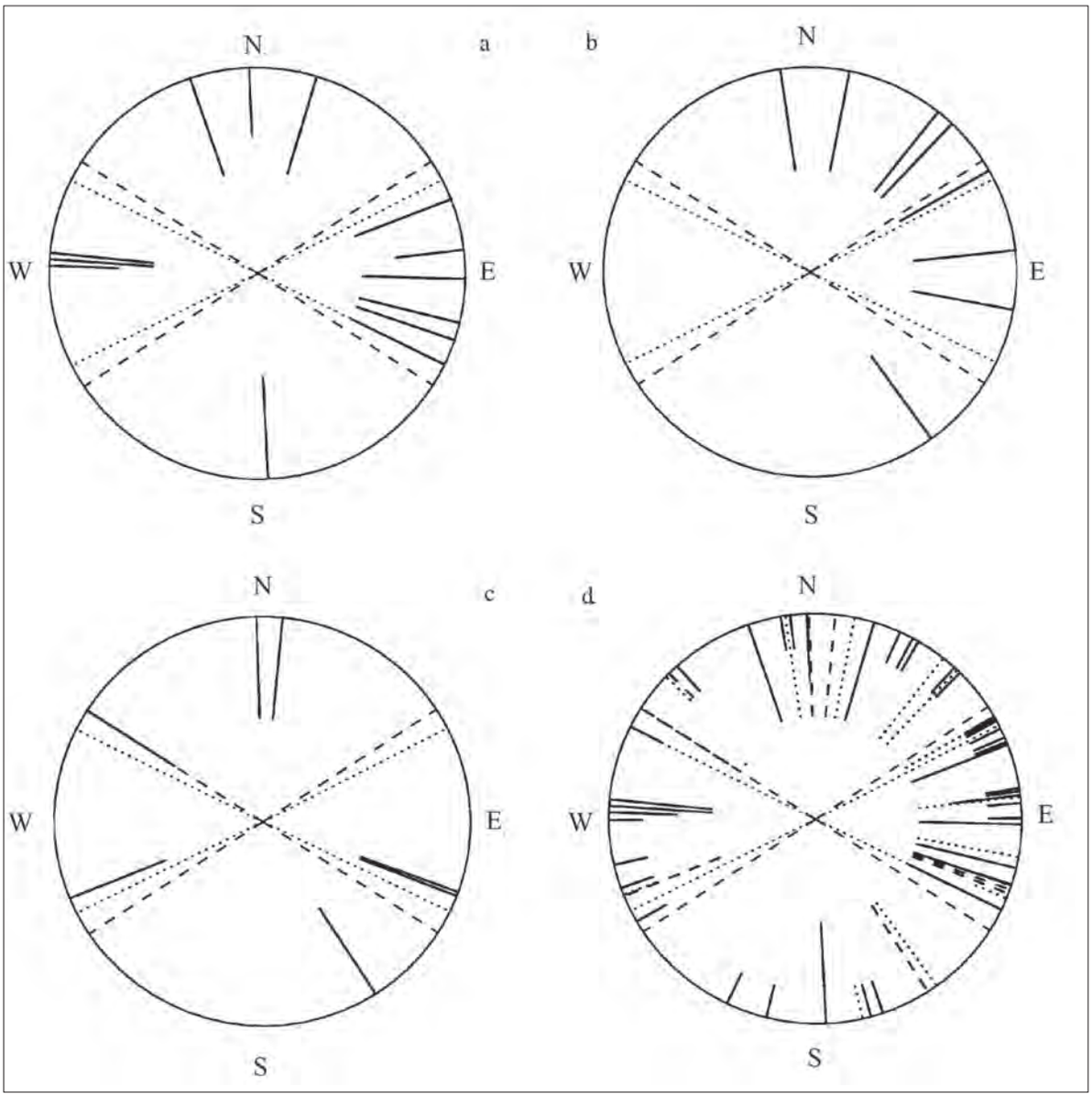

Fig. 5. Orientation diagrams of different sets of tombs of the Valley of the Kings: royal hypogea of the 18th Dynasty **(a)**; royal hypogea of the 19th Dynasty **(b)**; royal hypogea of the 20th Dynasty **(c)**; and the complete set of tombs discovered in the Valley, including those of the nobles and secondary members of the royal family **(d)**. The dotted and dashed lines completely crossing the diagrams represent the extreme rising and setting positions of the sun and the moon, respectively. See the text for further discussion.

The Pyramid Age ended with the fall of the Middle Kingdom[2] and when a new generation of pharaohs, coming from Thebes, were governing the entire country, a completely new method of burial was developed, possibly for safety reasons. A well protected valley within the western hills of Thebes was chosen in the shadow of a gigantic natural "pyramid", the mountain of El Qorn (see Fig. 4). This fact probably influenced the selection of the site.

