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RESEARCH ARTICLE

TYPES AND CHRONOLOGY OF VEHICLE PETROGLYPHS ON THE INNER MONGOLIA PLATEAU

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ABSTRACT

Vehicle petroglyphs represent a significant category of rock art on the Inner Mongolia Plateau. By employing the shaft of the vehicles as a 'typological marker' and the wheels and draft animals as 'artifact combinations', this study investigates the chronological sequence of vehicle petroglyphs through archaeological typology and comparative analysis with ancient vehicle forms. Discussions on the origin of chariots, the domestication of horses, and the archaeological findings of vehicles provide valuable references for understanding the forms and dating of vehicle petroglyphs. Therefore, vehicle petroglyphs are one of the rock art types that can be relatively accurately dated. This study concludes that the majority of single-shaft (the 'Yuan') vehicle petroglyphs on the Inner Mongolia Plateau date from the Late Shang to the Spring and Autumn periods. The double-shaft vehicle petroglyphs are later than the single-shaft ones and may date from the Han Dynasty or later. Additionally, the vehicles depicted in the petroglyphs served not only as means of transportation but also for hunting and warfare, and they may have had ritualistic or ceremonial significance.

KEYWORDS

Inner Mongolia Plateau, Vehicle Petroglyphs, Typology, Chronology

The Inner Mongolia Plateau, also known as the Inner Mongolia High Plain, is bordered by the western foothills of the Greater Khingan Range in the east, the northern slopes of the Yin Mountains in the south, extends from the western slopes of the Langshan Mountain to the China-Mongolia border in the southwest, and is bounded by the China-Mongolia border in the west and northwest. A small northeastern part of the plateau overlaps with Mongolia. The average elevation of the Inner Mongolia Plateau is 1,110 meters, with gentle undulations. According to its altitude, it is classified as a medium to low-altitude plateau. The northeastern part of the plateau overlaps with the Mongolian low-altitude plain, located in the northern part of the Inner Mongolia Plateau. The central part of the plateau is the Xilingol medium-altitude plain, while the southern part consists of the Bayannur-Ulanqab medium-altitude plain. Administratively, the Inner Mongolia Plateau includes the

western part of Hulunbuir City, most of the Xilingol League, Baotou City, as well as the northern parts of Ulanqab City and Bayannur City. The southwestern boundary of the plateau extends from the western slopes of the Lang Mountains to the China-Mongolia border, thus including parts of the northwestern Alxa League.

Currently, no petroglyphs have been discovered in the Hulunbuir low-altitude plain. Therefore, the rock art of the Inner Mongolia Plateau is distributed from east to west across parts of the Xilingol League, Ulanqab City, Baotou City, Bayannur City, and the northwestern part of the Alxa League. In terms of topography, the Xilingol petroglyphs are mostly found in the low hills of the Xilingol medium-altitude plain. The Ulanqab, Baotou, and Bayannur petroglyphs are located in the Bayannur-Ulanqab medium-altitude plain, mainly in the Yin Mountains, including

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Figure 1: Distribution Map of Vehicle Petroglyphs on the Inner Mongolia Plateau (Note 1)

the Daqing Mountain, Serteng Mountain, Ula Mountain, and Langshan Mountain regions. The petroglyphs in the northwestern Alxa League are found in the foothills extending from the Langshan Mountains. Therefore, the petroglyphs of vehicles on the Inner Mongolia Plateau are primarily concentrated in two large regions: Xilingol and Bayannur-Ulanqab. The research on vehicle petroglyphs in this paper is also conducted within these two regions (Figure 1).

Vehicle petroglyphs represent a highly significant category of rock art on the Inner Mongolia Plateau. Discussions on the origins of chariots and the domestication of horses, coupled with the archaeological excavation of physical vehicles, provide crucial references for comprehending the typology of vehicles and analyzing the chronology of vehicle petroglyphs. Through the application of archaeological typology to vehicle petroglyphs and comparative studies with ancient vehicle forms, it is possible to analyze and determine the chronological sequence of these petroglyphs. Therefore, vehicle petroglyphs are one of the rock art types that can be relatively accurately dated.

