

THE ASTRONOMICAL MEANING OF SOME JADE ARTIFACTS UNEARTHED AT THE LINGJIATAN SITE. 1: THE JADE TORTOISE AND THE JADE TABLET

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Abstract Unearthed in 1987 from the Neolithic site in a village called Lingjiatan in Anhui Province, China, a Jade Tortoise and a Jade Tablet are believed to be components of a set of divination tools that retain both astronomical and cosmological meaning. On the basis of the works by previous scholars, this paper aims to study this special set of jade artifacts from a syncretic point of view. After a verification of the previous researchers' opinions that the eight arrows carved in the central position of the Jade Tablet represent the Eight Cardinal Directions while the four arrows carved at its four corners represent the rising and setting positions of the Sun at the March and December Solstices. I argue that the five pairs of round holes on the Tablet's two short sides may represent the five pairs of the horizontal positions of sunrise and sunset corresponding to the later Eight Festivals in the Chinese calendar, i.e. the *Beginning of Spring*, the *Spring Equinox*, the *Beginning of Summer*, the *Summer Solstice*, *Beginning of Autumn*, *Autumn Equinox*, *Beginning of Winter*, and *Winter Solstice*. Together with the other twelve round holes on the two long sides of the same Tablet, they might have been used by the residents of the Lingjiatan site as a date-counting device related to the Eight Festivals in a year. Put together as a unified set, the Jade Tortoise and the Jade Tablet indicate an early model of the cosmos, reflecting the image of space and time in the minds of the residents of the site, which made the set a 'standard model' of the other tortoise-divination tools unearthed at the same site.

Keywords: Lingjiatan archaeological site; Jade Tortoise; Jade Tablet; primitive model of the cosmos.

1 INTRODUCTION

Located on the north bank of the Yuxi River in Hanshan County, Anhui Province, the Lingjiatan relics site is a large-scale Neolithic central settlement site dating back to 5800–5300 BP (Figure 1). Bordered by the Yuxi River in the south, and surrounded by two artificial moats on the other three sides, the total area of the site is about 1.4 million square meters (Figure 2). Since its discovery in 1985, 12 excavations have been organized, and the excavation area has reached 6,000 square meters, including an altar area of about

600 square meters, 68 tombs, two moats, and one red clay remaining area of more than 3,000 square meters. More than 3,000 cultural relics have been unearthed, and 1,200 of them are jade and stone artifacts of various types and superb craftsman-ship. The inhabitants of the settlement had reached a particularly high level of material and spiritual culture. The site is considered to be at the vanguard of Chinese civilization, where a basic level of power centralization in both military and spiritual activities already existed (Wu and Liu, 2022: 294–314).



Figure 1: The location of the Lingjiatan site (maps: Yan Yuxing).

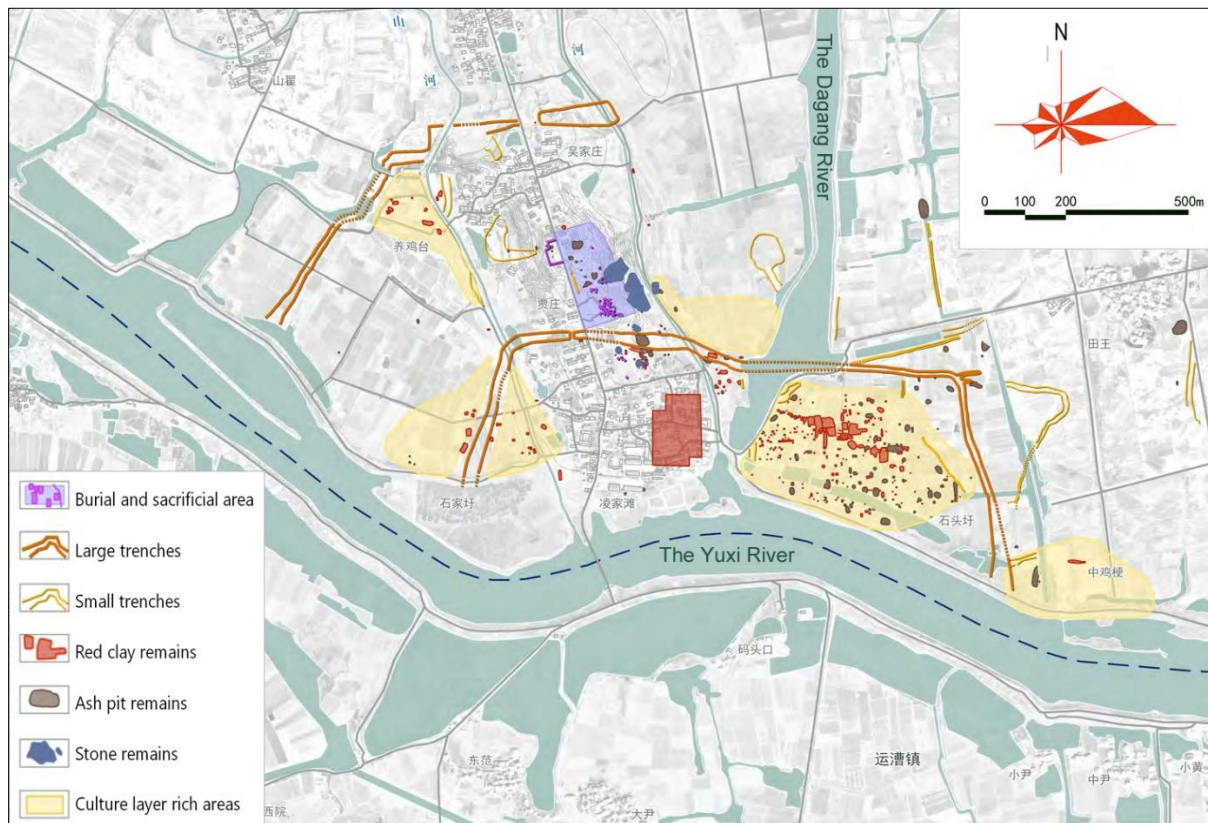


Figure 2: An overview of the Lingjiatan site (after APICRA, 2021).

Several jade artifacts unearthed at the site are believed to be related to astronomy (Qian, 1991), but few people in the international history of astronomy community know about them. On the basis of previous work done, mostly by Chinese scholars, I would like to present a new discussion on these artifacts, not only as a way of introducing them to international colleges, but also as an example of the rich potential that archaeoastronomy offers in the exploration of the early stages of Chinese civilization. In this first paper, I am going to discuss the Jade Tortoise and Jade Tablet, a pair of divination tools unearthed at the Lingjiatan site during the first excavation there in 1987, which may reflect the knowledge of key directions in space and important nodes in time recognised by the residents of the site via observations of the rising and setting of the Sun.

In a second paper, I would like to discuss three pig-shaped jade artifacts that may be related to the origin of the Lunar Lodge Kui, an important constellation in the traditional Chinese astronomical sky.

2 A SPECIAL SET OF DIVINATION TOOLS

Unearthed in 1987 from tomb 87M4, the Jade Tortoise (Figure 3) and the Jade Tablet (Figure 4) are apparently the components of a unified set of artifacts.

The dorsal carapace 87M4:35 of the Jade

Tortoise (Figure 3) is round, 9.4 cm long, 4.6 cm high, 7.5 cm wide and 0.6 cm thick. Four pairs of round holes are drilled on both sides and the rear part, and grooves are carved between the two round holes on the two sides. The ventral carapace 87M4:29 is 7.9 cm long, 7.6 cm wide, and 0.5~0.6 cm thick, mostly flat in shape with the two sides slightly oblique upward. Two round holes are drilled on each side, just opposite the holes on the two outer sides of the dorsal carapace, and one round hole is drilled on the rear part (APICRA, 2006: 47).

The Jade Tablet 87M4:30 (Figure 4) is rectangular and slightly convex, with a length of 11 cm, a width of 8.2 cm, and a thickness of 0.2~0.4 cm. There are five round holes drilled through on each of the two short sides (Nos. 9–13 and 18–22 in Figure 4), while eight and four round holes (Nos. 1–8 and 14–17 in Figure 4) are drilled through on the two long sides respectively. Very close to hole No. 1 there is a smaller round hole (No. 23 in Figure 4) drilled half-through. A small circle is carved in the middle, and a square octagonal star is carved in the circle. Outside the small circle is carved a large circle, and the area between the two circles is divided into eight blocks with eight radial lines, and each block is filled with a feather-shaped arrow in radial direction. Outside the large circle are four feather-shaped arrow pointing from the center of the circle to the



Figure 3: The Jade Tortoise excavated from the Lingjiatan site (after APICRA, 2006).

