



www.maajournal.com

Mediterranean Archaeology and Archaeometry
Vol. 20, No 1, (2020), pp. 145-161
Open Access. Online & Print.



DOI: 10.5281/zenodo.3605679

TOMB ORIENTATION AND POSTHUMOUS VISIT TO THE CAPITAL OF THE SUPERNATURAL WORLD: THE GUO CEMETERY AT SANMENXIA, HENAN, CHINA

Zhang, Lidong

*School of History & Culture, Henan University, 85 Minglun Street, Kaifeng, Henan, China
(13523789831@163.com)*

Received: 19/12/2019

Accepted: 10/02/2020

ABSTRACT

Tomb orientation is a serious matter in mortuary ritual. By contextualizing the predominant orientation of a cemetery, we may find the religious belief of afterlife. In the case of the Guo cemetery (770 B.C. to 665 B.C.), China, most burials were aligned with their heads to the north which is slightly deviated to the east. Such an orientation is definitely pointing to the North Polar Star, which is the abode of the Supreme One in later religious belief of the heaven. In textual materials the target of the tomb occupants heading to is the Dark Capital of the underworld, also located to the north end of the universe. Considering the identical locations of the North Polar Star and the Dark Capital, we may conclude that both the Heavenly Court and the Underground Capital are located in the center of the supernatural world. From the distribution of the Guo cemetery, we can sense two layers of motions, the tomb occupants are heading and ready to depart to the center of the supernatural world. The tomb is the home of the dead, and the posthumous journey to the center of the supernatural world is to report their arriving, in order to live a better life in the other world. Placing the dead with their head toward north is a common practice of the Xia, Shang and Zhou dynasties, and the change of deviation from west to east coincides with the change of the North Polar Star from Thuban to Kochab, hence, the religious belief about the afterlife observed from the Guo cemetery should be a common for Chinese Bronze Age. A brief connection to analogous Mediterranean practices is discussed.

KEYWORDS: Cemetery, tomb, orientation, north polar star, religious, Dark Capital

1. INTRODUCTION

Tomb orientation is a very serious matter in almost every culture (James 1957, 133-139). Where and how to put the remains of the dead is generally not only a matter of functional expediency. The place and posture of the dead in any society will have significant and powerful connotations within people's perceived socio-cultural geographies. By placing and positioning the dead human societies map out and express their relationships to ancestors, land and the living (Parker, 2000, 141).

In other parts of the World and in the Mediterranean orientation of burials has been studied, related to sunrise, moonrise, topographical points, stars/constellations (Belmonte et al., 2016; Hoskin, 2001; Liritzis et al., 2020).

The impressive Nabatean tombs at Petra, Jordan, has been suggested to have a series of solstitial and equinoctial alignments which might have lately helped its selection as the cathedral of the city (Belmonte et al., 2013). In other rock cut tombs studied, from Petra in Jordan and Madaa'in Saleh (Hegra) in northern Saudi Arabia via satellite images from Google Earth and its accessory facilities on compass and slope evaluation, it is found that there is not an apparent predominate orientation; and tombs are rather made by wealthy chiefs and officers, and any definite conclusion on deliberate orientation is without a strong argument (Liritzis et al., 2015).

The orientations of the Mycenaean tholoi tombs in Greece are highly correlated with topography and to the method of construction and not to any confirmable inclination toward astronomical events on the part of their designers (Mickelson & Mickelson, 2014).

In Crete (Greece) in the orientation project of the cemetery of Late Minoan period at Armenoi, out of 2029 tombs measured 95% oriented between the solstices, 4% southernly, and 3% northerly (Papathanassiou & Hoskin., 1996; Papathanassiou et al., 1992).

The Egyptians believed that the unmovable area the stars circled was heaven, and the pyramids were built to align north with a single, perfectly aligned vent. The entrances to all the Fourth Dynasty pyra-

mids at Giza (the Great Pyramid, the Pyramid of Khafre, and the Pyramid of Menkaure) are in their north faces and the corridors are sloped down from the entrances in such a way that both the circumpolar stars and the pole star were visible. The sides of all three of the Giza pyramids were astronomically oriented to the north-south and east-west within a small fraction of a degree (Wells, 1996, 35; Spence 2000; Belmonte, 2001; Castro, 2015).

A pyramid was a resting place, rather than a tomb, providing the occupant with all the requirements both physical and mystical for the journey of the ka to the afterlife to become an akh. Because of this, as David Warburton puts it, "In this sense... the entrance is in fact the exit" (Warburton, 2012).

Many archaeological cultures or cemeteries have a main orientation (Wang, 1989). Sunrise is among the earliest observed natural phenomena, so the east is the most important direction in many ancient cultures, yet sunset may be just as important as the east. Some ethnic groups only have two meaningful directions in their cosmology: east and west (Wang, 2001). For many cultures, a mountain may become a significant landmark from which a society may orient itself or derive important spiritual meaning (Mt. Olympus, Mt. Song, etc.). Additionally, a river (e.g. Nile, Egypt) may also be an axis which the society uses to orient itself towards the river, along it, on one bank or the other, or upstream and downstream.

The first Chinese dynasty Xia (2070BC-1600BC), the second dynasty Shang (1600BC-1046BC) and the third dynasty Zhou (1046BC-256BC) are sometimes generalized as the Three Dynasties. They centered in the Central Plains successively. In 771BC, the Zhou court moved to its secondary capital Luoyang forced by western barbarians. The Guo is a branch of the Zhou royal family, detached before the founding the dynasty, and soon separated into two parts, one went to the east (present-day Zhengzhou) to establish a vassal state, and another stayed in court as a hereditary minister. After the eastern move of the Zhou court (770BC), the previous Western Guo also moved to the east at present-day Sanmenxia and terminated by the state of Jin in 655BC (Fig. 1).

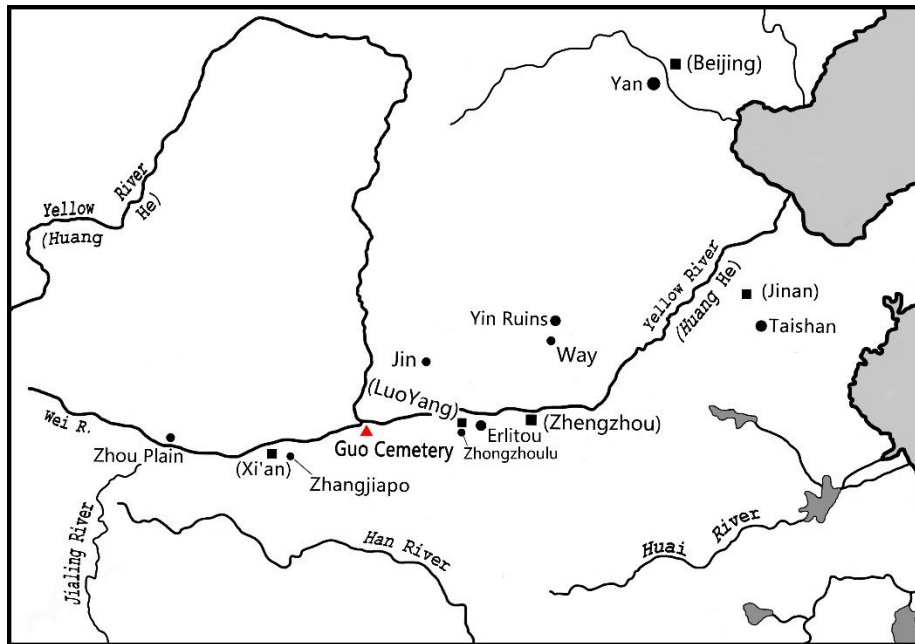


Figure 1. Location of the Guo Cemetery in Sunmenxia and some mentioned sites (34°46'23"N, 111°12'04"E).

The Guo cemetery is an appropriate case for the study of tomb orientation and its ritual, astronomical and religious meanings. In addition to its royal status, it is geographically close to the capital, and more importantly, it is one of the most thoroughly excavated cemeteries of Zhou dynasty. This study starts with generalizing the primary orientation and the significance of north in the Guo cemetery, then compares the orientation with astronomical north, contextualizes tomb orientation with relevant information in transmitted texts, reconstructs the understanding of the supernatural world, and finally advances a posthumous journey to the capital of the supernatural world.

Orienting the dead to the north is a tradition from Xia dynasty, so this study on the Guo cemetery can also contribute to our understanding of ancient Chinese civilization, such as mortuary ritual, astronomy, cosmology and religion.