1. THE EMERGENCE OF VEHICLES AND THE ORIGINS OF CHARIOTS

The use of vehicles dates back to ancient times. The earliest depiction of a wheeled vehicle appears in the form of a four-wheeled chariot drawn by four horses on a flagpole from the Royal Cemetery of Ur in the Mesopotamian region, dating back to 4600 BCE (Liu, 2002) (Figure 2). The earliest two-wheeled chariot was discovered in multiple Sintashta culture burials (Note 2) in the southern Ural Mountains and northern Kazakhstan, dating from 2030 to 1750 BCE (Note 3) (Figure 3). Archaeological excavations in China have revealed that materials related to horse-drawn chariots only began to appear in significant numbers as late as the Yin Xu (Late Shang Dynasty). From the Shang Dynasty to the late Spring and Autumn period, Chinese vehicles were equipped only with single shafts. The specific form of these vehicles was characterized by a single shaft, two wheels, with the rear part of the shaft located at the bottom of the carriage (the 'Yu') and intersecting perpendicularly with the axle. At the front of the shaft, there is a horizontal beam, known as the crossbeam. The crossbeam is fastened on the yoke (the 'E'), with the yoke positioned on both sides of the shaft, used to harness the horse for pulling the cart. A single-shaft vehicle required at least two horses, although some were drawn by four horses. For example,

a single-shaft vehicle drawn by four horses was unearthed from Tomb No. 1 at Da Baotai in Beijing, and the No. 1 chariot in the Zhangjiapo No. 2 Chariot and Horse Pit also features a single-shaft design, drawn by four horses (Figure 4). The structure of single-shaft vehicles can also be seen in Shang Dynasty inscriptions   (e.g., the character for 'chariot', or called 'Nian') and on a bone plate from Tomb M102 at Nanshan Gen (An and Zheng, 1981) (Figure 5). During the Warring States period, double-shaft vehicles began to appear. Unlike single-shaft vehicles, the yoke of a double-shaft vehicle was placed between the two shafts, allowing it to be drawn by a single horse (Note 4). Single-shaft vehicles were primarily used for standing charioteers, while double-shaft vehicles were designed for seated ones. Although double-shaft vehicles were more advanced, they were not widely adopted. Most of the chariots and noble vehicles mentioned in pre-Qin literature were single-shaft horse-drawn carriages. Therefore, the representative vehicle type in ancient China was the single-shaft vehicle. By the late Warring States period, as the advantages of infantry and cavalry became more evident, vehicles gradually became tools for transportation. In the mid-Western Han Dynasty, double-shaft vehicles became the main means of transportation. By the late Western Han Dynasty, single-shaft vehicles were gradually replaced by double-shaft vehicles (Note 5).



Figure 2: Chariot Depicted on a Flagpole from the Royal Cemetery of Ur (Note 6)

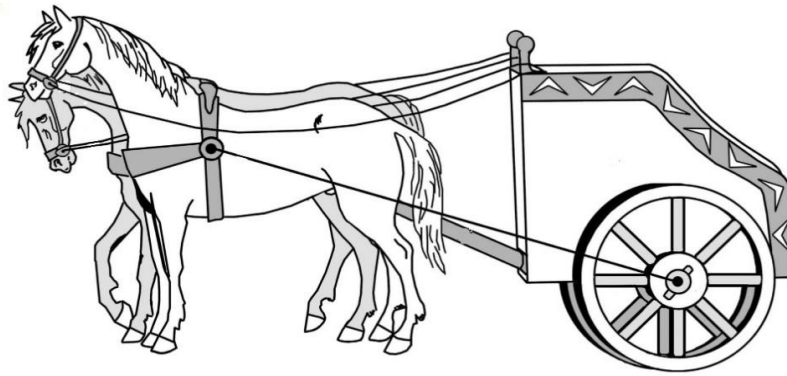


Figure 3: Reconstruction of a Chariot from the Sintashta Culture (Note 7)