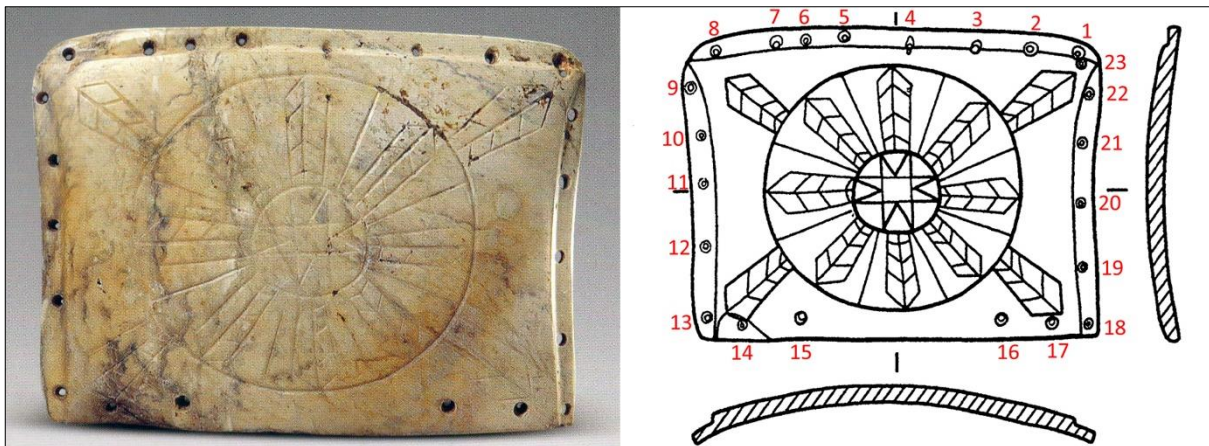


Figure 4: The Jade Tablet excavated at the Lingjiatan site (after APICRA, 2006).

four corners of the Tablet (APICRA, 2006: 47).

The two jade artifacts were located in the middle of the tomb over the thighs of the tomb-owner (Figure 5, wherein 29 is the dorsal carapace, 30 is the Jade Tablet, and 35 is the ventral carapace below the Jade Tablet), and the Tablet is sandwiched between the Tortoise's two carapaces, which is a clear indication that they comprise a set of artifacts that were made for a certain purpose.

From very early times, the tortoise was considered a divine animal ideal for divination in ancient Chinese society, and a great number of tortoise shells have been unearthed as funeral objects from various Neolithic tombs in China, and some of them were apparently used for divination (Gao and Shao, 1986). For this reason, Yu Weichao (1989) proposed that the Jade Tortoise unearthed at the Lingjiatan site was also used for divination, while the small holes on both the dorsal and ventral carapaces were used to tie them together with a string, so as to facilitate the divination action of shaking after putting the calculating chips into it. In his opinion, the Jade Tablet should represent a deity to be worshipped during the divination, and the feather-shaped arrows on the central part of it represents the trees of the eight directions, a symbol of the guardian gods of

the lands in these directions, whereas the round holes around the Tablet were drilled to hang it up for worship.

Li Xueqin (1992) agreed with Yu Weichao on this explanation of the function of the Jade Tortoise and the Jade Tablet, but he believed that the carvings on the Tablet were related to the concept of Eight Directions (four cardinal and four intercardinal directions) and Eight Trigrams in ancient Chinese literature, while the octagonal star in the center was a hieroglyphic symbol denoting a shaman ($\overline{AA}$), an indication of the identity of the tomb-owner.

The claim that the Jade Tortoise was a tool for divination can be verified from two other archaeological facts of the Lingjiatan site. Firstly, three pieces of Tortoise-shaped jade artifacts were unearthed from tomb 07M23 at the Lingjiatan site in 2007 (APICRA, 2008). Among them, the dorsal carapace of the Jade Tortoise 07M23:123 (No. 1 in Figure 6) is arc-shaped, with two round holes drilled in its rear part, while its ventral carapace is flat and connected with the dorsal carapace, with one round hole drilled in the middle of its rear part. The dorsal carapace is 6.5 cm long, the ventral carapace is 4.8 cm long, the overall maximum width of the tortoise is 6 cm, and the overall maximum height of the tortoise is 5.3 cm, with a

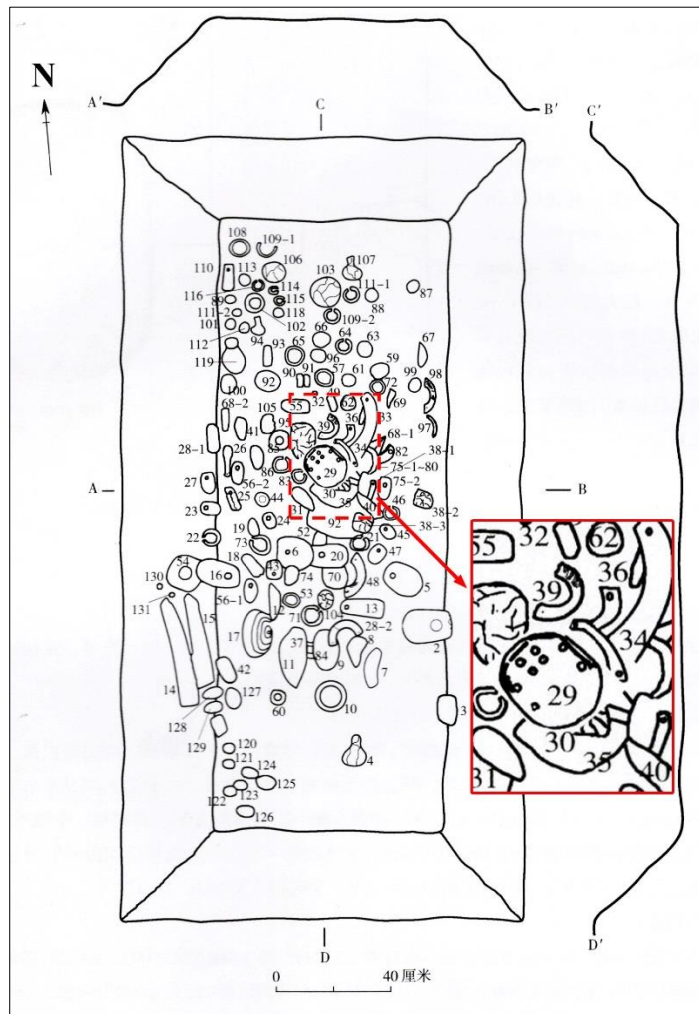


Figure 5: The location of the Jade Tortoise and the Jade Tablet in the tomb.



jade stick in the cavity (Figure 6, left), which is 5.4 cm long, 1.3 cm wide, and 0.6 cm thick. The two tortoise-shaped flattened jade objects 07M23:125 and 07M23:127 (Nos. II and III in Figure 6) are more simplified, with an arc-shaped dorsal carapace connected with a flattened ventral carapace, forming a flat cylindrical shape, while three round holes drilled in the rear part of the dorsal carapace. The dorsal and ventral carapaces of 07M23:127 are 6.3 and 4.4 cm long, while the overall maximum width and height are 6.3 and 3.7 cm, respectively. There are two jade sticks similar to the one mentioned above in the abdominal cavity. The 07M23:125 is slightly smaller than the 07M23:127, and there is also a similar jade stick in its abdominal cavity. These tortoise-shaped vessels are typical divination tools, and the jade sticks accompanying them are either calculating chips used for divination operations, indicating that tortoise divination did exist at the Lingjiatan settlement.

When the Jade Tortoise and the Jade Tablet were unearthed, there was also a jade stick at their side (87M4:36 in Figure 7 and No. 36 in Figure 4) (APICRA, 2006: 56; Wu and Liu: 240–241), which is 8.7 cm long and 0.1–0.7 cm thick.

This provides an additional piece of evidence that this special set of jade artifacts is also a tool of divination, although it looks more sophisticated and has one special component, namely, the rectangular Jade Tablet. Judging from their shape and structure, one may reasonably suggest that both the Jade Tortoise and the Tortoise-shaped Jade artifacts found in Lingjiatan, including the jade sticks unearthed together with them, were simply some sort of bell for a shaman's rattle. However, the existence of the Jade Tablet and the meaningful carvings on it indicate that they were not.

