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## Archaeological Research in Asia

journal homepage: [www.elsevier.com/locate/ara](http://www.elsevier.com/locate/ara)

Full length article

# Royal mausoleums of the western Han and of the Song Chinese dynasties: A satellite imagery analysis

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## ARTICLE INFO

## Keywords:

Chinese mausoleums  
Imperial Chinese sacred landscapes  
Orientation and dimensions of Chinese burial mounds  
Archaeoastronomy of ancient China

## ABSTRACT

The mausoleums of the Emperors and of some members of the royal family of the Western Han Chinese Dynasty are a spectacular ensemble of tombs, covered by huge earth mounds and scattered throughout the outskirts of modern Xi'an. Their inspiration comes from the world-famous mausoleum of the first Emperor of the Qin, who reigned immediately before the Han, and these in turn inspired the much later mausoleums of the Song Dynasty. For numerous reasons it is nowadays difficult to acquire data and to capture on the ground the spatial and cognitive relationships between these monuments and the way they formed a unified cultural landscape. Therefore we make use here of satellite data to investigate dimensions, orientations and mutual cognitive aspects of their projects. The analysis encompasses a consideration of the cultural links of astronomy with orientation and topography, as well as a test of the possible influence of traditional Chinese doctrines on these. The special case of the mountain tomb of Emperor Wen of Han is also discussed.

## 1. Introduction

A fundamental breakthrough in Chinese history occurs with the reign of Ying Zheng, who succeeded in unifying China in 221 BCE, becoming “the first Emperor”. His name is famous worldwide due to the astonishing archaeological discovery of the Terracotta Army guarding his – as yet unexcavated – tomb, located in Lintong, not far from modern Xi'an. The tomb lies beneath a huge tumulus (burial mound) of compacted earth, which constitutes an unmistakable landmark denoting the funerary landscape of the Emperor.

The realm of the first Emperor rapidly became unstable and fragmented after his death, but was unified again in 202 BCE under Liu Bang of Han (usually referred to as Gaozu), the founder of the Western Han Dynasty. This Dynasty (202 BCE – 9 CE) presided over a period of substantial state stability and wealth, marked by important political, economic and scientific developments (Needham, 1959). The Western Han rulers (with the notable exception of Emperor Wen, who will be discussed separately) followed the custom of being buried in tombs located under huge mounds of compacted earth (sometimes today known popularly as “Chinese pyramids”).

These tombs – excluding the famous pits of Emperor Jing's burial place, where an enormous quantity of miniature terracotta figurines was found – are unexcavated, and their identification (commonly accepted by archaeologists) is mostly based on the stelae which were erected in front of them in the second half of the eighteenth century (Wu, 2010). Much later than the Western Han period, another Chinese

Dynasty, the Song, was to revive the tradition of constructing mausoleums in the form of burial mounds.

The Han and the Song royal mausoleums make for a fascinating presence in the rapidly developing landscape of modern China. Unfortunately however, it is difficult today, on site, to have an idea of the ways in which these funerary landscapes were conceived, as well as of the spatial, visual relationships the monuments bear to each other. This is due to various factors, but chiefly pollution – which drastically reduces horizon visibility – and to the sheer difficulty of reaching some of the monuments and/or their tops.

Obtaining precise measures in situ is also difficult, since the sides are not well defined in many points (due to encroaching vegetation, cultivated fields, and washed-away borders). Therefore, although the author has visited many of them, the research here has been carried out with the use of satellite imagery tools. This paper presents the results of a study of the cognitive, astronomical and contextual aspects of these imposing projects, along the lines of research developed in recent years with regard to Egyptian funerary landscapes (see e.g. Magli, 2011, 2012, 2013; Belmonte and Magli, 2016).

## 2. The western Han burial mounds: dimensions and mutual positioning

Beginning with the first Emperor of Qin and then with the Western Han Dynasty, a fundamental transformation of ancient Chinese burial practices can be noted (Lai, 2005). The tomb becomes an underground

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<http://dx.doi.org/10.1016/j.ara.2017.10.003>

Received 2 May 2017; Received in revised form 24 October 2017; Accepted 27 October 2017  
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Fig. 1. The mausoleum of the first Emperor Qin, fitted with a modern stairway.

“palace”, and the standard burial equipment (mostly bronze ritual vessels, bells and weapons) is replaced by a variety of pottery figurines. In particular, the underground tomb of the first Emperor is described by the Chinese historian Sima Qian as a microcosm endowed with vaults representing the heavenly bodies and a miniature of the empire – including rivers of mercury – on the ground. The complex itself was conceived of as a symbolic replica of the imperial town, with above-ground inner and outer enclosures, and a series of underground pits and galleries containing “replicas” of the living world familiar to the Emperor.