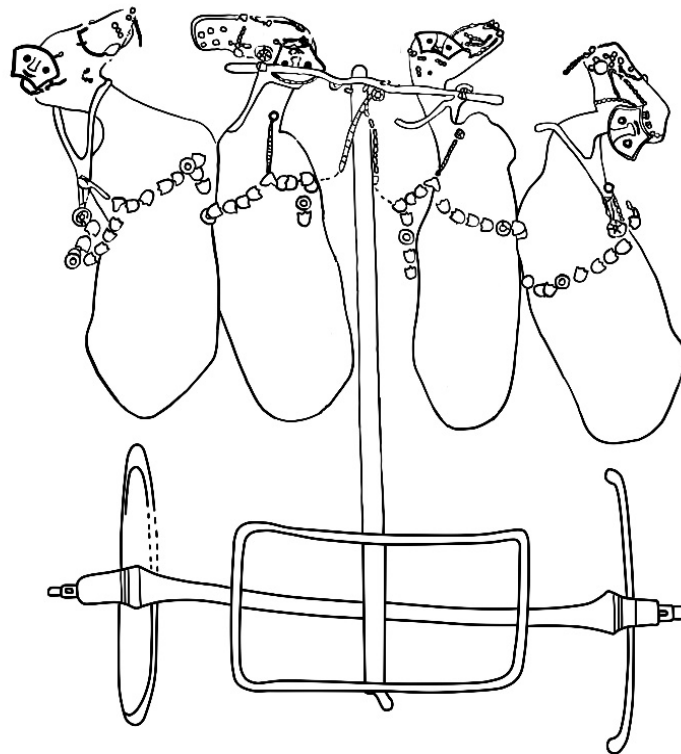


Figure 4: Remains of a Carriage from Pit No. 2 at Zhangjiapo (Note 8)

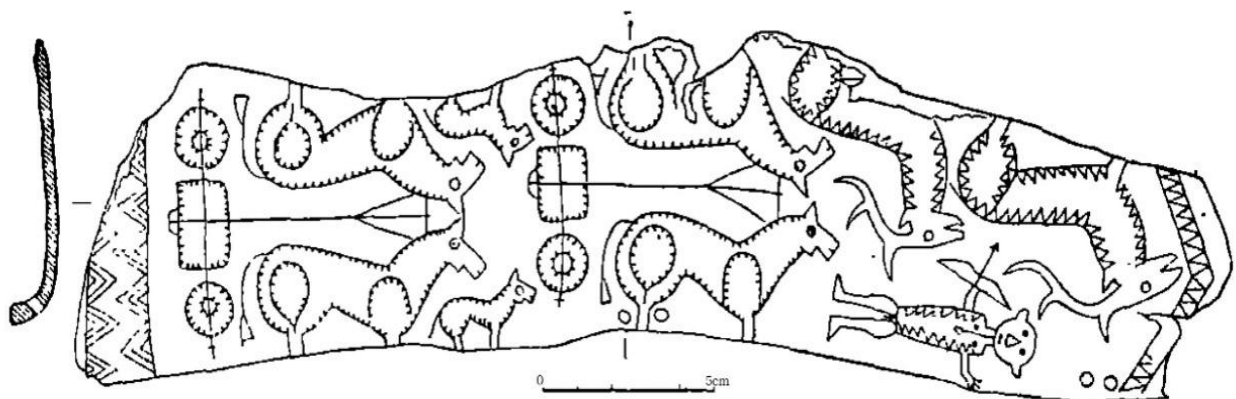


Figure 5: Bone Plate with a Chariot Depiction from Tomb M102 at Nanshan Gen (Note 9)

The origin and evolution of ancient Chinese chariots have always been important issues in Chinese archaeology, with much discussion in the academic community. There are generally two viewpoints: 'indigenous origin' and 'Eurasian origin'. Scholars such as Sun Ji, Zhai Defang, and Zheng Ruikui support the indigenous origin, while those like Lin Yun, Wang Wei, and Gong Yingyan argue for a Eurasian origin (Note 10). Since the archaeological findings of vehicles in China date to a later period, many foreign scholars believe that Chinese vehicles were introduced from outside. For instance, Russian scholar Kuzmina argues that the metallurgy, lightweight chariots, and horse domestication at YinXu were the result of the expansion and migration of the Andronovo people, with the northern Chinese population acting as intermediaries (Note 11). In addition to the traditional Hexi Corridor route, the distribution of vehicle petroglyphs in the central part of the Eurasian steppe suggests that the Altai Mountains-Mongolian Plateau was also an important route for the spread of vehicles (Note 12).