When one first enters the Valley of the Kings (or Biban al Muluk, the Gates of the Kings in Arabic) the impression gained is that the tombs are randomly located in suitable empty spaces and, consequently, that the local topography should have determined their orientations. However, our study shows that the answer is not always as simple as one would expect. On the one hand, Table 1 shows the orientation data for the royal tombs of the Valley of the Kings, combining topographic data from the Theban Mapping Project (Weeks 2003) with our own data taken on site. On the other hand, Figures 5(a), (b) and (c) show the corresponding orientation diagrams for the 18th, 19th and 20th Dynasties, respectively. Figure 5(d) shows the orientation of every single tomb excavated in the valley so far and this clearly shows the apparently random nature of the distribu-

[2] With the possible exception of the swansong represented by the funerary complex of Ahmose in south Abydos (see Paper 4).

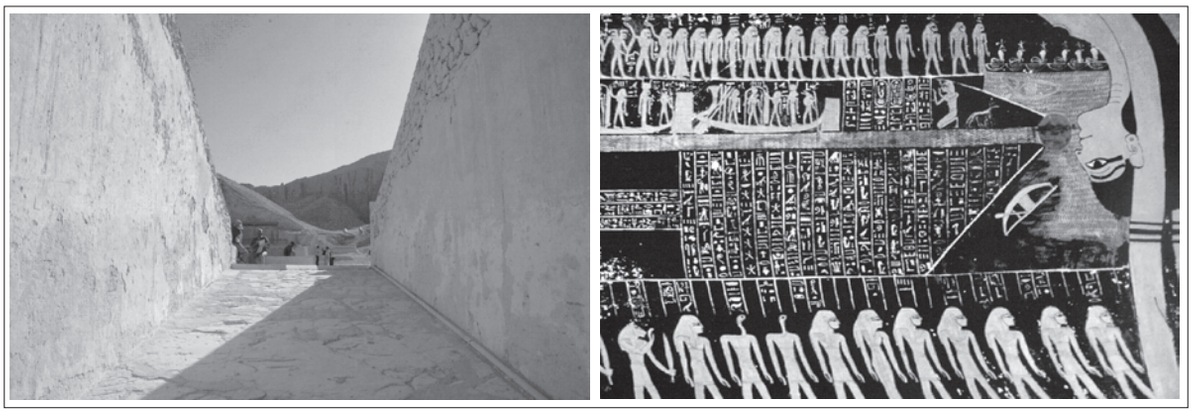

Fig. 6. (a, left) The dromos of access to the tomb of Ramses VI, fifth king of the 20th Dynasty. The horizon, far from being open, is actually obscured by the cliffs of the hills over Deir el Bahari. This precludes its possible orientation upon the rising of Sirius at the time of construction. However, the central asterism of the constellation of Sah (Orion´s Belt) would have been visible in that area of the sky in the correct epoch. (b, right) A section of the Book of the Day and Night on the ceiling of the burial chamber of the same king. This mentions, among others, the constellations of Meskhetyu and Sah as most conspicuous celestial bodies in the northern and southern parts of the sky, respectively. See the text for further discussion. Photographs by Juan A. Belmonte.

Fig. 7. The sarcophagus of King Neferites I at the royal necropolis of the 29th Dynasty at Mendes, in the Eastern Delta. Either by design or by chance, the monument is orientated upon a declination of −17¼º±¾º, which roughly corresponds to the contemporary value of Sirius, the Harbinger of the Flooding. Photograph by Juan A. Belmonte.

tion. Yet we will demonstrate that we can find order in apparent chaos.

Table 1 and Fig. 5(a) seem to indicate that in the first stages of the use of the Valley during the 18th Dynasty, astronomical orientations were indeed intended. When construction began, the vast majority of the tombs were facing either sunrise or sunset, with three exceptions facing north that, surprisingly, correspond to the reigns of kings called Thutmosis. All these tombs followed a similar design that has been interpreted as an imitation of the journey of the sun through the underworld (Baqué and Costa 2007). This design was abruptly abandoned at the end of the dynasty by the "reformer" king Horemheb, who orientated his tomb with its extended axis almost S–N. This new longitudinal axis would be the norm for the remainder of the occupation of the Valley and most of the tombs, despite their real orientation, showed clear "cardinal" patterns in the design and decoration of their interiors (Wilkinson 1993). However, the tombs of the 19th and 20th Dynasties apparently lacked a commanding pattern and one would tend to suggest that the orientations were dictated by other practicalities (proximity, empty spaces) rather than by astronomical concerns. Nonetheless, there are a few examples that make us think that this was not always the case.