2. TOMB ORIENTATIONS OF THE GUO CEMETERY

The Guo cemetery located at north of present city Sanmenxia. In late 1950s, archaeologists excavated 234 tombs and 3 chariot-horse pits, distributing in an area which was 280 meters long and 200 meters wide (Institute of Archaeology 1959,1-2). From 1986 on, no less than 18 tombs, 4 chariot-horse pits, 2 horse pits have been excavated inside and outside the previous excavated area (Henan Provincial Institute 1999, 9). The entire cemetery can be regrouped into 7 groups.

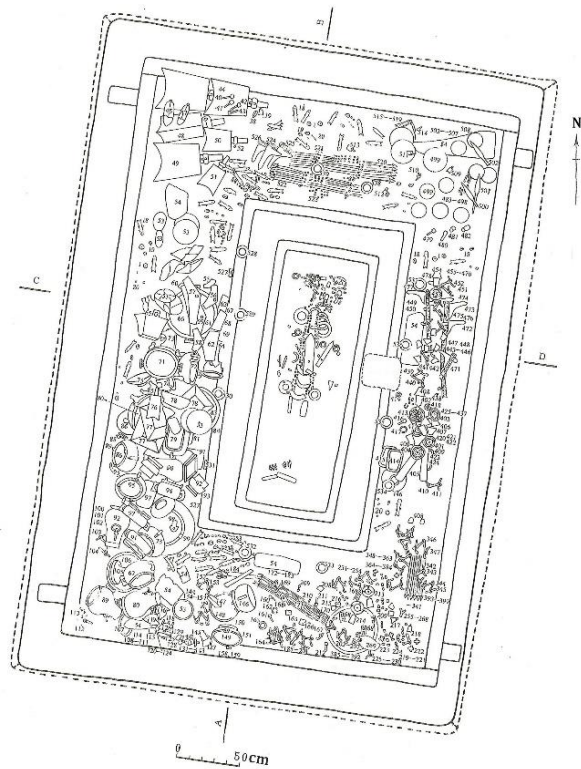


Figure 2. Plan of Tomb 2001 in the Guo Cemetery (Henan Provincial Institute,1999, p.22, fig12.)

The orientations of 247 tombs can be found in the reports. Based on my statistics, roughly 95% of the tombs are primarily oriented north (Fig. 2 and Fig. 3a, b), and tombs oriented to other directions are very few (Table 1).

Table 1: Orientations of Tombs in the Guo Cemetery

	North	East	South	West	Total
Tombs (1950s)	219	1	10	1	231
Tombs (1990s)	16				16
Total	235	1	10	1	247
%	95.14	0.4	4.05	0.4	99.99

Among the 235 north oriented tombs, 67.70% (more than 2/3) of them deviates eastward up to 32 degree, while only 10.60% of them were oriented to the true north, and 21.70% of them deviates westward up to 38 degrees (Table 2).

The orientations of the 159 easterly deviated tombs scatter from 1 to 32 degrees, and 52.3% of them are 5-10° (Table 3, Fig. 3a, b).

Table 2: Deviations (%) of Northerly Oriented Tombs

Orientation	Deviated to NW	True North	Deviated to NE	Total
Tombs (1950s)	48	25	146	219
Tombs (1990s)	3		13	16
Total	51	25	159	235
%	21.70	10.60	67.70	100

Table 3: Northerly Oriented and Easterly Deviated Tombs in the Guo Cemetery

Degree	Tombs	Quantity
1	1645, 1680, 1731, 2010	4
2	1616, 1609, 1629, 1725, 1849	5
3	1601, 1611, 1636, 1620, 1662, 1773, 1832, 1821, 1804, 2119	10
4	1621, 1671, 1666, 1850, 1751, 1812, 2006	7
5	1055, 1607, 1639, 1626, 1623, 1724, 1723, 1721, 1719, 1718, 1691, 1656, 1652, 1769, 1788, 1786, 1839, 1824, 1744, 1743, 1728, 2118, 2018, 2016, 2013, 2013, 2012	27
6	1615, 1720, 1765, 2121, 2011	5
7	1641, 1628, 1715, 1705, 1688, 1793, 1771, 1837	8
8	1643, 1635, 1632, 1675, 1674, 1676, 1774, 1753, 1726	9
9	1638, 1622, 1755, 1761, 1757, 1745, 1729, 1797	8
10	1612, 1602, 1644, 1642, 1637, 1633, 1630, 1627, 1624, 1709, 1707, 1706, 1675A, 1668, 1667, 1651, 1794, 1777, 1767, 1842, 1756, 1758, 1833, 1747, 1810, 1738, 2001	27
11	1646, 1689	2
12	1610, 1605, 1634, 1619, 1617, 1702, 1694, 1692, 1679, 1664, 1834, 1796	12
14	1604, 1659, 1827	3
15	1647, 1703, 1661, 1770, 1789, 1772, 1847, 1843, 1823, 1822, 2122	11
16	1838, 1795	2
17	1683	1
18	1768, 1807	2
19	1803	1
20	1614, 1708, 1775, 1763, 1759, 1840, 1749	7
22	1754, 1798	2
24	1678	1
25	1766, 1764, 1762, 1748	4
32	1699	1
Total		159

The few tombs oriented to other directions are exceptions. Some of these exceptions can be understood after observation and contextualization (Table 4).

The few tombs deviate from True North by more than 90 degrees are described as 'contrarily oriented tombs' (Wang, 1989). I would still use the 'contrary orientation' concept, but confine the definition as

tombs toward south, which deviate no more than 45 degrees. Furthermore, I would also define the northerly, easterly and westerly oriented tombs with the same criteria, and treat all the southerly, easterly and westerly oriented tombs as "abnormally oriented tombs".

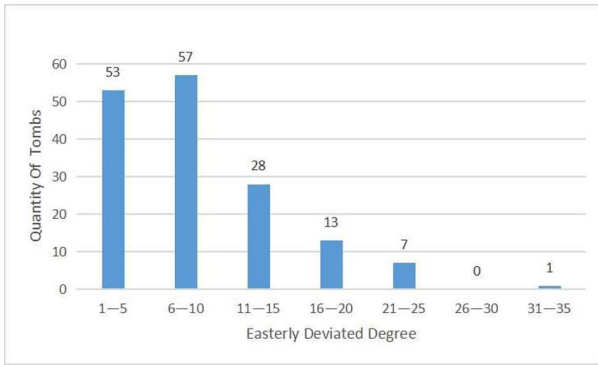


Figure 3a. Northerly Oriented and Easterly Deviated Tombs in the Guo Cemetery, per groups of 5 degrees

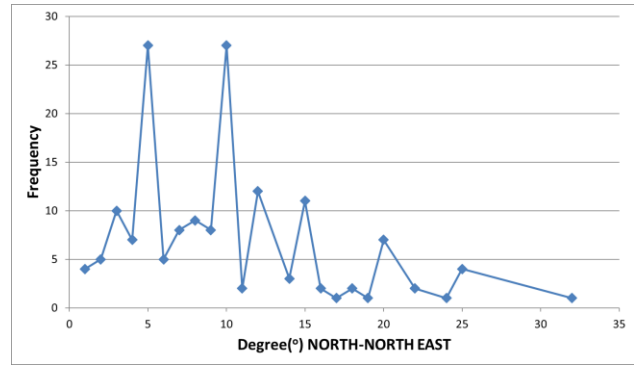


Figure 3b. Deviation per degree from the North- North East of tombs in the Guo cemetery

Table 4: Tombs in Orientations other than the Principal Orientation

Orientation	Deviation	Tomb	Degree	Deviation	Grave goods
South	Westerly deviated	1631	189°	9	1 Bronze <i>li</i> ; 4 stone halberds; 2 jade <i>jue</i> ; 1 stone <i>huang</i>
		1781	195°	15	2 jade <i>jue</i>
		1693	192°	12	None
		1717	190°	10	2 jade <i>jue</i> ; 2 stone cowry shell
		1698	182°	2	2 pottery <i>dou</i> , 1 pottery basin, 1 pottery <i>guan</i> .
		1760	185°	5	2 stone halberds, 2 strings
	Real South	1714	180°		Bronzes: 1 <i>ding</i> , 1 <i>pan</i> , 1 <i>yi</i> ; Jades: 2 <i>jue</i> , 3 small pieces; Stones: 5 halberds, 1 <i>huang</i> , 2 strings.
	Easterly deviated	1697	176°	4	2 pottery <i>dou</i> ; 1 pottery <i>guan</i> ; 1 stone <i>jue</i> ; 1 stone halberd.
		1828	179°	1	1 pottery <i>li</i> ; 1 pottery <i>guan</i> ; 1 stone halberd; 1 jade <i>jue</i>
		1672	168°	12	None
West		1695	271°	1	Potteries: 1 <i>li</i> , 1 basin, 1 <i>guan</i>
East		1787	127°	37	1 jade <i>jue</i>

In the Guo cemetery, there are 12 abnormally oriented tombs (4.85%). Ten (10) of them are heading south, namely in the contrary orientation to the principal orientation of the entire cemetery. One tomb is heading east, and another is heading west. Of the ten tombs oriented to the south, 6 are deviated to the west, and 3 to the east (Table 4, Fig. 4). These 6 southerly orientated and westerly deviated tombs are consistent with the northerly oriented and easterly deviated tombs.