Secondly, all the said jade artifacts in Lingjiatan were excavated from the tombs in the altar area of the site (Figure 8), which "... further verifies that the burials of these tombs had certain religious and sacrificial meanings." (Shuozhi, 2006). The area of the sacrifice is more than 1,000 square meters, and the part that has been excavated so far is 600 square meters, where the tombs 87M4 and 07M23 are located. More convincingly, two groups of jade figurines in the process of praying have been discovered in tombs 87M1 and 98M29 (APICRA, 2006: 37–38). The three figurines from the former tomb all

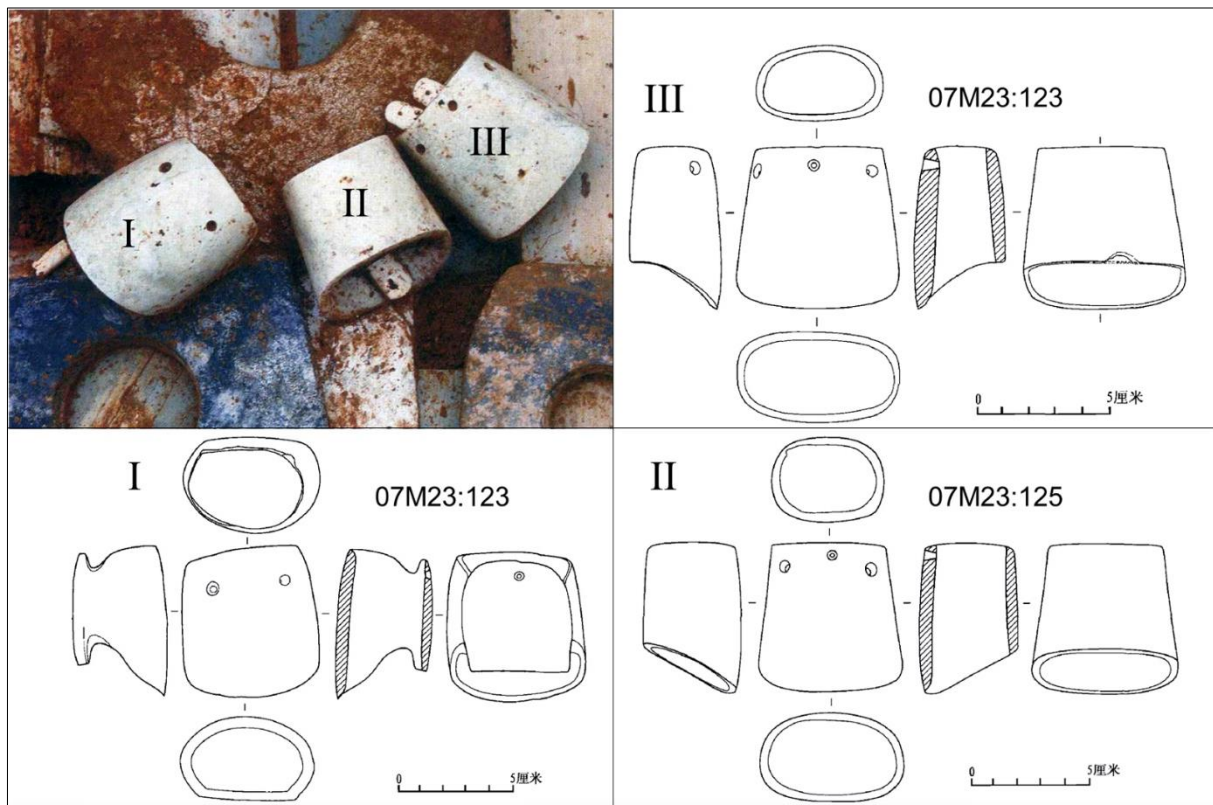
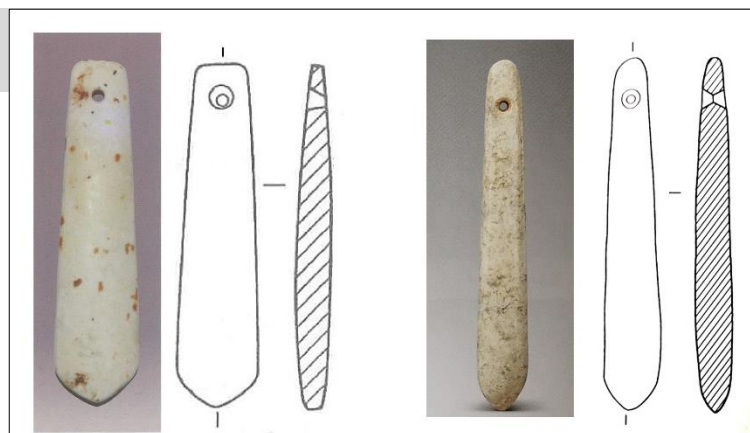


Figure 6: The Tortoise-shaped jade artifacts from the Lingjiatan site.

Figure 7 (right): Jade sticks 07M23:140 (left) and 87M4:36 (right) from the Lingjiatan site.

stand straight, while the three from the latter tomb are all in a half-squatting position, and the tallest of them, 87M1:3, is 9.6 cm high (Figure 9, where the relative heights of the jade figures reflect the actual proportions). Arguably, the owners of these tombs were priests or shamans, who were responsible for worship and divination at the settlement.



Except for the great number of tortoise shells, a number of jade and clay tortoises have been excavated from other Neolithic sites in China since the 1950s, especially the jade tortoises N2Z1M21:10 (Figure 10) unearthed in 1989 at the Niheliang site in Liaoning Province (LPICRA, 2012: 99 and 102; Wu and Liu, 2022: 145–146). They may bear some similarities to the big Jade Tortoise from the Lingjiatan site, but none of them was found together with a jade tablet. This fact makes the Jade Tortoise and the Jade Tablet from the Lingjiatan site

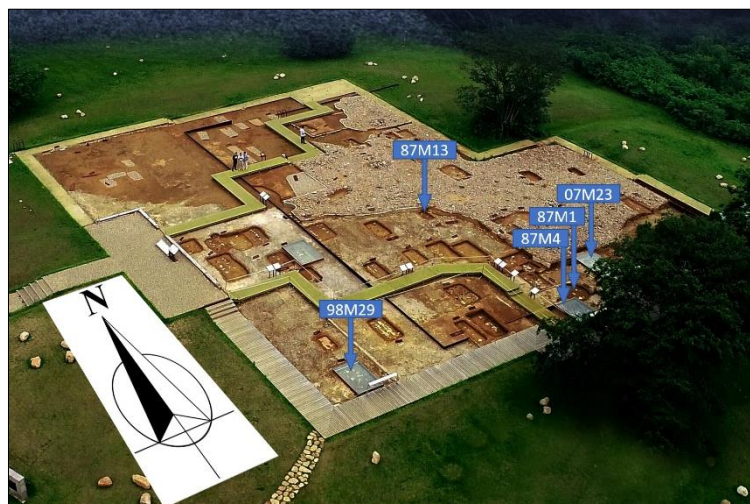


Figure 8: Altar area of the Lingjiatan site.

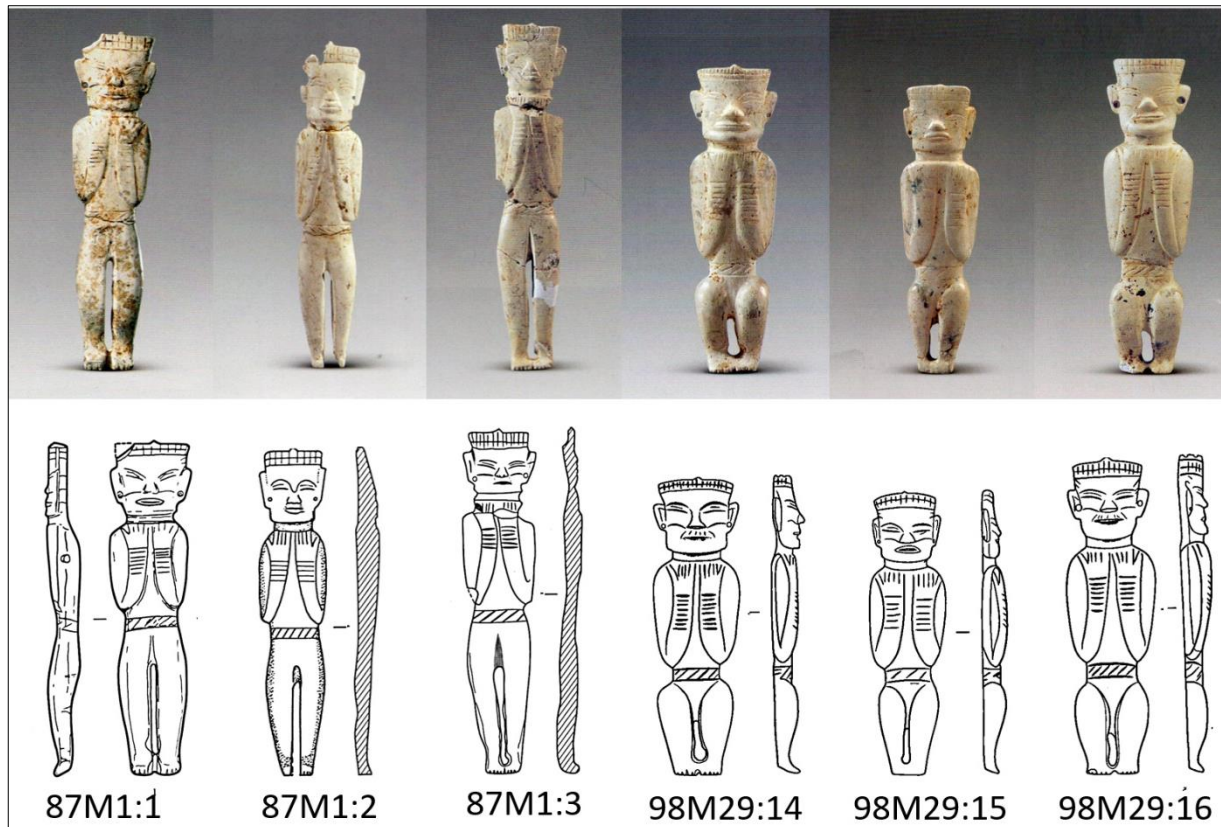


Figure 9: Small jade figures unearthed at the Lingjiatan site.

unique, and they deserve more careful study and deliberation.