The use of chariots is closely related to the domestication of horses. After a long period of horse domestication and breeding, humans gradually realized the value of horses as means of transportation and warfare, leading to the combination of horses and vehicles, and thus the creation of chariots and war chariots. Many questions remain about the process of the evolution of wild horses into domestic horses. Fossils of Przewalski's wild horses have been found in several Late Pleistocene sites in northern China (Qi, 1989). For example, Przewalski's wild horse (*Equus przewalskii*) bones were discovered in the lower layer (7B) of the Jinstai Cave (Wang et al., 2010), dating back 47,000 years (Li et al., 2018), and continued to be the most abundant animal bones in the upper layer (③B) of the Jinstai culture, dating from 16,080 to 15,820 years ago. Przewalski's wild horse bones were also found at the Xujialiao (Li et al., 2017) and Shiyu sites (You, 1977) in Shanxi. However, recent studies indicate that Przewalski's wild horses were not domesticated into domestic horses (Note 13). Cai Dawei et al. conducted mitochondrial DNA research on ancient Chinese domestic horses and concluded that ancient Chinese domestic horses share the closest maternal genetic relationship with the modern Mongolian horse. However, they found no direct maternal connection between them and Przewalski's wild horse (Cai et al., 2007). Yet, different results have emerged from different research perspectives. In 1987, Bowling and Ryder's study of allelic enzyme loci in Przewalski's wild horses and domestic horses showed a very close genetic relationship between the two (Bowling and Ryder, 1987). An Liping et al. recently sequenced the complete 1140bp cytochrome b gene of 14 Przewalski's wild horses (6 from Series A and 8 from Series B) and 18 Mongolian horses, and their analysis of genetic polymorphism between Przewalski's wild horses and Mongolian horses also suggested a close genetic relationship. They also argued that Mongolian horses have multiple origins or have undergone multiple domestications (An et al., 2006).

Despite many mysteries surrounding the domestication of wild horses, the process of domestication has spanned millions of years. Wild horses, which have lived on Earth for 60 million years, have undergone a long evolutionary process to become domestic horses. A genetic research group led by Professor Vera Warmuth from the University of Cambridge, after 16 years of investigation and research, concluded that the initial domestication of horses occurred around 6000 years ago in the western Eurasian steppe, specifically in present-day Kazakhstan, southwestern Russia, and Ukraine. Domesticated horse populations continuously expanded outward, interbreeding with local wild horses to form domestic horse populations in various regions (Warmuth et al., 2012). The latest research findings indicate that domestic horses appeared in the Gansu-Qinghai and Northeast China regions around 3800 years ago (Note 14), and ancient DNA studies suggest that they were introduced to China from West Asia or Central Asia. Before the late Shang Dynasty, domesticated horses were sporadically introduced to northern China. However, due to environmental constraints and the lack of utilization methods for domestic horses, the relationship between the late Neolithic people and horses remained relatively loose until the late Shang Dynasty. From the late Shang period, environmental changes and the development of the 'labor' function of domestic horses rapidly accelerated the process of horse domestication in China. Therefore, some scholars argue that the chariots of the late Shang Dynasty in the Central Plains were the result of the domestication process of horses,

representing a technological transformation of previously animal-drawn two-wheeled vehicles (Zhao and Fan, 2017).

Regardless of the debates, archaeological excavations of physical vehicles provide valuable material for understanding the forms of ancient vehicles.