Abnormal burial orientations must be caused by abnormal social status, abnormal deaths, etc. The 12 abnormally oriented tombs are all located in Group V, VI and VII. 6 of these tombs are located on the peripheral areas. The M1787, heading southeast, is located on the northeast corner of Group V. Then, M1695, heading west, is located in the northern pe-

riphery of Group VI and clearly separated from the rest. M1631, heading south, is located in the western periphery of Group VII and M1828, M1717 and M1714 are located on the borders of the centers of Group V and VII, respectively. Some “contrarily oriented tombs” are located in the peripheral area of tomb groups and can thus be set apart from the northerly orientated ones (Wang, 1989). The reasons for these differing tomb orientations are unclear. However, the ‘abnormal’ tombs are not significantly different from the ‘normal’ tombs in terms of grave goods (Table 5), and furthermore there is no evidence to suggest any abnormality to their death to justify different tomb orientation than the norm such as a pathology, murder, treason, blasphemy, criminal, etc.

Table 5. Joint Burials Containing Abnormally Oriented Tombs

Pair	Tomb	Size	Location	Position	Orientation	Grave goods	Gender
1	1828	2.2×1.1-3.35	L	E	179	Pottery: 2; stone: 1; Jade: 1.	M
	1826	2.3×1-3.25	R	F	340	Pottery: 3; Shell: 1.	F
2	1717	2.4×0.97-1.7	L	E	190	Jade: 1; stone: 1.	M
	1716		R				F
3	1714	3.25×1.95-6.49	L	E	180	Bonze: 3; stone: 6+; jade: 4.	M
	1712	2.54×1.2-1.05	R	E	0	Jade: 2	F
4	1696	2.8×1.5-1.5	L	E	328	Pottery: 7; stone: 1; jade: 1; bone: 1, shell:1	M
	1697	2.8×1.5-2.4	R	F	176	Pottery: 3; Stone: 1; Jade: 1.	F
5	1698	2.8×1.5-2.4	L	E	182	Pottery: 4	M
	1805	2.5×1.3-1.6		E	355	Pottery: 3; Shell: 1; stone:1; jade: 1	

Notes:

- 1) L, R for location: L: left; R: right.
- 2) E, F for position: E: extended; F: flexed.
- 3) M, F for gender: M: male; F: female.

The southerly oriented tombs should be distinguished from those heading east or west, and some of them can be interpreted. The abnormal orientations of M1828, M1698, M1697, M1717 and M1714 are probably following a counter-orientation tradition of joint burials. In M1828-M1826, M1697-M1696, M1714-M1712 pairs, the west tomb was oriented to south, whereas the east one was oriented to north, but in reverse in the pair M1698–M1805. In the M1717–M1716 pair, M1716 is missing in the registration form of tombs. Such a counter orientation might resemble the similar sleeping mode of husband and wife that was still very common some decades ago in the countryside of north China. Moreover, such a counter orientation might be an indigenous tradition. Among the newly excavated Western Zhou (1026BC-771BC) tombs, all the male tombs are heading east, whereas all the female tombs are heading west (Sanmenxia City Bureau of Culture 2007). Two Warring States (775BC-221BC) tombs are seemingly paired. The east tomb is heading north, whereas the west tomb is heading south (Institute of Archaeology 1994, 5 and 204). These counter-orientation pairs are probably outcome of abnormal marriage.

These examples within the Guo cemetery that are not oriented north are few (about 5%) and can be

understood as either abnormal deaths, or abnormal marriage. These few outliers do not undermine the fact that the vast majority of the tombs at the Guo cemetery are orientated north. This phenomenon is not accidental. It is a custom widespread among the Yellow River settlements which ought to be contextualized synchronically and diachronically.

3. THE SIGNIFICANCE OF NORTH IN THE GUO CEMETERY

The importance of the North is reinforced by its repetition with regards to burial complexes. In the Guo cemetery, the northern orientation operates on three levels. Individual tomb orientation is just one of them. The middle level is that the elites are buried to the north end of the entire cemetery. The upper level is that the cemetery is located to the north of the city.

The privilege of the northernmost location is not easy to be understood. Most of the tombs are heading north, so we may imagine that the tomb occupants are seemingly marching towards the north. In such a procession, the elites are absolutely at the leading position, and then the social status in the Guo state is well expressed in the arrangement of burial locations (Figure 5).

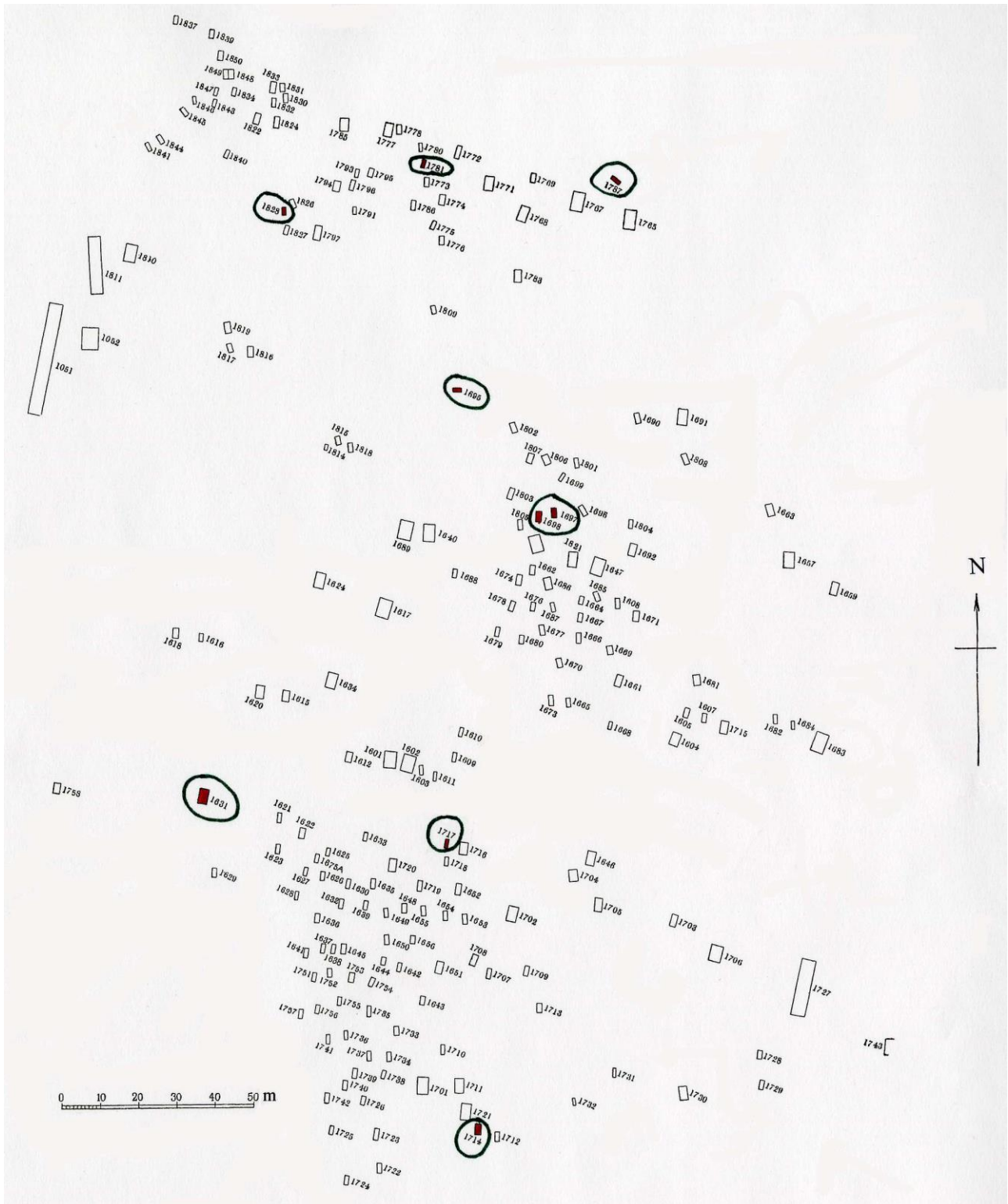


Figure 4. Distribution of the abnormally oriented tombs in the Guo cemetery (Based on Institute of Archaeology, 1959, figure 1B)