3 THE SYMBOL OF CARDINAL AND SUBCARDIAL DIRECTIONS

Compared with the possible function of the whole set of the Jade Tortoise and Jade Tablet, the con-

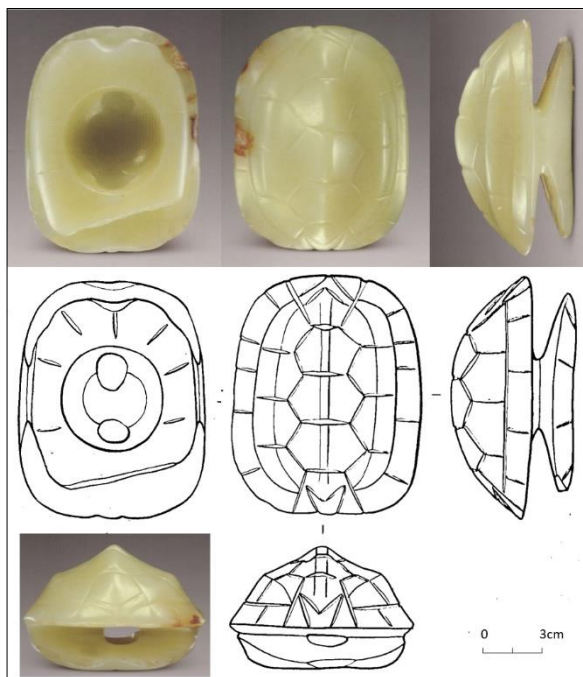


Figure 10: The jade tortoise from the Niuheliang site.

crete meaning and function of the carvings on the Jade Tablet are more difficult to understand. Although scholars like [Yu Weichao \(1989\)](#) and [Li Xueqin \(1992\)](#) regard them as objects to be worshipped during divination, most scholars prefer to interpret them from an astronomical point of view. Since the eight arrows between the large and the small circles point symmetrically to eight directions, it is easy for us to associate them with the four cardinal (North, East, South, West) and four intercardinal directions (Northeast, Southeast, Southwest, Northwest), or the Eight Directions (*Bafang*, 八方) as called in ancient Chinese literature

Therefore, [Chen Jiuqing and Zhang Jingguo \(1989\)](#) pointed out that, while a square octagonal star within the small circle in the middle of the Jade Tablet is a symbol for the Sun, as most later scholars believed, the eight arrows between the large and small circles represent the Eight Directions, and they also implicate a primitive form of the Eight Trigrams (*Bagua*, 八卦) since ancient Chinese people believed that there was a correspondence between the two systems ([Figure 11](#)). Drawing on the seeming similarity between the round holes on the Jade Tortoise and the Jade Tablet and the number arrangements in both the Yellow River Map (*Hetu*, 河图) and the Luo Chart (*Luoshu*, 洛书) ([Figure 12](#)) in traditional Chinese numerology, they also sug-

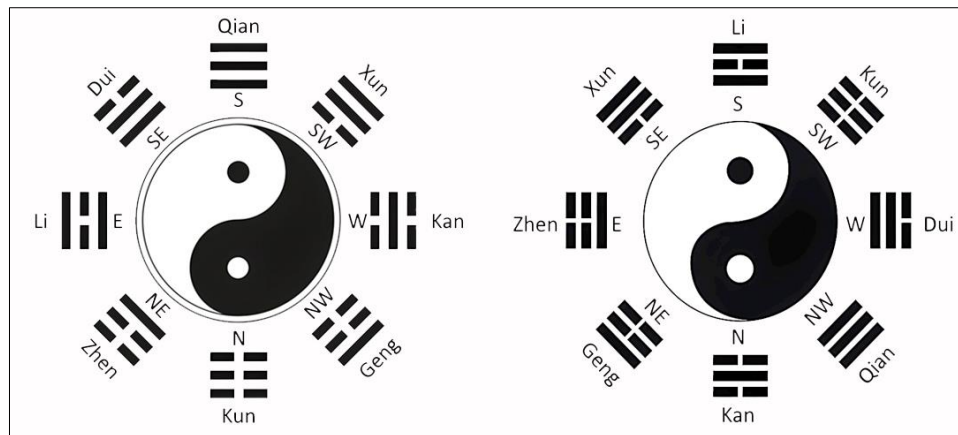


Figure 11: Two arrangements of eight directions and trigrams.

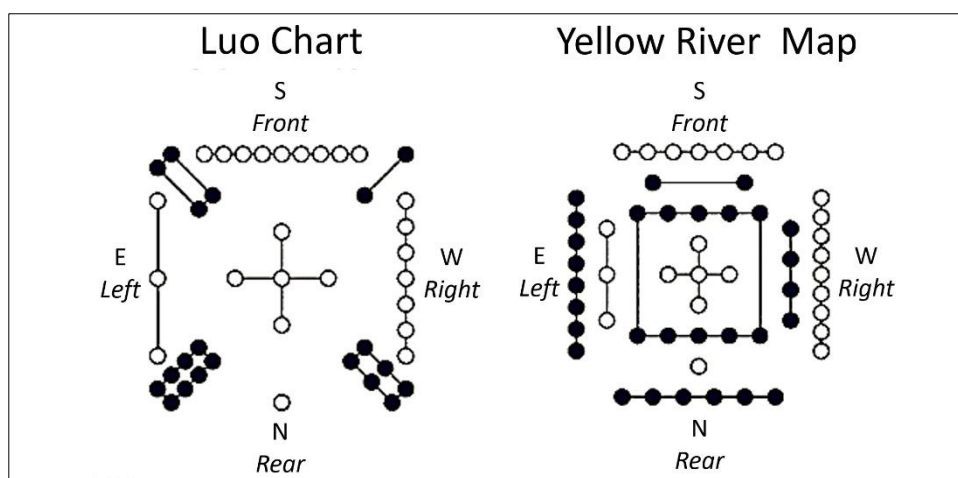


Figure 12: The Luo Chart (left) and the Yellow River Map (right).

gested that the whole set put together conveys the concepts of the Yellow River Map, the Luo Square and the Eight Trigrams and thus presents a primitive form of philosophical thinking from 5000 years ago.

In response to their opinion, [Jao Tsung-I. \(1990\)](#) argued that although the square octagonal star in the center may represent the Sun and the eight arrows may represent both the rays of the Sun and the Eight Directions, the arrangement of round holes on the whole set are actually very different from both the Yellow River Map and the Luo Square, and seem to represent a more primitive numerological system. He was also very skeptical as to whether the Eight Directions were already thought to be equivalent to the Eight Trigrams during the era of the Lingjiatan site, and whether the whole system already formed any kind of philosophy at such an early age. Instead, he only admitted the possible existence of a 'pre-philosophical' thinking.

From another angle, [Li Bin \(1993\)](#) noticed that the Jade Tablet looks very similar to the two Han Dynasty sundials unearthed respectively at

Tuoketuo (托克托) in Inner Mongolia and Luoyang (洛阳) in Henan Province ([Figure 13](#), see [Needham, 1959: 305–306](#)), while the eight arrows and eight radial straight lines between the large and small circles on its surface divide the circumference into 16 intervals, which is the same as an early timekeeping system dividing a day into 16 hours, as can be seen in the inscriptions on the oracle bones of the Shang Dynasty and the bamboo slips of the Qin Dynasty. Therefore,



Figure 13: The sundial unearthed at Tuoketuo.