2. TYPOLOGICAL STUDY OF VEHICLE PETROGLYPHS ON THE INNER MONGOLIA PLATEAU

Generally speaking, typology is a methodology for scientifically categorizing and analyzing archaeological data. It is one of the most fundamental methodologies in archaeology, primarily used to study the evolutionary processes of artifacts. By classifying the external forms of archaeological remains and examining the logical sequence of their changes, typology helps establish the relative chronological order of the remains. Through stratigraphic relationships, it is possible to determine the beginning and end of these morphological change sequences, thus enabling the identification of phase characteristics and the division of these phases, also known as periodization. Pottery, due to its abundance, clear temporal and cultural features, is often selected as a typical artifact for comparative study. Pottery can be categorized into types based on fabric and color, and the different vessel forms that coexist are often grouped into functional sets, which are referred to as artifact assemblages (Wang, 2015). Any human-made object with a specific form, such as architecture, vehicles, sculptures, paintings, decorative patterns, etc., can be analyzed using typology to explore its morphological changes. Moreover, these forms evolve along a specific trajectory, rather than changing arbitrarily (Yu, 1996). Therefore, petroglyphs can benefit from the application of typological methods in archaeology. This paper will apply typological analysis to the petroglyphs of vehicles on the Inner Mongolian Plateau.

Using archaeological typology methods to classify vehicle petroglyphs involves first addressing the issue of artifact classification. Artifact classification entails identifying the "connection point between two sequential phases along the evolutionary trajectory," which refers to selecting the type fossil (or typical artifact). The type fossil is generally chosen based on characteristics such as high sensitivity to change, widespread distribution, and being among the most common and abundant artifacts (Yan, 1989). In this study, we have collected and analyzed all available vehicle petroglyphs from the Inner Mongolian Plateau and conducted a typological analysis. We propose that the most sensitive, common, and typical type fossil in vehicle petroglyphs is the shaft of the vehicle. Therefore, using the shaft as the type fossil and categorizing the wheels, draft animals, and other related elements as artifact assemblages, we classify the vehicle petroglyphs and further explore their chronological implications.

The Inner Mongolia Plateau is divided into two regions for analysis: the Xilingol petroglyph area and the Bayannur-Ulanqab petroglyph area.

2.1 Typological Analysis of Xilingol Vehicle Petroglyphs

A total of 31 vehicle petroglyphs have been discovered in the Xilingol petroglyph area (Note 15), including four at the Baixinghudaga site in Abaga Banner (all depicting wheels), three vehicles at the Xiahanur site in Abaga Banner, one vehicle at the Bayan Wundur site in Xilinhot City, and 20 vehicles and three wheels at the Hoh Chorol site in Sunite Left Banner. Five vehicle images in the entire petroglyph area are very unclear or partially missing content, but based on the basic elements included, we determine that they are vehicle petroglyphs, although they are not analyzed for vehicle typology.

Through analysis, we classified the vehicle petroglyphs in this region into three types based on the variations in the vehicle shafts: Type A (no shaft), Type B (single-shaft vehicle), and Type C (double-shaft vehicle). Since there is greater variation in Type B vehicles, further classification can be made based on the presence or absence of draft animals (whether the vehicle is drawn by horses on both sides), as well as the different representations of the wheels (wheeled with spokes, solid circular wheels, or omitted wheels).

Type A: No shaft, only wheels

Seven examples, all depicting wheels with spokes, varying in number. See Figures 6 and 7.

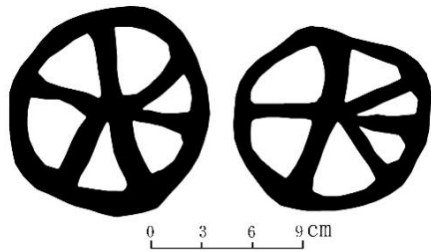


Figure 6: Type A (*Xilingol*, XMAQC055)



Figure 7: Type A (*Xilingol*, XMAQC032, with an animal above the wheel)

Type B: Single-shaft**Subtype Ba: Two wheels, no draft animals****Ba₁: Wheels with spokes**

Seven examples, such as Figures 8 to 11. Some vehicles are highly simplified, lacking elements like the yoke and crossbar. All have depictions of the carriage. Two of these have horses carved nearby.