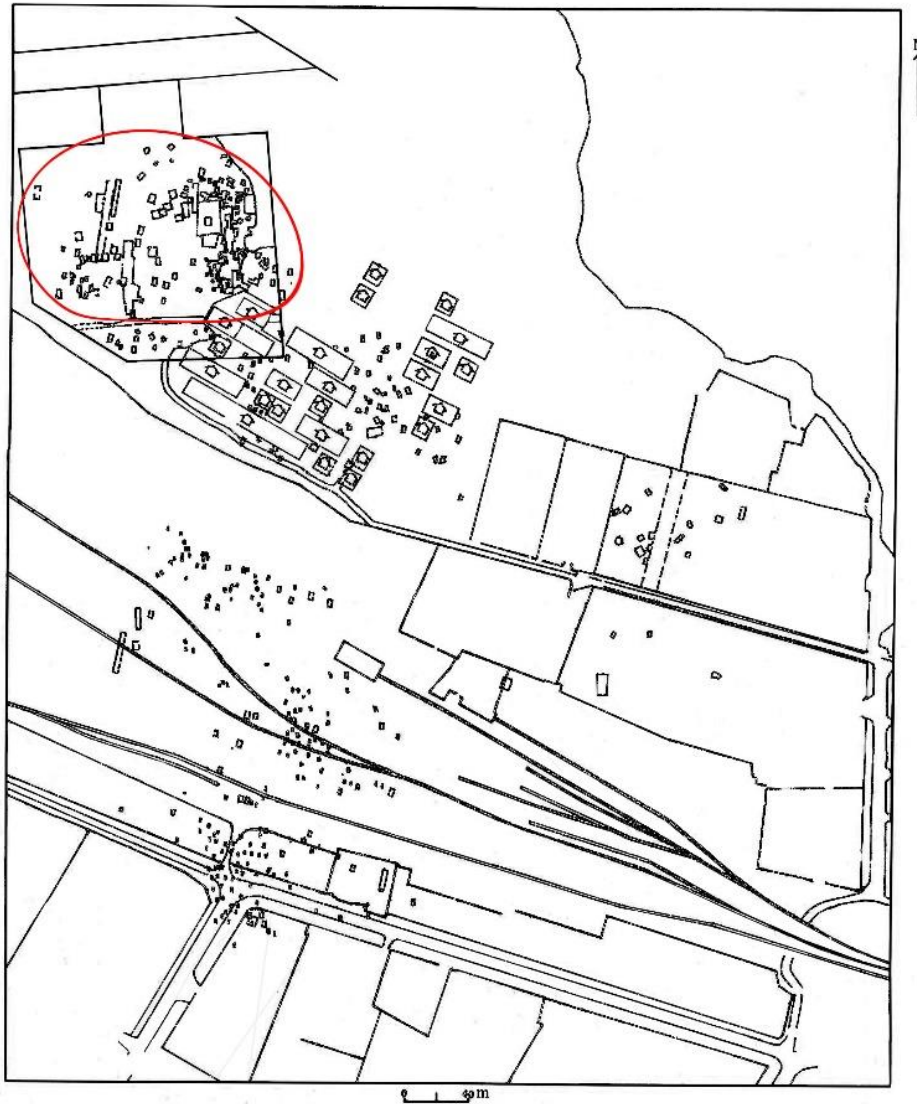


Figure 5. Burial ground of lords in the Guo Cemetery
(Based on Henan Provincial Institute, 1999, p.4, fig.2)

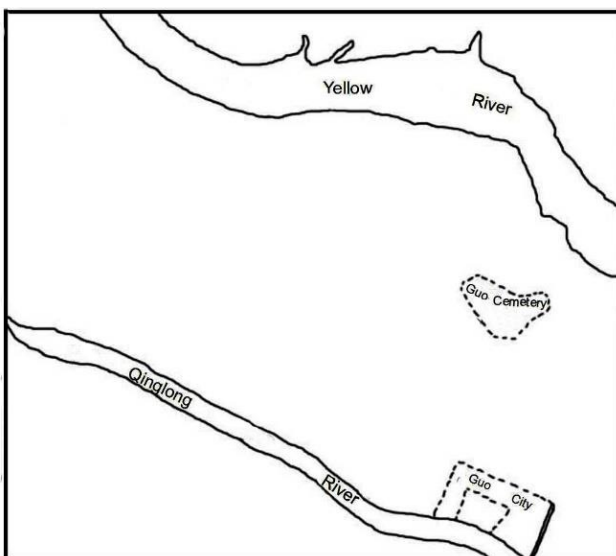


Figure 6. South-north juxtaposition of the city and cemetery
(Based on Jiang Tao et al., 2002, p.12, fig. 1)

The south-north juxtaposition of the city and the cemetery is reminiscent of the Eastern Han's (25AD-220AD) tomb texts where the capitals of the living and the dead are juxtaposed along an east-west axis (Wu, 1981). Similarly, in the case of the Guo society and the Zhou more generally, a south-north juxtaposition between the metropolis and the necropolis should be understood as a contrast between the realm of the living and the realm of the dead (Fig. 6).

The counter orientations of the city and the cemetery compose another south-north juxtaposition. Taking references of later capital cities, it is evident that ancient Zhou dynasty cities such as the Guo city should be orientated to the south. In 2000 and 2001, archaeologists excavated the Guo city. According to the very brief newspaper notice, this city has two ramped-earth walls. The outer wall is 1,000-1,050 meters long from east to west, and 560-610 meters

wide (calculated on the remaining part) from south to north. The orientation of the east wall is 207.5°. The inner city is nearly rectangular, located in the southwest part of the outer city. Its perimeter is around 1,300 meters. Inside the inner city found many large square and rectangular ramped-earth foundations. One of them near the north wall was excavated. It is parallel to the north wall, measuring 24.6 meters long from east to west and 21 meters wide from south to north. Its orientation is 210° (Archaeological team at the Lijiayao Site 2001, Wei, Xingtao et al. 2002). Based on the notion that the city should be oriented to the south and the measurement of the outer wall and the palatial foundation, we know that the city was oriented to the south, and deviated to the west 27-30 degrees. The westerly deviated south orientation of the city obviously corresponds to the easterly deviated north orientation of the cemetery.

How typical is the Guo cemetery in Zhou dynasty? As the cemeteries of the Zhou kings have not been found yet, and the occasional inconsistencies in orientations in Zhou tombs make it challenging to claim that the cultural norm for the principal orientation of Zhou tombs is to the north with an eastern deviation, as in the case of the Guo cemetery. For example, in the Zhangjiapo cemetery about half of the tombs are oriented north deviated west, a quarter of them are headed towards true north, and a fifth of them are headed north but deviated east. Furthermore, 3 out of the 4 large tombs with ramps, identified as belonging to the Jing family, are heading north, deviated west (Institute of Archaeology 1999, 5 and 38). The same orientation is found at the Yan cemetery (Beijing City Institute of Cultural Relics 1995, 7, 8, 73-78). Correspondingly, the residential compound at Fengchu, Qishan, Shaanxi, is oriented south and deviated east (Archaeological Team at the Zhou Plain 1979). In contrast, the tombs of the cemeteries of the Marquises of Jin and Way (Li, Boqian 1999; Guo, Baojun 1964, 7), as well as of the Dukes of Zhou, which are all headed north with an easterly deviation (Chong, Jianrong 2018). The ancestral temples at the Zhou Plain are consistent with this (Archaeological Team at the Zhou Plain 2002). Furthermore, most of the Zhou tombs in Luoyang are headed north, deviated east, as well most Eastern Zhou (770BC-221BC) tombs excavated near Zhengzhou are also oriented north with an easterly deviation. Yin Qun states that the Eastern Zhou tombs in the vicinity of the capital and the neighboring Guo and Zheng cities are generally oriented north and deviated east (Yin Qun 2001, 67-68). Li Ling further notes that the Guo and Zheng are inner-service aristocrats, which are different from the marquises of Jin, Yan, Wei, Lu, and so on in the outer-service sys-

tem (Li, Ling 1996). In general, in the Middle Yellow River region, approximately correspond to the capital and inner-service area during the Early Spring and Autumn Period (770BC-476BC), the principal tomb orientation is most probably an easterly deviated north. In other words, the burial customs observed at Guo are therefore typical to contemporary dominant Zhou culture, representing a typical Zhou burial tradition.