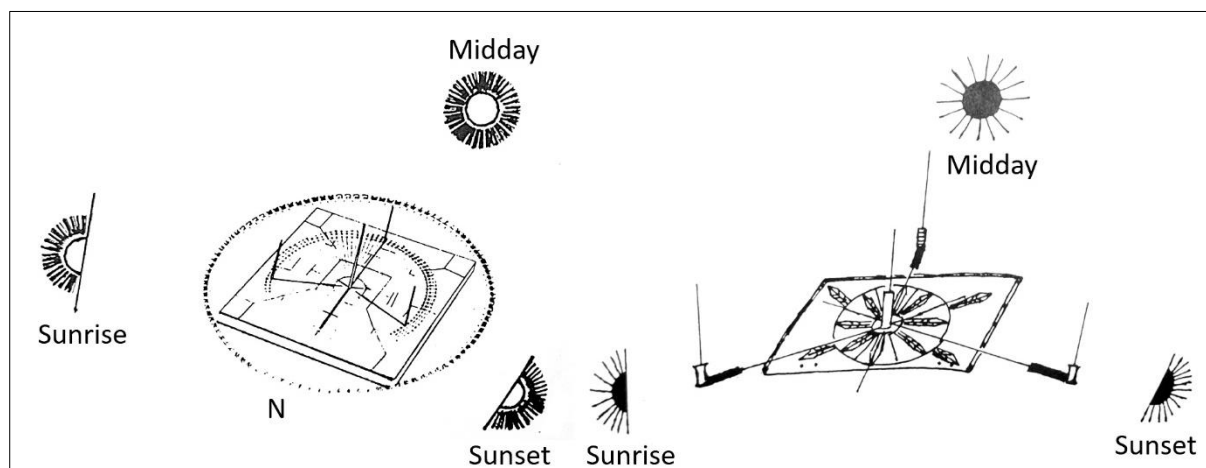
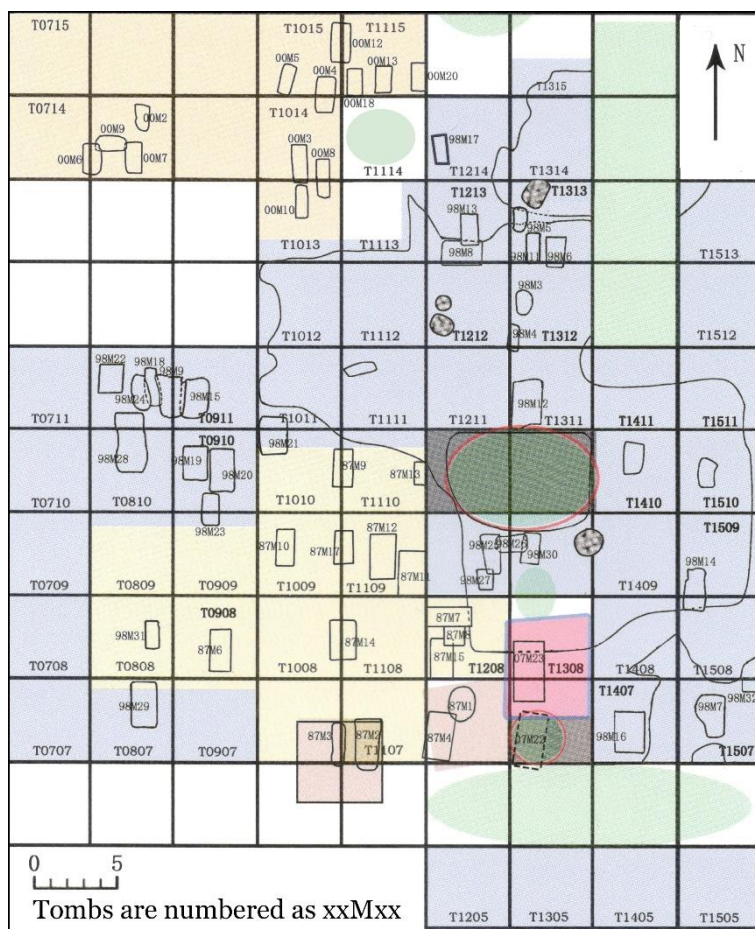


Figure 14: A comparison of the Tuoketuo sundial (left) and the Lingjiatan Jade Tablet (right).

he proposed that the Jade Tablet might have been a tool used by the residents of the Lingjiatan site to measure the time through the motion of the Sun, and is therefore a predecessor of the sundial. Thinking along the same lines, Wang Yu-cheng (1993) also believed that the Jade Tablet could have been used to observe the shadows of the Sun at sunrise, mid-day, and sunset, so as to measure time and direction (Figure 14).

The axes of the square tombs excavated at the Lingjiatan site are mostly along the north–

south direction (Figure 15), indicating that the residents of the site did know a method for direction determination. Of course, by observing the directions of sunrise and sunset, coupled with the observation of stars near the North Pole, it was possible for them to know roughly the existence of the four cardinal directions. In the meantime, however, it was equally possible for them to find as well that the rising and setting directions of the Sun changed, so that they had to find a more reliable way to determine the four cardinal directions with a satisfactory degree of certainty.



As some astronomical historians have pointed out, "... besides the observation of the North Star, the only viable method for a precise determination of direction under a primitive technical condition is to measure the shadow of an erected rod." (RGHCA, 1984: 175–176). In fact, this method was still in use by masons and astronomers up to the Western Han Dynasty (202 BCE–8 CE) for direction determination, as can be seen from the two procedures recorded in the *Artificers' Record* (Wenren, 2012: 95), the *Mathematical Canon of the Gnomon of Lord Zhou* (Cullen, 1996: 192) and *The Huainanzi* (Liu, 2010: 146).

The first procedure described in the first two books can be interpreted as follows (Figure 16): prepare a piece of horizontal ground with the help of a water level, erect an upright rod G on the ground with the help of a hanging cord, i.e. a plumb bob, draw a large circle cen-

Figure 15: As this site plan shows, most of the tombs at the Lingjiatan site were aligned N–S.

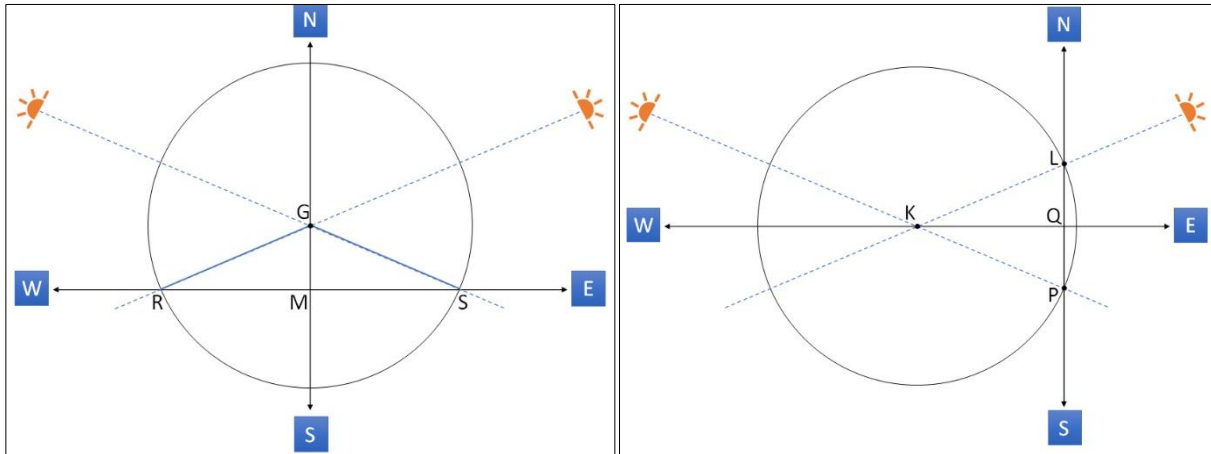


Figure 16 (left): First procedure for direction determination.

Figure 17 (right): Second procedure for direction determination.

tered on G, and mark the intersections of the shadows of the rod with the circle at sunrise and sunset R and S. Connecting R and S, you obtain an east–west line, and connecting the midpoint M of RS with the center G gives the north–south direction. During the day, you can also refer to the shadow of the rod at noon, and at night you can refer to the direction of the North Star.

The second procedure introduced in *The Huainanzi* is slightly different but more reliable considering that the sunshine in the dawn and dusk could be very faint and thus the shadow very vague and blurred (Figure 17): set up a vertical rod K on a level ground, take a rod L and move ten steps to the east of rod K. When the Sun just rises from the northeast corner, target it so that K and L are in line with the Sun. When the Sun is about to set, erect another rod P in the east and target through K which is ten steps away in the west. When the Sun has just set in the northwest corner, fix P so that P, K are in line with the Sun. Connecting the midpoint Q of L and P with K, you get the direction of due east and west.

After the four cardinal directions have been determined with enough precision, it is natural and easy to obtain the four intercardinal directions by bisecting the azimuths of the known directions.

There is no reason to doubt that the residents of the Lingjiatan site acquired the necessary knowledge and skill to make such measurements, because among these people there were very proficient artisans who reached a high level in the art of jade ware manufacture, where they were able to drill tiny and clean holes down to 1.5 mm in diameter in a hard material like jade (Yang and Zhang, 2006). Therefore, there should be little doubt that the eight arrows between the large and small circles on the Lingjiatan Jade Tablet is a representation of their knowledge of the cardinal and intercardinal directions.