First, there are a couple of tombs of the 19th Dynasty, notably Merenptah's and perhaps also Twosret's, that were constructed in such a way that the light of the rising sun on a couple of particular days of the year could pass right through the burial chamber and strike the sarcophagus of the king. Whether or not this could be connected to any symbolic aspect of the burial ritual will be the subject of future studies.[3]

Second, there are another two tombs, in this case of the 20th Dynasty, Ramses IV´s and Ramses VI´s, whose orientation is so similar, despite the distance between them within the Valley, that it is difficult to attribute this to mere chance. When we first analyzed the data, using the information provided by the Theban Mapping Project (see Table 1), we were puzzled by the possibility that both tombs could have been orientated to Sirius (*Sopdet*), the brightest star of the sky and the leader of the decans. However, once more we were convinced of the necessity of performing actual fieldwork on site when detecting that this orientation was precluded by the presence of a nearby horizon, as demonstrated in Figure 6(a). Curiously, our corrected data (see Table 1) still showed that both tombs could have been oriented upon exactly the same celestial object: perhaps this was the important constellation of *Sah*, often mentioned in Egyptian astronomical texts (Maravelia 2006; Lull and Belmonte 2006), and indeed featured in the astronomical ceilings of the tombs of both Ramses IV and Ramses VI (see for example Fig. 6(b)). Significantly, a majority of the royal tombs of the Valley of the Kings did show astronomical patterns of orientation as opposed to mere topographic dictates.

Few royal burial monuments of the Late Period and none of the Ptolemaic Era have survived. Consequently, it is difficult to extend our analysis further in time. Perhaps we should just mention that, on the one hand, the tombs at the royal necropolis of Tanis apparently follow the general pattern of orientation of the city and likely follow similar rules (see Paper 3, Part II). On the other hand, in Fig. 7 we show the scant remains of the royal necropolis of the pharaohs of the 29th Dynasty at Mendes, in the Delta. An astronomical intention could perhaps be inferred from our data, but at the present state of our knowledge, it would be unwise to carry our conclusions any further.

[3] A very prosaic interpretation is that this design would have permitted direct sunlight to enter the deep interior of the tomb to facilitate its decoration.

Acknowledgements

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NUO UMM AL QAB IKI BIBAN AL MULUK: SENOVĖS EGIPTO KARALIŠKŲJŲ KAPŲ ORIENTAVIMAS

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Santrauka

Nuo 2003 m. lapkričio mėn. vykdoma Egipto–Ispanijos archeoastronomijos misija Senovės Egipte, globojama Vyriausiosios senienų tarybos ir finansuojama Ispanijos švietimo ir mokslo ministerijos pagal *Orientatio ad Sidera* projektą. Iki šiol visoje šalyje įgyvendinamos keturios kampanijos, kurių metu buvo vykdomos sistemingos, statistiškai reikšmingos Egipto archeoastronomijos studijos. Tai pirmas tokio pobūdžio tyrimas Egipte.

Vienas pagrindinių projekto tikslų – pateikti galutinį atsakymą į klausimą, ar Senovės Egipto kulto pastatai buvo astronomiškai orientuoti. Ši tema egiptologų ilgą laiką buvo traktuojama labai prieštaringai. Daugelis jų palaikė nuomonę, kad kulto pastatai, ypač šventyklos, buvo topografiškai orientuotos pagal Nilo tėkmę, tačiau tai nebuvo įrodyta. Mūsų preliminarūs šventyklų tyrimų rezultatai (Shaltout, Belmonte 2005, p. 273–298; Belmonte, Shaltout 2006, p. 173–192) statistiškai tai įrodė. Taip pat tyrimas parodė, kad Senovės Egipto šventyklų statytojai kreipė dėmesį ir į tam tikrus astronominius reiškinius. Mes atskleidėme, kad kraštovaizdis plačiąja prasme, apimant žemės ir dangaus aspektus, vaidino ypač svarbų vaidmenį parenkant Senovės Egipto kulto pastatų vietą ir orientavimą.

Viena įdomiausių mūsų tyrinėtų paminklų grupių – Senovės Egipto karališkieji nekropoliai. Kasinėjimai buvo vykdomi Umm al Qab vietovėje, netoli Abydos, kur yra karališkasis ikidinastinio periodo kapinynas, didelė teritorija netoli Kairo, kurioje stovi Senosios ir Vidurinės karalystės piramidės, ir Biban el Muluk (Karalių slėnis) Tebuose, kur buvo tyrinėjami požeminiai Naujosios karalystės karalių kapai.

Straipsnyje pristatomi preliminarūs šių vietovių tyrimų rezultatai. Paaiškėjo, kad teisingas statinių orientavimas nuo ankstyvųjų *mastabų* iki vėlyvųjų *hypogėjų* buvo būtinas, ir dangus čia vaidino labai svarbų vaidmenį. Nuodugni šių rezultatų analizė padės geriau suprasti Senovės Egipto pasaulį.

Vertė Jurgita Žukauskaitė