The importance of a northern orientation of tombs can also be traced back to the Shang and Xia dynasties as well. An exhaustive study of the Bronze Age burial traditions of the Yellow River basin is beyond the scope of this paper. But briefly, in the Shang dynasty a similar pattern can be observed. For example, nearly all the palatial foundations at Zhengzhou Shang City and Yanshi Shang City are oriented south with a western deviation and, correspondingly, the principal orientation of Shang tombs is north with an eastern deviation. At the Yin Ruins (Anyang), most Shang tombs are also oriented north with an eastern deviation and the aforementioned south-north juxtaposition between living and dead is also visible. The royal cemetery is to the north of the Palatial Zone, and tombs of the Shang Kings oriented north with an eastern deviation.

Furthermore, in the Xia burial tradition, the main orientation is north as well. However, the main orientation of the palatial foundations of the Xia is south deviated east, whereas that of the Shang is south deviated east. In the Erlitou site, 35 out of 48 tombs are heading north, and deviate west. As the 9 easterly oriented tombs are in one burial ground they may be the burials of another ethnic group. The primary orientation of the Erlitou tombs is north-deviated-west and consistent with the orientation of the palatial foundations (Zhang, 1999).

Generally speaking, the north orientation and the south-north juxtaposition between the living and the dead, can be traced back to the Erlitou Site, capital of Middle and Late Xia dynasty. The only change of the north tradition of tomb orientation through such a long history is that the early westly deviation changed to later eastly deviation after the Shang dynasty established.

Such a south-north juxtaposition of the orientations of the living and the dead is very similar to that in the Guo cemetery.

The Guo city was also been excavated, yielding wall, moat and palaces, providing comparative materials for our study of the cemetery.

4. PRIMARY TOMB ORIENTATION AND THE ASTRONOMICAL NORTH

After generalizing the northern orientation and eastly deviation in the Guo cemetery, as well as the

representativeness in the Zhou culture and changing trajectory from Xia to Zhou periods, it would be judicious to ask why such an emphasis on a northern orientation; and which north was used specifically?

To place the dead in certain direction is not a senseless custom, it represents a certain thought process (Ren, 1983, 5). When discussing the orientation of Shang tombs, Keightley insightfully deduced: "The orientation of the dead was rarely, if ever, based upon some local feature of the landscape. It appears to have derived from some larger, more abstract plan that these early cosmologists discerned on earth and in the heavens" (Keightley, 2000, 84). To then correctly understand the meaning of northern orientations that decline to the east, this burial custom should be contextualized in a larger religious context.

The Guo people knew two methods to identify north: Solar method is to bisect the angle between the directions of the sunrise and sunset; while polar method is to use the North Polar Star. The north direction located with the solar method is the true north. This method has a long history in China. Scholars find enough evidences in late Shang Oracle Bone Inscriptions (Xiao, 1983), and even trace it back to prehistoric times (Lu, 2000, 53-71). The north direction located with the polar method is the so-called astronomical north. Due to the lack of high magnitude star in the celestial pole, Chinese people usually use a closest bright star to represent the pole, therefore the result of this method is always several degrees away from the true north. The magnetic method was invented after the Guo cemetery was abandoned, so the Guo people by no means used this method. However, the directions given in archaeological reports are measured with a magnetic compass, and the magnetic north is usually 1-2 degrees deviated from the true north, so the measured data we used have such an error (Institute of Archaeology 1982, 195-196). This however does not alter our concept and discussion of the aim of this paper. If the Xia and Shang people were using the solar north to orient their tombs, the change from east to west from the Xia to the Shang periods cannot be explained, so polar method is the only choice for scholars to consider.

After noticing the consistent displacement from the true north by some 5° to 12° E displayed by late Shang tombs, Joseph Needham asserted that "this difference is not far from what we should expect if the Shang people had taken care to site their tombs in accordance with the astronomical north of their time" (Needham, 1962, 313). Considering the precession of star locations, he also posited that different stars might be used as the Polar Star through history (Needham, 1959, 259-262) (See Figs. 7).

As we compared the cultural difference between the Xia and the Shang, we noticed that the different orientations of their palaces and tombs. 35 out of 48 tombs at the Erlitou site (capital of the Xia) are heading north, and westerly deviated (Zhang, 1999). Later Pankenier investigates the orientations of the tombs published in the monograph report, and concludes that all the north-heading tombs at the Erlitou site are aligned within the range of 0° to 10° west of north (Pankenier, 2004). The principal orientation of Shang tombs is easterly deviated north. 11 of 19 bronze-yielding tombs in the Zhengzhou Shang City are heading north, and easterly deviated. Totally 13 tombs excavated in the Yanshi Shang City have been reported. 7 of them are heading north, and easterly deviated (Zhang, 1999). The principal orientation of the Shang tombs at the Yin Ruins is also easterly deviated north. Among 938 tombs excavated in the West Zone, 399 tombs are heading north. 86 out of 183 tombs excavated at Dasikong in 1953 are heading north. Most importantly, 30 out of 32 large tombs with 1-4 ramps are heading north, and easterly deviated (Yang, 1989).

So, it is evident that there was a shift of deviation in the transitional period between Xia dynasty and Shang dynasty. The principal orientation of the Xia tombs is westerly deviated north, whereas that of Shang tombs is easterly deviated north. What explains this shift in the deviation of the northern orientation of tombs? After generalizing the actual degree of the deviation of the Xia, Shang tombs, Pankenier argues: "Perhaps a transition from the obsolete pole star Thuban to the upstart Kochab, located on the opposite side of the celestial pole, might provide an explanation for this phenomenon (Pankenier, 2004)". Such a deduction is based on the astronomy of ancient China (see Fig.7, Thuban in 800 BC with azimuth 346° to Kochab in 600 BC with azimuth 357°). The center of Chinese sky is the North Polar Star, but there is not a star right in the celestial pole, so Chinese people usually use the closest star to represent the pole. Naturally, the result of this method is a north direction always several degrees away from the True North. This consistent displacement from the True North displayed in tombs explains the deviations of the tombs and in turn strongly supports the application of the polar method by these Xia, Shang, and Zhou, including the Guo cemetery. The precession of star locations in time leads us to consider that different stars might have been used as the defacto polar star throughout history.