4 FROM KEY POSITIONS IN SPACE TO BASIC NODES IN TIME

From the observation of the directions of sunrise and sunset, the residents of the Lingjiatan site should have been able to notice that the rising and setting directions of the Sun kept shifting every day but the shift had certain regularities. For example, when the rising and setting positions of the Sun reached an ‘extreme point’ on the horizon, they would not move further, but began to turn around and move backwards, all the way until they met another ‘extreme point’ where they would turn around again. Halfway between the two pairs of extreme positions, the Sun would rise from the due east and set in the due west. Hence, they could find three pairs of special positions where the Sun would rise and set at the times corresponding to the four ‘cardinal nodes’ in time, namely, the December Solstice, the March Equinox, the June Solstice and the September Equinox, or the *Winter Solstice* (*Dongzhi* 冬至), the *Spring Equinox* (*Chunfen* 春分), the *Summer Solstice* (*Xiazhi* 夏至) and the *Autumn Equinox* (*Qiufen* 秋分) respectively in Chinese Solar Terms, just as *The Huainanzi* describes right in the end of its introduction of the method for direction determination:

At the *Winter Solstice*, the Sun will rise from the southeast and set in the southwest; at the *Spring* and *Autumn Equinoxes*, the Sun will rise from the east and set in the west; while at the *Summer Solstice*, the Sun will rise from the northeast and set in the northwest.

Of course, the four intercardinal directions used in the text here do not mean that the positions of sunrise and sunset at the *Winter* and *Spring Solstices* are exactly in these directions, but are just listed there to convey an idea of the existence of the four ‘extreme positions’.

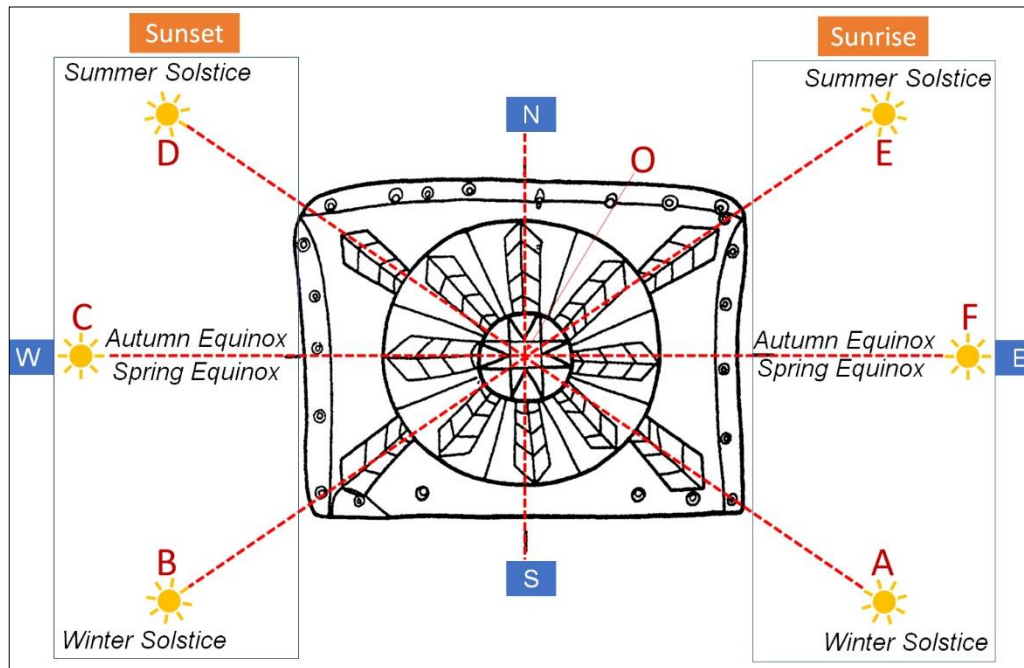


Figure 18: Sunrise and sunset directions in December and June solstices.

In his explanation of the meaning of the four 'arrows' outside the large circle on the Jade Tablet, [Jao Tsung-i. \(1990\)](#) argued that they represent the 'Four Corners' (*Siwei*, 四维) mentioned by the ancients, but he did not explain what the 'Four Corners' are, and what are their difference(s) from the Eight Directions represented by the eight arrows. The questions were not answered until [Liu Zhengying \(1997\)](#) pointed out for the first time that the four arrows should represent the directions of the sunrise and sunset positions at the December and the June Solstices. [Wu Jiabi \(2006\)](#) accepted this idea and analyzed the angle AOB between their lines ([Figure 18](#)), and found that it did correspond with the geographical latitude of the Lingjiatan area, suggesting that the residents of the Lingjiatan site might have indeed made the observations discussed above. A verifying calculation shows that, since the ecliptic obliquity was about $24^{\circ} 3' 52.2''$ around 3500 BCE and the geographical latitude of the Lingjiatan site is $31^{\circ} 51' 51''.12$ N, the angle between the east-west axis and the directions of the extreme rising and setting positions of the Sun at the December and the June Solstices is about $36^{\circ} 30' 51''$, quite close to angles AOF and BOC on the jade tablet which is about 32° ([Figure 18](#)).

According to [Liu Zhengying \(1997\)](#), as long as the residents of the Lingjiatan site knew the existence of three pairs of special positions corresponding to the December Solstice, the March Equinox, the September Equinox, and the June Solstice through the observation of sunrise and sunset, they could logically recognize the existence of the tropical year through the 'return' of

the Sun to these rising and setting positions, and could in turn use the shifts of the position of sunrise and sunset to mark the change of seasons and dates in a year. Therefore, in his opinion, the four arrows at the four corners of the Jade Tablet represent a solar calendar in principle although more operations are needed in putting it in practical applications. This judgment is in line with the logic of the ancients' understanding of the problem and therefore is very reasonable. In this way, the above-mentioned three pairs of spatial positions obtained through direction observations have been transformed into three pairs of 'cardinal nodes' in time.

However, the length of a tropical year has 365 to 366 days. It is hard to imagine how time management for social activities could have been achieved in a large central settlement like the Lingjiatan site where a relatively complex social organization just emerged, if the year was not divided into smaller segments. Therefore, it is also reasonable to think that the residents of the site should have divided a year successively into four and eight parts in accordance with their observation of the shifting positions of sunrise and sunset in a year, just like what they did in dividing a circle into four and eight parts. Hence, they should have determined the four 'intercardinal nodes' in time halfway between the December Solstice, the March Equinox, the June Solstice, and the September Equinox, which made up the Four Beginnings (*Sili* 四立) in Chinese Solar Terms, i.e. the *Beginnings of Spring, Summer, Autumn and Winter*, respectively, marked with the two pairs of rising and setting positions of the

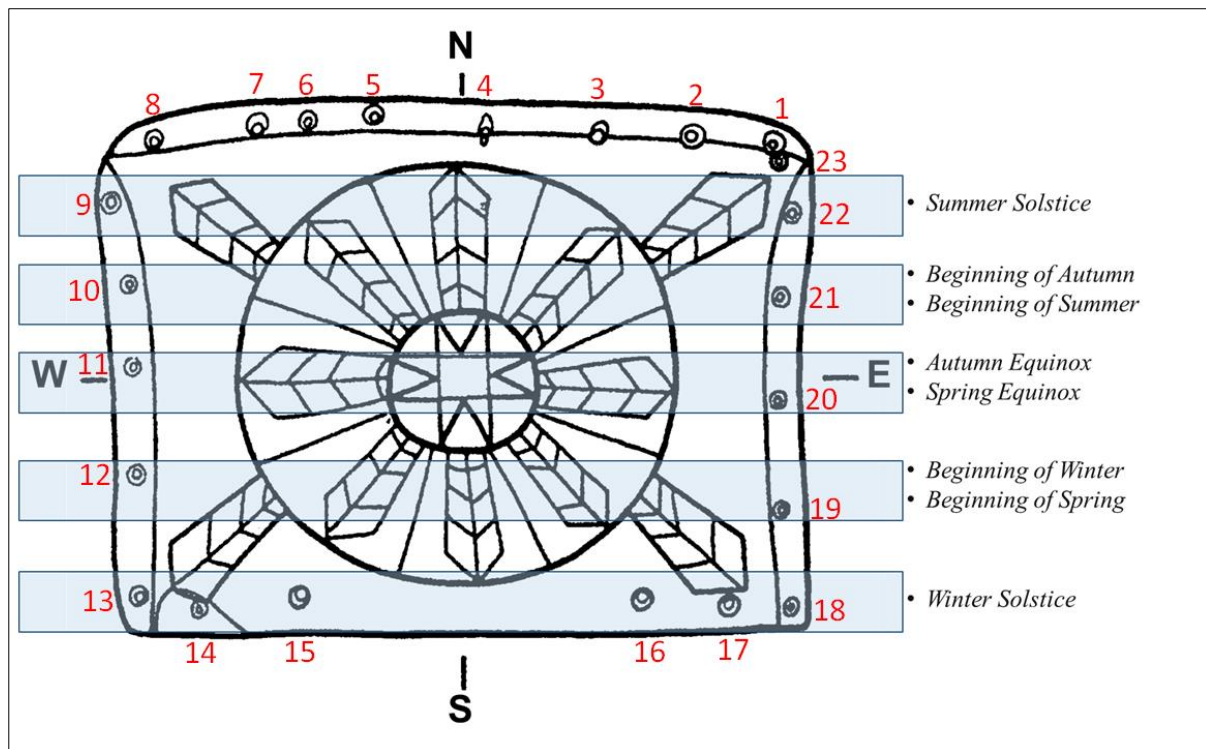


Figure 19: Meanings of the five pairs of holes on the short side of the Jade Tablet.