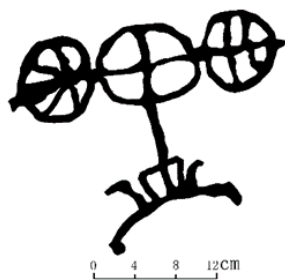


Figure 8: Subtype Ba1 (*Xilingol*, XMSZA085)

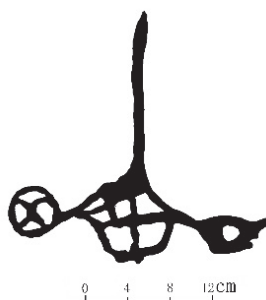


Figure 9: Subtype Ba1 (*Xilingol*, XMSZC151)



Figure 10: Subtype Ba1 (*Xilingol*, XMSZA014)



Figure 11: Subtype Ba1 (*Xilingol*, XMSZB162)

Ba₂: Solid or circular wheels

Four examples, all with wheels and carriage. Three of these have horses carved nearby, as shown in Figures 12 to 14.

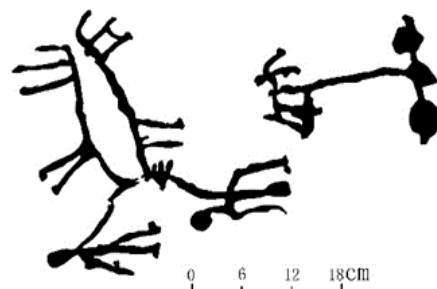


Figure 12: Subtype Ba₂ (*Xilingol*, XMSZC123)



Figure 13: Subtype Ba₂ (*Xilingol*, XMXSD010)

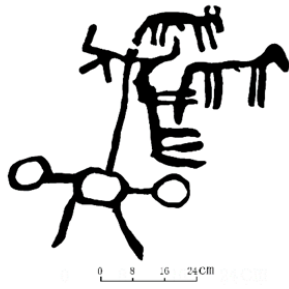


Figure 14: Subtype Ba₂ (*Xilingol*, XMSZA068)

Ba₃: Wheels omitted

One example, with a depiction of the carriage only, as shown in Figure 15.

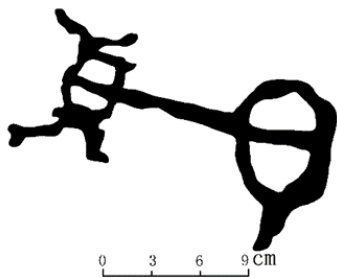


Figure 15: Subtype Ba₃ (*Xilingol*, XMSZA088)

Subtype Bb: Two wheels, with draft animals, horses on both sides

Bb₁: Solid or circular wheels

Two examples, typically showing two horses facing away from each other representing draft animals, as shown in Figures 16 and 17.



Figure 16: Subtype Bb₁ (*Xilingol*, XMSZA086)



Figure 17: Subtype Bb₁ (*Xilingol*, XMAQA047)

Bb₂: Wheels omitted

One example, with neither wheels nor carriage depicted, as shown in Figure 18.

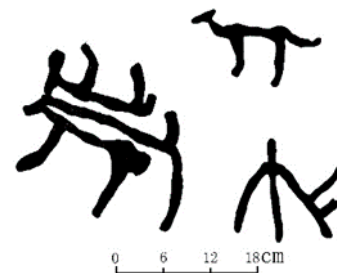


Figure 18: Subtype Bb₂ (*Xilingol*, XMAQA029)

Type C: Double-shaft

Four examples, all in side view with a carriage and a single draft animal, which may be a horse or possibly a camel, as shown in Figures 19 to 21.