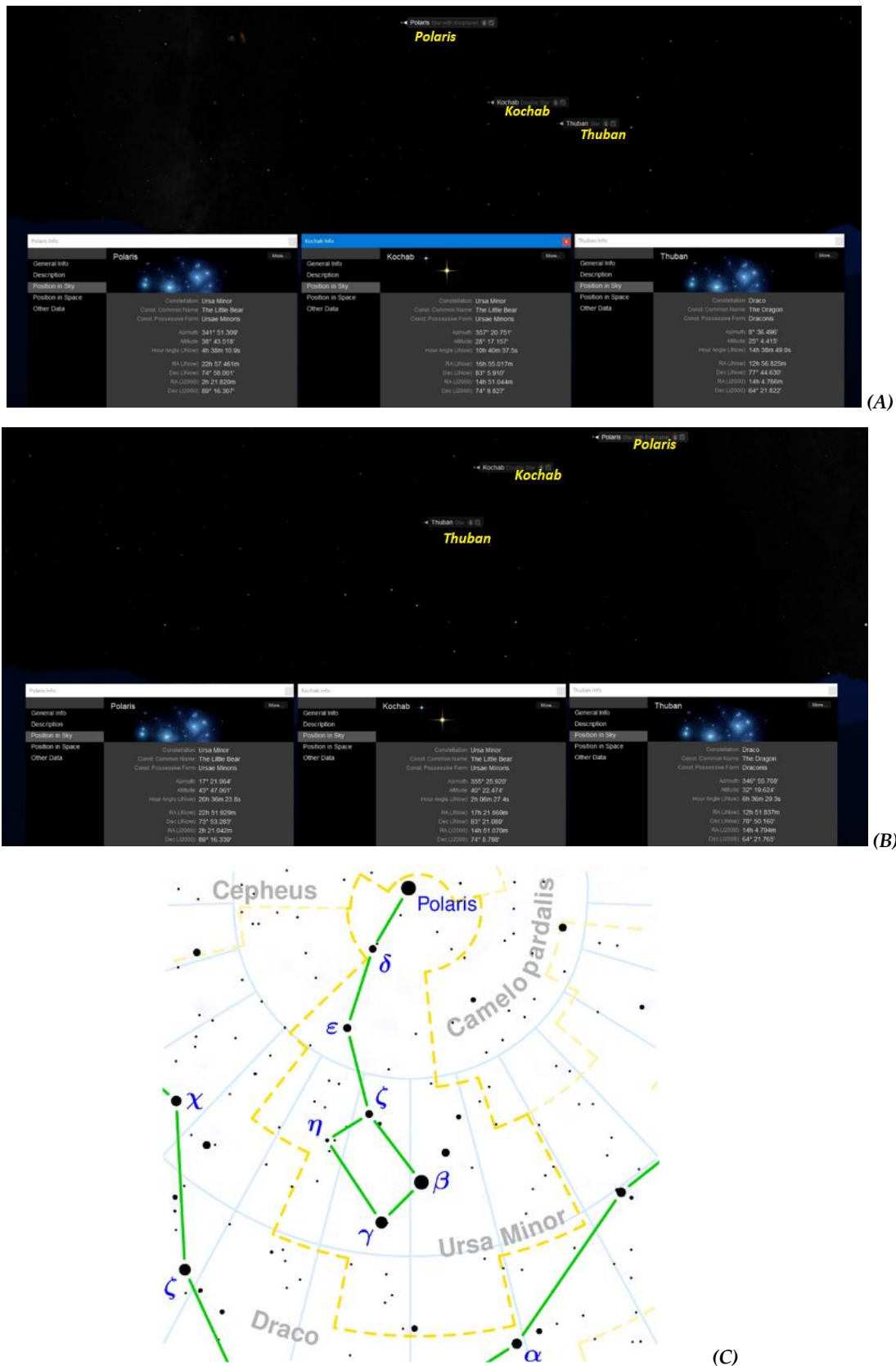


Figure 7. The skyscape of northern stars for Guo by Stellarium: a) 600 BC 1 Oct 04.00. b) the same for 800 BC 30 Sept 20.00, c) a representation of Ursa Minor configuration (Wikimedia Commons, licensed under the Creative Commons Attribution-Share Alike 3.0 Unported licence). Note the position of three bright stars of Polaris (α Ursae Minoris), Thuban (α Draconis) and Kochab (β Ursae Minoris), as well as, astronomical data (azimuths, declination etc) below.

Based on Needham and Pankenier's theory on the North Polar Star, we can easily explain the northern orientation and east deviation of the primary orientation of the Guo cemetery. In the Guo cemetery, 52.3% tombs are 5-10° east of the true north. As examined by Pankenier, the declination of Kochab from the polar is 6.5° in 1000 B.C., and 7° in 600 B. C. The Guo cemetery was used from approximately 770 B.C. to 665 B.C. Comparing the easterly deviation of the tomb orientations from the true north with the declination of the Kochab from the pole, I am very confident to associate the principal orientation in the Guo cemetery with Kochab, the North Polar Star of that time.

Then it raises another question, why the Guo people made the deceased heading to the North Polar Star, and what ritual, religious meaning behind the this orientation?

5. "NORTH" IN MORTUARY PRACTICE FROM TEXTUAL MATERIALS

Textual evidence support the notion that the principal orientation of the Guo tombs is north. *The Book of Rites* generalizes: "Burying (the dead) to the north (of the city), and with the head (of the dead) pointing north, is the common practice of the Three Dynasties. This is done because they are going to the dark (capital) (Legge, 1967, 170)". The same book even compares the orientations of the dead and living: "Thus... the dead are placed with their heads to the north, while the living look towards the south. In all these matters the earliest practice is followed (Legge, 1967, 369)". The north orientation of the dead took root so deeply that the posture of heading north is regarded as that of the dead. This is mentioned in one person's dream. He dreamed that another person was lying outside one city gate with his head to the north. Later scholars interpret the heading north posture as the appearance of the dead (Legge, 1960, 859).

After confirming the consistence on the heading north tradition between archaeological and textual materials, one would ask why the dead are heading north, why heading the North Polar Star, and what religious meaning behind the technical preference for the polar method?

Considering the strong continuity of Chinese history, we may try to clarify the astronomic and religious meaning of the heading north tradition by generalizing later astronomic and religious significance of the north. In the various late Warring States to Western Han (202BC-8AD) texts, the North Polar

Star is regarded as the abode of the Supreme One (Fig. 8), so we have enough reason to deduce: During the Zhou and earlier Xia and Shang periods, the North Polar Star might be also regarded as the abode of the Supreme One.

The heading north tradition presented in the Guo cemetery, most tombs are oriented north and specifically towards the polar star, implies that the deceased are oriented to the center of the sky, and the abode of the Supreme One. By doing so, the mourners probably believed that in their afterlife the deceased will head to the Supreme One.

Closely related to the North Pole Worship, the North Dipper was regarded as being responsible for life and death. Many pottery bottles found in Han dynasty tombs are inscribed with the Yellow God and the North Dipper, the two most powerful deities (Wang, 1981). Cui Hao of the Northern Wei dynasty (386AD-534AD) prayed to the North Dipper for prolonging his father's life. This practice was not unlike the later technique of prolonging life in the religious Daoism (Chen, 1933). The belief that the North Dipper can prolong people's life might be a leftover from earlier beliefs that were prevalent in the era of north heading tombs.

From later west-east juxtapositions of Chang'an and Taishan which are the capitals of the living and the dead, we can discern that in the earlier south-north juxtaposition of the living and dead, the north should refer to the center of the supernatural world. The tomb text dated to 172AD says: "The living faces south, whereas the dead heads north. The living and the dead are going to different directions" (Liu, 2001, 198-199).

Furthermore, according to traditional beliefs, the Dark Capital of the underworld is also located to the northernmost area. The "dark capital" is mentioned in a Warring States poem: "O soul, come back! Go not down to the Land of Darkness". An Eastern Han dynasty commentary explains: "Dark Capital is the capital of the underground lord. The underground is gloomy, so this place is described as dark" (Hawkes, 1959, 105). During Warring States period, there was a clear notion about capital, it is clarified in the *Zuo zhuan*: "Whereby all towns having an ancestral temple, with the spirit-tablets of former rulers, were called capitals, and those without such were called towns" (Legge, 1960, 115). Thus, it is beyond doubt that the Dark Capital is referring to the 'capital' city of the of the dark (immortal, after, other, spiritual, supernatural) world.



Figure 8. The Grand One travels on a Northern Diaper chariot
(From Pankenier, 2004, Fig. 9)

Coordinating the North Polar Star as the abode of the Supreme One and the Dark Capital as the capital of the underground world, we can imagine in their gaze the Heavenly Court and the Underground Capital are both probably located in the same place. In ancient China, the northern horizon was regarded as the center of the supernatural world. Probably this center may not have been distinguished as the Heavenly Court and the Underground Capital, in other words they might be two in one.

Anthropologically, the cultural emphasis placed on a city at the center of the universe where the Supreme One lives is distinct from other cosmologies in the world. This points to a specific civilizational process and to a city-dwelling culture whereby the highest aspiration of the mortals would be to exist in such an afterworld.

6. POSTHUMOUS TRAVEL TO THE CAPITAL OF THE IMMORTAL WORLD

After clarifying the northern end of the universe is the capital of the supernatural world, and the North Polar Star is the abode of the Supreme One, we can reasonably deduce and discern the meaning and significance of the "north" in the Guo cemetery.

In the mind of the planner of this well-planned cemetery, all the tombs should have composed an image that all the tomb occupants are heading to the capital of the supernatural world or to the abode of the Supreme One, symbolizing that all the individu-

als are facing the Supreme One, just like sunflowers who always turn their heads towards the sun. Such an image of sunflowers was used in China half century ago to represent the people's loyalty to the Chairman. The *Analecets* records a famous political metaphor stated by Confucius: "The rule of virtue can be compared to the Pole Star which commands the homage of the multitude of stars simply by remaining in its place" (Lau, 1992, 11).

From the distribution of the Guo cemetery, we can not only see a static picture, but also can discern some movements. This is well represented in the orientations of tombs and chariot-horse pits, in which all the people, horses and chariots are heading north, seemingly moving to the north. This movement can also be discerned in the relative location of the cemetery to the city, the internal organisation of the burial ground with the rulers at the northern end. Such a northward movement is reminiscent of the posthumous travel of the deceased recoded in later texts.

The northward travel of the dead's soul is clearly presented in the soul recall rite. The *Book of Etiquette and Ceremonial* records: "The single caller...ascends to the roof of the middle room from the east. Facing north and waving the clothes, he says: "Oh, somebody comes back!" After doing this three times, he descends to the front with the clothes (Ruan, 1980, 1128-1129). The *Book of Rites* says: "Calling (the soul) back is the way in which love receives its con-

summation and has in it the mind that is expressed by prayer. The looking for it to return from the dark region is a way of seeking for it among the spiritual beings. The turning the face to the north springs from the idea of its being in the dark region (Legge, 1967, 167)." In the soul recall ritual, the caller is standing on roof and facing north, so it is evident that in the caller's mind more convenient for him to face north than to head north. Such a facing north act implies that the dying person might have already gone to the north, and the caller tries to call the soul of the dying person back to the dead body.