Sun in correspondence to the four 'intercardinal nodes' in time, and eventually obtained five pairs of rising and setting positions of the Sun in a year.

Following this chain of logic, it is natural to suggest that five pairs of round holes on the two short sides of the Jade Tablet represent the five pairs of rising and setting positions of the Sun at the four cardinal and four intercardinal nodes in time (Figure 19). Starting from the pair of holes Nos. 13 and 18 corresponding to the December Solstice, or *Winter Solstice* as in Chinese Solar Terms, counting in the sequence of *Winter Solstice* → *Beginning of Spring* → *March Equinox* → *Beginning of Summer* → *Summer Solstice* → *Beginning of Autumn* → *September Equinox* → *Beginning of Winter* → *Winter Solstice*, we can complete a circuit tour through the so-called 'Eight Festivals' (*Bajie* 八节) of a year, as they are called in ancient Chinese literature.

The practice of dividing a year into segments and using the rising and setting positions of the Sun as an indication of special time-nodes related to the segments can also be found in other Neolithic sites. For example, a number of bottom-pointed round pottery vessels, mostly sacrificial and child burial utensils, have been unearthed from a number of Neolithic sites of the Dawenkou Culture, 4600–6300 BP, in Shandong and Anhui Provinces, on which a special symbol has been found (see Figure 20). Archaeologists believe that the circle at the top may represent the Sun; the three tipped crescent in the middle may re-

present either clouds or fire, or even a New Moon; while the five tipped carving on the bottom may represent a mountain with five peaks. As a whole, the symbol has been deemed to have a clear astronomical meaning: the Sun rises successively from each of the five mountain peaks at eight different time-nodes of a year (Wang Shuming, 1986), an arrangement similar in principle to the five pairs of round holes on the two short sides of the Lingjiatan Jade Tablet. It can also be argued that the three tips on the crescent in the middle represent the three spatial nodes corresponding to the four time-nodes in a year, corresponding in turn to the *Winter solstice*, the *Spring* and *Autumn Equinoxes*, and the *Summer Solstice* in later Chinese calendrical systems.

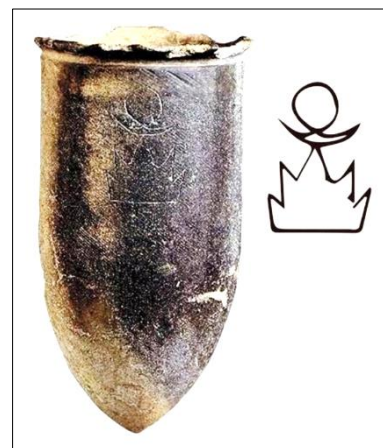


Figure 20: The special symbol on the pottery of the Dawenkou Culture.

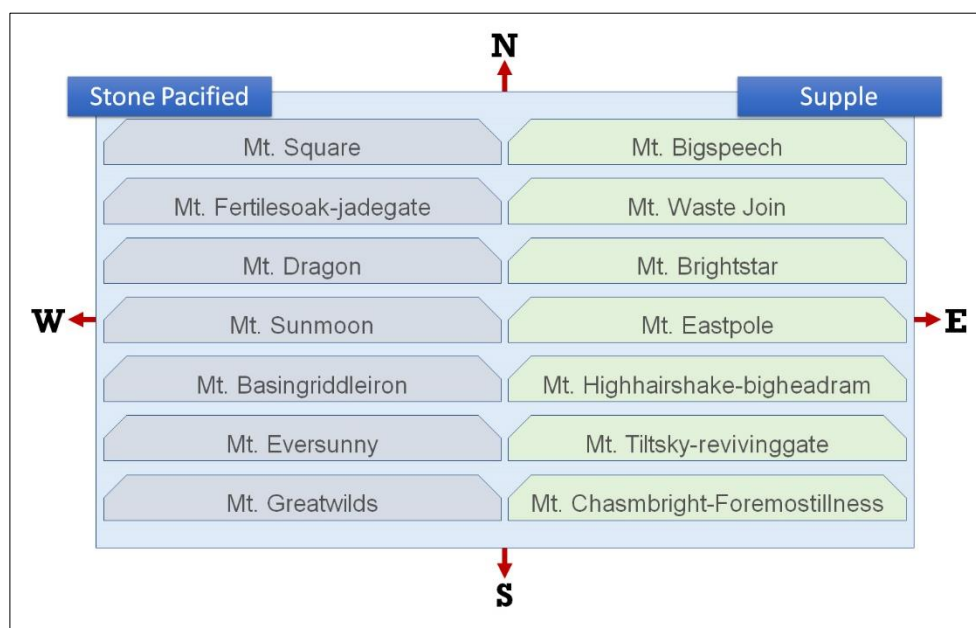


Figure 21: The seven pairs of mountains in the *Classic of Mountains and Seas*.

In later literature, we can also find traces of this practice. For example, in the *Classic of Mountains and Seas* (Birrel, 1999: 159–162 and 173–177), the famous Chinese mythological work composed between 476 and 202 BCE, there are seven mountains in the Great Wilderness in the East whence “... the sun and the moon rise ...”, whereas seven mountains where “... the sun and the moon set ...” are also there in the Great Wilderness in the West. Moreover, beyond the northeastern sea outside the Great Wilderness in the East, there is a deity named Supple who stays at the northeast corner of the world to halt the Sun and Moon so that they do not meet each other when they rise and set, thus to preside over shortness and length of the day and night. Symmetrically, beyond the northwest sea at the corner of the Great Wilderness in the West, there is another deity named Stone Pacified who stays in the northwest corner of the world to preside over the shortness and length of the journeys of the Sun and the Moon (Figure 21). Described in a mythological way, the seven pairs of mountains here are also used to represent the rising and setting positions of the Sun at twelve temporal nodes, or in twelve months, of a year.

5 A SPECIAL DATE COUNTING SYSTEM

Date counting is a basic problem that needs to be resolved in the early stages of a civilization. The earliest Chinese system of date counting that we know of was invented in the Shang Dynasty (c.1600–c.1045) when a writing system was established. The system is a compound cycle of sixty days produced from the combination of the ten Heavenly Stems and twelve Earthly Branches, two series of Chinese ordinal words. Since then,

the system has been used for date counting in official calendars for more than 3000 years without any interruption (Smith, 2011). In a prehistoric settlement like the Lingjiatan site where a basic level of power centralization already appeared, there had to be a primitive system of time management, so people needed to find a way of counting and date management.

From the discussion in the previous section of this paper, it is clear that the residents of the Lingjiatan site should have divided a year into eight segments and thus created a system like the ‘Eight Festivals’ in the Chinese calendar of later eras. From the *Book of Documents*, we can find the earliest value for the length of a tropical year available in ancient Chinese literature, 366 days a year. Dividing it into eight parts, we get 45.75 days which makes the length of each ‘Festival’ 45 to 46 days. Judging from the 16 divisions existing between the inner and outer circles of the jade plate, it is even possible that the residents of the Lingjiatan site further subdivided the Eight Festivals into 16 subsections, each of which is 22 to 23 days (22.875 days), which is the same with the number of round holes on the four sides of the Lingjiatan Jade Tablet, including the 22 through-drilled holes Nos. 1–22 and the one half-drilled hole No. 23 as shown in Figure 19. The special number and arrangement of these holes suggests to us that they might have been a device used by its owner to count days in a year.

Thinking along this line and taking the *Winter Solstice* as the beginning of an astronomical year just as all Chinese calendar-making systems from the Western Han Dynasty (202 BCE–88 CE) on regulated, we can work out a possible proced-

ure through which the date-counting task can be performed with the use of the 22 through-drilled holes (Figure 19): Insert a small stick into the hole No.18 corresponding to the *Winter Solstice*, and then every day next move the stick counter clockwise to the next hole. After 45 days, the stick would have been moved two circles and finally reached hole No.19 corresponding to the *Beginning of Spring*, and thus completed a cycle corresponding to one of the 'Eight Festivals'. Start from this hole and repeat the same operations in the first cycle. After every 45 days, the stick would reach holes No. 20, No. 21 and No. 22, corresponding to the *Beginning of Spring*, the *Spring Equinox*, and the *Beginning of Summer* successively, all the way until hole No. 22 on the top, which corresponds to the *Summer Solstice*. After the *Summer Solstice*, move the small stick clockwise in the same way every day. After 180 days, the small stick would return to hole No. 18, which brings to an end all of the cycles of the 'Eight Festivals'. After staying for 5–6 days, when the actual position of sunrise reaches the position corresponding to the *Winter Solstice* again, a new round of the stick shift could begin to repeat again. Taking any round hole on the short side of the jade tablet as a starting point, either on the east side or on the west side, you can always achieve the same result of date counting through similar operations.