There is no doubt that the first Emperor's building programme, and in particular that regarding his own tomb, served political and symbolic ends. He conceived of himself as the earthly representative of the tutelary gods of heaven (sky) and earth and thus was pivotal in the proper functioning of the earth and its inhabitants. For instance, the alignment of his newly founded palace south of the Wei River was with the asterism Yingshi (Encampment), the square of Pegasus. Yingshi was thought of as the “administrative centre”, in the south west, of the god Tianyi (Heavenly One), who represented the active side of the higher god Taiyi (Great One) who sat in the north at the star Alioth, a sort of astrological pole (Didier, 2009a, 2009c). The first Emperor's intention was thus to align himself with Tianyi as the active administrator of the earth.

The location of the tomb also reflected political symbolism. It was positioned near the sacred peak of Mt. Li, which dominated the Wei River from the south. The burial complex is marked in the landscape by a huge mound of compacted earth, constructed probably with the aid of a stepped core (Fig. 1). The mound was itself referred to as a “mountain”, and was thus meant to be a replica of nature, over which the owner of the tomb exerted his power and control. However, the base plan is square, and as such it connects with an ancient pre-existing tradition governing the basic geometry (square, or rectangular) of Chinese tombs, probably a reflection of the centrality of the “polar rectangle”, an ideal quadrilateral formed in the sky by the stars Mizar, Alioth, Pherkad and Kochab. One of its sides centres on the star Thuban, the pole star of the third millennium BC (Didier, 2009a, 2009b). The tomb's location is to the east of Qin's capital, in front of the eastern pass, so that all travellers from that direction had to cross the “funerary” city, which also served defensive purposes. Cardinality inspired the whole funerary complex: the enclosures are in fact oriented to the cardinal points, as well as the pits. Thousands of terracotta warriors, in their ordered rows, ready for battle, face due east, perhaps to guard the

Emperor from enemy souls coming from that direction, and the burial mound is oriented cardinally. We thus see in the project of the First Emperor's tomb an overwhelming symbolic importance and a keen interest in cardinal orientation on Earth, connected as it was with the “cosmic” order in the heavens, which formed the core organizing principles of Chinese cosmological thinking (Didier, 2009a; Pankenier, 2011).

The Qin Dynasty collapsed rapidly, and the founder of the new Dynasty, Gaozu of Han, was faced with the problem of legitimating his own power. As a consequence, he appropriated for himself the idea of a divine mandate from Heaven. To express this concept through architecture, he embarked on the construction of his own “City of Heaven”, the Han capital Chang'an. Historical sources report that the circuit wall of the capital was inspired by the stylized form of two constellations, the Northern Dipper (Ursa Major), and the Southern Dipper (essentially our Sagittarius) (Pankenier, 2011). This idea seems to be confirmed, at least in part, by archaeological surveys (Hotaling, 1978). Furthermore, he chose to continue the Qin tradition of the construction of huge burial mounds, thus setting the benchmark for the Dynasty.

However, the tomb of the first Han Emperor is on the vast flatland located to the north of the river Wei, on the opposite side in relation to Mount Li. Most of the rulers who subsequently followed selected a building site in the same area, so that today the “pyramids” of the western Han Dynasty rulers and of their relatives create a fascinating landscape, dotted over the course of the River Wei for some 40 km. This area is well covered by satellite imagery (both on Google Earth and Bing), with a resolution which is more than sufficient to measure the average sides and average azimuths of the mounds; in addition, while the horizon visibility today is very poor and modern buildings are present, using satellite tools it is easy to establish whether monuments had mutual inter-visibility in the past or not.<sup>1</sup>

The first interesting point which can be addressed using satellite imagery is the spatial distribution of the mausoleums. The annals of the Han Dynasty make it quite clear that the choice of the position of the royal tomb was a delicate matter, and indeed the distribution of the monuments in the necropolis is somewhat puzzling (Fig. 2).

As a matter of fact, they were not built in a linear succession from

<sup>1</sup> For this reason it is important to recall that an object of height  $h$  in meters is visible (in optimal air conditions) from a distance in kilometres equal to the square root of  $13h$ , so that, for instance, a person two metres tall sees a flat horizon at about 5 km, but a mound (say) 30 m high is theoretically visible from 20 km afar.

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