The beliefs in the posthumous movements of the deceased are debated. Wu Hung suggests that "Before the idea of a transcendent paradise had been fully developed, a happy conclusion to the soul's story might simply be to return to its homeland...The two trends—the ideas of a 'happy homeland' and of immortality—were amalgamated in popular Han beliefs dealing with the problem of death" (Wu, 1987,99). Lai Guolong argues: "[T]he soul did leave the body and travel to the other world, and would periodically come back to the real home to receive the food and wine offered by its descendants." "New archaeological evidence from the Chu region suggests that there were many local traditions on certain sacred places such as mountains and mystical islands, but one popular destination of the soul's journey was Mount Buzhou located in the Northwest of the universe" (Lai, 2002, 120-121).

By incorporating textual materials and archaeological materials, one can easily clarify the paradox in the afterlife movement. The efforts then to build tombs, especially the well designed and furnished elite tombs, demonstrate the idea of a happy posthumous home. As for the intention or task of the posthumous journey, many textual evidences prove that in most cases this journey is just a short-time visit to the Dark Capital. After seeing one of the aforementioned authorities of the supernatural world after travelling to the Dark Capital, the newly deceased would go back to its home, the tomb itself. Such a posthumous movement is clearly stated in the inscription of the Meng Xiaoju Stele, erected in 98 A.D. In the eulogy on the deceased, the author described the occupant's death, posthumous journey and everyday life. After death, he traveled to the distant Dark Capital, and then came back to a place presumably where his tombs is located. A couplet vividly describes the deceased's miserable life condition, cold and clammy. In another Han dynasty stele, the Xianyu Huang Stele, the sentence that describes death is "eternally stay in the gloomy hut" (Gao, 1997, 15, 286). It is beyond a doubt that the tomb is the eternal home of the dead.

The posthumous journey to the Dark Capital is directly expressed in the generalization about mortuary rituals: Burying the dead to the north of the city with their heads pointing north are the common practice of the Three Dynasties, since they are going to the Dark Capital. The Dark Capital is sometimes abbreviated as "dark" or interchanged with a capital with other modifications, but from the contexts we know they all refer to the Dark Capital.

Demonstrating the Dark Capital is the destination of the posthumous journey, we would ask why they would go to a 'capital' in the afterlife? Later texts tell us that the mission of the deceased should be going to report in court of the Supreme One. In the Xuning slips it reads: "X[uning's head is facing into the distance, the eyes stare, the two hands are fisted. Below] enter the yellow Spring, above enter Blue Heaven. What the splendid man and splendid wife (offered) on behalf of Xuning in the prayer for favor to the Stove Lord, Xuning takes it all to go to the Heaven Sire's place to report". The Heavenly Sire is an alternative name of the Supreme One. In this context, Xuning is going to report in the Heavenly Sire's place (Harper, 2004, 234-237).

From Han dynasty (202BC-220AD) tomb texts, we know the most important procedure in this visit is to register in the immigrations office in the Afterlife. Some texts from Qin (221BC-207BC) and Western Han periods are much like the immigration papers issued by the mover's original local government, and much like the permit for move in modern Chinese registration system. Only with this document can one be accepted by the government of his or her new home. In permit, the receivers are called the premier of the Peaceful Capital or Underworld and the highest authority are called Master or Lord of the Underworld. The motivation to register in the underworld is to gain legal status in order not to become illegal immigrants. It is noteworthy that the locality of underworld officials is missing. It seems that all the deceased have the priority to see the highest supernatural authority, without any economic and transport difficulty. In contrast to this, in his life a commoner may have never any chance to see his king or emperor. As in many religions, a commoner can directly communicate with the highest supernatural authority, while he/she cannot do the same thing to the supreme leader in real life.

The resurrection story recorded in a bamboo slip texts dated around 300 B.C. provides precious materials about life and death. An underworld official receives a law suit and finally returns the protagonist back to life. Based on this resurrection story, Harper insightfully indicated: "We might speculate that there existed a Western Zhou version of a bureaucratic pantheon in which a supreme god in

heaven employed spirits to oversee cosmic affairs" (Harper, 1994). Many scholars argue that the afterworld usually mirrors this world. The difference between Western Zhou afterworld and Warring States afterworld should be the same as the difference between the feudalistic society and the bureaucratic society in real life. There is a ruler, a capital and ministers more or less.

For the mourners of the Guo cemetery, the Dark Capital in the northern horizon is the center of the supernatural world, the new deceased would go there to report in order to have a right identification. They might go not just one time, but their eternal home should the tombs.

7. CONCLUSION

Tomb orientation is a serious matter in mortuary ritual. By contextualizing the primary orientation of a cemetery, we may find the mourner's religious belief for afterlife. In the case of the Guo cemetery, most burials were aligned with their heads to the north. The emphasis of "north" is also reinforced by the northern location to the city, and the northern hierarchy of the layout whereby the northernmost location was reserved for the Guo elites.

The principal orientation of the Guo tombs is slightly deviated to the east. Such an eastern deviation can be traced back to the beginning of Shang dynasty, whereas in the Xia dynasty the principal orientation of tombs is slightly deviated to the west.

ACKNOWLEDGEMENTS

I thank the two anonymous referees, my student Alex Westra and Editor-in-Chief of MAA for taken care of this work.

REFERENCES

- Archaeological Team at the Lijiayao Site (2001) The Shangyang City of the Guo State was found at Sanmenxia. *Zhongguo wenwu bao* 2001.1.10:1 (in Chinese).
- Archaeological Team at the Zhou Plain (1979) Simplified excavation report of the Western Zhou building foundations at Fengchu, Qishan, Shaanxi, *Wenwu* 1979.10: 28 (in Chinese).
- Archaeological Team at the Zhou Plain (2002) Simplified report of the 1999-2000 excavation of the Western Zhou building foundation at Yuntang and Qizhen, Fufeng, Shaanxi, *Kaogu* 2002.9 (in Chinese).
- Beijing City Institute of Cultural Relics (1995) *Yan Cemetery of Western Zhou at Liulihe (1973-1977)*. Beijing: Wenwu chubanshe (in Chinese).
- Belmonte J.A (2001) On the Orientation of Old Kingdom Egyptian Pyramids. *Archaeoastronomy (JHA)*, Vol.32 No. 26, pp. S1-S20.
- Belmonte J. A, César González-García, A and Polcaro, A (2013) Light and Shadows over Petra: astronomy and landscape in Nabataean lands. *Nexus Network Journal*, 15, 487-501.
- Belmonte, J.A, González García, A.C, Polcaro, A, Rodríguez-Antón, A, Schaltout, M Orientatio ad sidera (OAS) (2016): Highlights of a decade of archaeoastronomical research in the Mediterranean region and beyond. *Mediterranean Archaeology and Archaeometry*, 16/4, pp. 93-101.
- Castro B. M. (2015) A historical review of the Egyptian calendars: the development of time measurement in ancient Egypt from Nabta Playa to the Ptolemies. *SCIENTIFIC CULTURE*, vol. 1, no 3, pp. 15-27. doi: 10.5281/zenodo.18446
- Chen, Yinque (1933) The correlation between the Tianshidao and the East Coast. *Zhongyang yanjiuyuan lishi yuyan yanjiusuo jikan* 3.4.

By comparing the change of principal tomb orientation with that of the North Polar Star, we can confidently conclude that the two are synchronous, and the principal orientation in the Guo cemetery, and most cemeteries in the Xia, Shang and Zhou dynasties at large, is aligned with the North Polar Star. In ancient Chinese religion, the North Polar Star is the abode of the Supreme One, the counterpart of the king or emperor in real life, so to be oriented to the North Polar Star is a presentation of facing to the Supreme One.

In textual materials the target of the tomb occupants heading to is the Dark Capital of the underworld, located to the north end of the universe. It is clearly expressed in an authoritative generalization concerning the mortuary ritual of the Xia, Shang and Zhou dynasties, and appears in slightly different names in archaeological texts. Considering the identical locations of the North Polar Star and the Dark Capital, we may conclude that both the Heavenly Court and the Underground Capital are located in the center of the supernatural world.

From the distribution of the Guo cemetery, we can sense two layers of motions, the tomb occupants are heading and ready to depart to the center of the supernatural world. The tomb is the home of the dead, and the posthumous journey to the center of the supernatural world is to report their arriving in order to live a better life in the afterworld.