Chen Jiujiu and Zhang Jingguo (1989) were the first to claim that the carvings and round holes on the Jade Tortoise and Tablet represent a kind of calendar expressed in a primitive form of Eight Trigrams, Yellow River Map and Luo Chart, but they did not make clear how this function could be realized through these carvings and holes. Liu Zhengying (1997) also suggested that the four arrows on the Lingjiatan Jade Tablet pointing to the rising and setting positions of the Sun at the *Summer* and *Winter Solstices* implied certain rules of a solar calendar which could be applied by an experienced user with the help of some instruments, but he did not provide any explanation on what the concrete operation could be to put these rules into practice. From my discussion above, it is now clear that the 22 holes along the four sides of the tablet could be an 'interface' to turn the whole set of holes into a practical 'calendar'. This theory is acceptable because the method is very straight forward and would have been easy for people in the Neolithic era to invent and use.

6 AN EARLY MODEL OF THE COSMOS

For most of the earlier researchers, the Jade Tablet and the carvings on it also embodied an early cosmological idea of 'the round heaven and square Earth', a model of the cosmos popular in China predating the model of Spherical Heavens

(*Huntian* 浑天) established in the Western Han Dynasty. Li Xinwei (2004) deliberated on this opinion and further pointed out that the eight-pointed star in the center of the Jade Tablet represents the celestial pole at the top of the canopy heaven, the two circles and the Tablet's slightly convex shape in side-view represents the celestial dome, the rectangular outer contour represents the square Earth, the four arrows protruding from the outer rim of the celestial dome should represent the four piers that maintain the heaven and the Earth, and the tortoise is a natural model of the canopy cosmos. This set of arguments is very inspiring, but it also gives rise to a new question: if the Jade Tortoise is now 'a natural model of the canopy cosmos', what then is its relationship with the Jade Tablet, which in Li Xinwei's opinion is also a cosmos model that combines the heaven and the Earth into one object?



Figure 22: The Jade Tortoise and Jade Tablet as a unified object.

Just as I have mentioned in the first section of the present paper, the Jade Tortoise and Jade Tablet belong to a unified set of artifacts. Putting the dorsal and ventral carapaces of the Jade Tortoise and the Jade Tablet together according to their positional relationship seen at the time of excavation, the three pieces of the components can reach a very close fit in both size and shape (Figure 22), meaning that they were deliberately designed and produced by the residents of the Lingjiatan site to express some important ideas or concepts in their minds. Therefore, when considering their cosmological meaning, we should not analyze the Tablet and the Tortoise separately, but should consider them as a whole.

From the chapter "Discrimination" in the *Garden of Eloquence*, a collection of stories and anecdotes from the pre-Qin period to the Western Han Dynasty compiled and collated by the famous official scholar Liu Xiang (77–6 BCE), we can find the following description of the 'Numinous Tortoise' which summarizes the typical Chinese understanding of this divine animal up to that era:

The numinous tortoise has multicolored patterns, like jade or gold. Its back starts



Figure 23: The Jade Tortoise and the Jade Tablet as a model of the cosmos.

low and gets higher. On top it bulges like the heavens; its underside is flat like the earth. Its patterns swirl like those of a mountain. Its feet move back and forth in response to the four seasons, and its patterns are distinct like those of the twenty-eight constellations. It has a head like a snake and wings like a dragon. Its left eye is like the sun and its right like the moon. Throughout the transformations of a thousand years, its earthly *qi* communes with that above. It is able to perceive the transformations that lead to survival and destruction, good fortune and disaster. It is self-possessed when still and vividly apparent when in motion. (Henry, 2022: 1670–1671).

In other words, the tortoise is a living model of the cosmos, which is the source of its special power in divination.

Observing the whole set of the Jade Tortoise and the Jade Tablet closely (Figure 23), we find that the four arrows outside the large circle on the Jade Tablet are located right in the positions of the four feet of the Jade Tortoise, and the whole set conforms very well with Liu Xiang's description: while the dorsal and ventral cara-

paces of the Jade Tortoise stand for the bulging heaven and the flat Earth, the four arrows on the four corners of the Jade Tablet, combined with the 22 round holes around them, including the five pairs of round holes on the two short (eastern and western) sides, represent the change in seasonal times. From this angle, Liu Xiang's description provides a key piece of evidence for the credibility of our interpretation of the meaning and function of the four arrows and the round holes on the Jade Tablet, and thus paves a sound way for us to move forward in reaching the following conclusion: as a whole set, the combination of the Jade Tortoise and the Jade Tablet compose a materialized presentation of the early Lingjiatan residents' understanding of the world, a primitive model of the cosmos that embodies the conceptions of both space (the Eight Directions) and time (the Eight Festivals) of these people, in addition to the visible shapes of the heaven and the Earth represented by the two carapaces of the Jade Tortoise. Since these conceptions were originally derived from the observation of the rising and setting directions of the Sun, it is natural for us to understand why, as Chen Jiujin and Zhang Jingguo (1989) have suggested, a symbol of the Sun, the octagonal star inside the small circle, was carved in the center of the whole Tablet. Habitually we often regard the 'round sky and the square Earth' scheme as the earliest cosmic model of ancient Chinese people, but just as we have seen above, the cosmos represented by the Jade Tortoise and the Jade Tablet from the Lingjiatan site turns out to be much richer and more sophisticated than such a simple scheme.

Of course, the 'model of the cosmos' here is just a modern concept used as an aid to understand history, while this special set of jade artifacts should have its own cultural role and function in the Lingjiatan settlement, that is, tortoise divination. However, the differences in structure and size between this set and the other three tortoise-shaped jade artifacts excavated at the same site (Figure 6) suggest that it should have surpassed the latter in terms of status and importance. A plausible explanation is that this set of jade artifacts should be a kind of mother-type, whereas the three tortoise-shaped jade artifacts are derivative and simplified copies of this 'standard model', which also served as a source of their meaning and divinity. According to this interpretation, the owner of this 'standard model' would be a high-ranking priest or shaman, while the owners of its derivative and simplified copies should be an ordinary priest and shaman. Judging from the date-counting function of the Jade Tablet, this high-ranking priest or shaman might also have been in charge of time management for the entire settlement. A 4.25-kilogram stone broadaxe was in the sealing soil of tomb 87M4 (Figure 24),

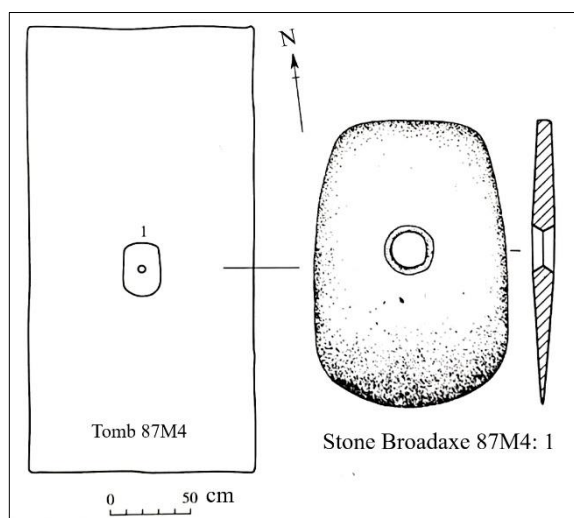


Figure 24: The stone broadaxe in the sealing soil of Tomb 87M4.

where the Jade Tortoise and the Jade Tablet were unearthed, which is apparently a mark of the unusual status of the tomb owner (APICRA, 2006: 47).

7 CONCLUDING REMARKS

From my discussion above, a deeper and clearer understanding of the function and meaning of the Jade Tortoise and the Jade Tablet from the Lingjiatan site can be reached. Basically, the Jade Tortoise itself is a divination tool, very similar to the great number of tortoise shells, either natural or artificial, excavated in recent years from many other Neolithic sites in China. What makes it different is the Jade Tablet which reflects the primitive conception of space and time in the mind of the residents of the site, and thus turns this set of jade artifacts into a unique object, a materialized

model of the cosmos, as can be expressed in contemporary terms. The model is a spiritual product which combines the primitive imagination of the structure of the heaven and the Earth according to the shape of a tortoise with the empirical observations of the motion of the most important celestial body, the Sun. Understandably, such a model must have been a very important resource that a priest or a shaman could resort to in his or her explanation of the divine power of the tortoise shells in divination.

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