- Chong, Jianrong (2018) A study of the Lingpo cemetery at the Zhaogongmiao site and related issues, *Zhongguo guojia bowuguan guankan* 2018.7. (in Chinese).
- Gan, Bao (1980) *Stories of Various Gods*, Beijing: Zhonghua shuju. (in Chinese).
- Gao, Wen (1997) *Collective Transcription on of Han Dynasty Tomb Stele Inscriptions*. Kaifeng: Henan daxue chubanshe (in Chinese).
- Guo, B (1964) *Xincun Cemetery at Xunxian*. Beijing: Kexue chubanshe. (In Chinese)
- Harper, D (1994) Resurrection in Warring States popular religion. *Taoist Resources* 5.2.
- Harper, Donald (2004) Contracts with the Spirit World in Han common religion: The Xuning prayer and sacrifice documents of A.D. 79, *Cahiers D'Extrême-Asie*, 14.
- Hawkes, D. (1959) *Ch'u Tz'u: The Songs of the South*. Oxford: At the Clarendon Press.
- Henan Provincial Institute of Archaeology and Cultural Relics, et.al. (1999) *Tombs of the Guo at Sanmenxia*, vol.1, Beijing: Wenwu chubanshe (in Chinese).
- Hoskin, M. (2001) Tombs, Temples and their orientations. *A new perspective on Mediterranean Prehistory*. Ocarina Books Ltd.
- Institute of Archaeology, Chinese Academy of Social Sciences (1959) *The Guo Cemetery at Shangcunling*. Beijing: Kexue chubanshe (in Chinese).
- Institute of Archaeology, Chinese Academy of Social Sciences (ed.) (1982) *Handbook of Archaeological Works*. Beijing: Wenwu chubanshe (in Chinese).
- Institute of Archaeology, Chinese Academy of Social Sciences (1999) *Western Zhou Cemetery at Zhangjiapo*. Beijing: Zhongguo dabaiké quanshu chubanshe (in Chinese).
- Institute of Archaeology, Chinese Academy of Social Sciences (1994) *Tombs of Eastern Zhou, Qin and Han Periods in Shaanxian*. Beijing: Kexue chubanshe. (In Chinese)
- James, E. O. (1957) *Prehistoric Religion: A Study in Prehistoric Archaeology*. New York: Barnes & Noble.
- Jiang Tao et al.(2002) *Selected Jades from Female Elite Tombs of the Guo at Sanmenxia*, Taipei: Zhongzhi meishu chubanshe (in Chinese).
- Keightley, D. N. (2000) *The Ancestral Landscape: Time, Space, and Community in Late Shang China (ca. 1200-1045 B.C.)*, Berkeley: Institute of East Asian Studies, University of California at Berkeley.
- Lai, Guolong (2002) The Baoshan tomb: religious transitions in art, ritual, and text during the Warring States period (480-221BCE), Ph.D. dissertation, University of California, Los Angeles.
- Lau, D. C. (1992) *The Analects*. Hong Kong: The Chinese University Press.
- Legge, J. (trans.) (1960) *The Chinese Classics*. Hong Kong: Hong Kong University Press.
- Legge, J. (trans.)(1967) *Li Chi (Book of Rites): An Encyclopedia of Ancient Ceremonial Usages, Religious Creeds, and Social Institutions*, Edited with introduction and study guide by Ch'u Chai and Winberg Chai, New Hyde Park, New York: University Books.
- Li, B. (1999) The sumptuary system governing Western Zhou rulers' cemeteries, viewed from a Jin rulers' cemetery. *Journal of East Asian Archaeology* Vol. 1, No. 1-4.
- Li, L. (1996) The bureaucratic system of the Western Zhou dynasty as seen in the Bronze Inscriptions). In *Papers of Exhaustive Thought*, Changchun: Jilin wenshi chubanshe. (in Chinese).
- Liu, Z. (2001). *Chronicle of Stone Inscriptions of Han-Wei Dynasties*. Hong Kong: Xin wenfeng chuban gongsi (in Chinese).
- Liritzis, I, Al-Otaibi, F.M, Castro, B, Drivaliari, A (2015) Nabatean tombs orientation by remote sensing: provisional results. *Mediterranean Archaeology Archaeometry*, Vol. 15, No 3, pp. 289-299. DOI: 10.5281/zenodo.33835.
- Liritzis, I, Laskaris, N, Vafiadou A, Karapanagiotis I, Volonakis, P, Papageorgopoulou, C, Bratitsi, M (2020) Archaeometry: an overview. *SCIENTIFIC CULTURE*, Vol. 6, No. 1, pp. 49-98 DOI:10.5281/zenodo.3625220
- Lu, X. (2006). Substance, origin and significance of the land contracts in Han dynasty". *Zhongguo shi yanjiu* 2006.1 (in Chinese).
- Mickelson, M.E & Mickelson, A.M. (2014) Do Mycenaean tholos tombs encode astronomical alignments? *Mediterranean Archaeology and Archaeometry*, Vol. 14, No 3, pp. 1-14
- Needham, J. (1959) *Science and Civilisation in China*, vol. III. Cambridge, England: The University Press.
- Needham, J. (1962) *Science and Civilisation in China*, vol. IV. Cambridge, England: The University Press.
- Parker P. M. (2000) *The Archaeology of Death and Burial*. Texas: A&M University Press.
- Pankenier, D. W. (2004) A brief history of Beiji 北極(Northern Culmen), with an excursus on the origin of the character di 帝. *Journal of the American Oriental Society* 124, 2.

- Papathanassiou, M., Hoskin, M. (1996) The late-Minoan cemetery at Armenoi, A Reappraisal. *Archaeoastronomy (JHA)*, xxvii, 54–59.
- Papathanassiou, M, Hoskin, M and Papadopoulou, H (1992) Orientations of tombs in the late Minoan cemetery at Armenoi, Crete. *Archaeoastronomy No.17 (JHA)*, 43-59.
- Ren, J. (ed.) (1983) *The Developing History of Chinese Philosophy*, vol. 1. Beijing: Renmin chubanshe (in Chinese).
- Ruan, Y. (ed.) (1980) *Commentaries of the Thirteen Cannons*, Beijing: Zhonghua shuju.
- Sanmenxia City Bureau of Culture (2007) *Ancient tombs of the state of Jiao in Sanmenxia city*, <http://www.hawh.cn/html/20071116/300875.html> (in Chinese).
- Spence, K. (2000) Ancient Egyptian chronology and the astronomical orientation of pyramids. *Nature*, 408, 6810, pp. 320–324.
- Wang, G. (1981) Potteries with red inscriptions of the Guanghe and Yongyuan reignages found in Han tombs at Baoji). *Wenwu* 1981.3. (In Chinese)
- Wang, G. et.al. (trans. and commentator) (2011) *Records of the Confucius' Family*. Beijing: Zhonghua shuju (in Chinese).
- Wang, N. (2001) *New Studies on Ancient Customs*. Lanzhou: Dunhuang wenyi chubanshe (in Chinese).
- Wang, R. (1989) Study of the tomb orientations in Neolithic China. In Tian, Changwu and Shi, Xingbang ed. *Studies on Preliminary Cultures of China*. Beijing: Wenwu chubanshe (in Chinese)
- Warburton D.A. (2012). *Architecture, Power, and Religion: Hatshepsut, Amun & Karnak in Context*. Beitrage zur Archäologie, vol. 7, Vienna: Lit Verlag.
- Wei, X. et.al. (2002) Palatial foundations have been found in the Guo Capital Shangyang City at Sanmenxia), *Zhongguo wenwu bao* 2002.1.25: 1. (in Chinese)
- Wells, R.A. (1996) Astronomy in Egypt. In: *Astronomy Before the Telescope*, Walker, Ch. (Editor), London, British Museum, pp. 28–41.
- Wu, R. (1981) The relationship between the Dao and the Wu in the texts from Eastern Han tombs. *Wenwu* 1981.3 (in Chinese).
- Wu, H. (1987) The earliest pictorial representations of ape tales. *T'oung Pao* 73.
- Xiao, L. (1983) Pole-erecting ritual in Oracle Bone Inscriptions and the Gnomon Shadow Measurement in Shang dynasty. In *Papers of the History of Science and Technology*, vol.10, Shanghai: Shanghai kexue jishu chubanshe. (in Chinese)
- Yang, B. (1990) *Commentary of the Chunqiu and Zuozhuan*. Beijing: Zhonghua shuju.
- Yang, Xizhang (1989) Veneration to northeast direction in the Shang dynasty. In *Papers Celebrating the 55th Anniversary of Su Bingqi's Archaeological Study*. Beijing: Wenwu chubanshe. (in Chinese)
- Yin, Q. (2001) *Burial System of the Eastern Zhou Dynasty in the Middle and Lower Reaches of the Yellow River*. Beijing: Shehui kexue wenxian chubanshe. (in Chinese)
- Zhang, L. (1999) Some Opinions on the Layout of Yanshi Shang City. *Zhongguo wenwu bao*, 1999.7.7: 3 (in Chinese).