Figure 19: Type C (*Xilingol*, XMAQA028, with a Possible Camel as the Draft Animal)

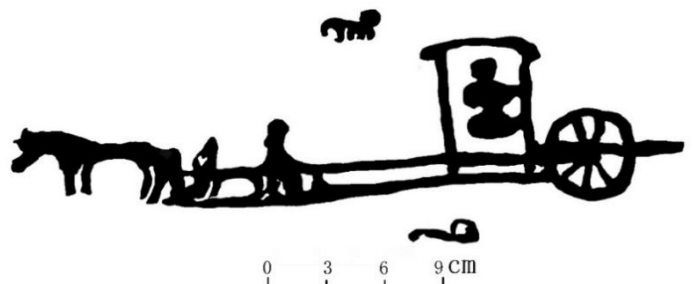


Figure 20: Type C (*Xilingol*, XMSZF036, with a Horse as the Draft Animal and a Person Seated inside the Carriage)

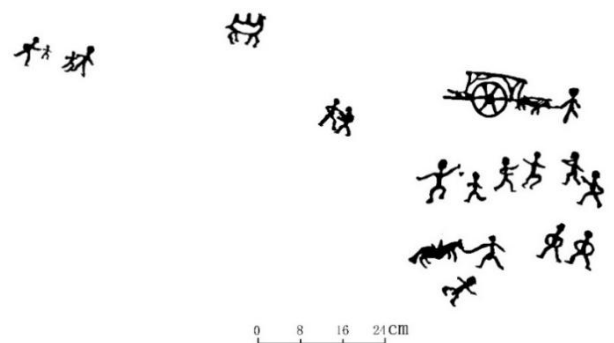


Figure 21: Type C (*Xilingol*, XMSZG003)

2.2 Typological Analysis of Bayannur-Ulanqab Vehicle Petroglyphs

The Bayannur-Ulanqab petroglyph area contains a total of 70 vehicle petroglyphs (Note 16), including one at the Baolega site in Sunite Right Banner, 25 at the Tuolamiao site in Baotou, 36 at the Aolenaobao site in Baotou, two at the Qiangpan Hure and Deligeer Hua sites, two at the Jigong Hailaiste and its vicinity, one at the Hanwula Mountain site, and one each at the Daba Gully, Agui Gully, and Tuolin Gully sites. Additionally, two vehicle petroglyphs are not analyzed due to missing content (Note 17).

Similarly, based on the changes in the shaft, the vehicle petroglyphs in this region are divided into two types: Type A (no shaft) and Type B (single-shaft). No double-shaft vehicle petroglyphs have been found in this area. Type B is further classified into four-wheeled and two-wheeled types based on the number of wheels. The two-wheeled type is further classified based on whether there are draft animals on both sides (whether there are draft animals), different representations of wheels (wheels with spokes, solid circular wheels or circles, omitted wheels), and other characteristics.

Type A: No shaft, only wheels

Three examples, all with wheels having spokes, varying in number, and with animals depicted in the scene, as shown in Figures 22 to 24.

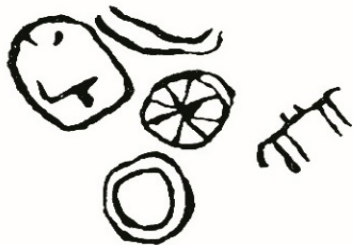


Figure 22: Type A (Yin, Figure 1027)



Figure 23: Type A (Yin, Figure 1143)



Figure 24: Type A (Yin, Figure 70)

Type B: Single-shaft

Subtype I: Four wheels, with draft animals

Two examples, with four wheels depicted as solid circles, the axle intersecting perpendicularly with the shaft, a crossbar for yoking horses, draft animals on both sides, and a charioteer with a whip in front of the vehicle, as shown in Figure 25.



Figure 25: Subtype BI (Wu, Figure 881)

Subtype II: Two wheels

Subtype IIa: No draft animals

IIa₁: Wheels with spokes

Two examples, with two wheels, a single shaft, and a carriage, as shown in Figure 26.



Figure 26: Subtype BIIa1 (Yin, Figure 485)

IIa₂: Solid or circular wheels

Eight examples, with wheels and carriages depicted as circular or solid circles. Notably, the yoke is clearly depicted in some examples, as shown in Figures 27 and 28.



Figure 27: Subtype BIIa2 (Wu, Figure 882)



Figure 28: Subtype IIa2 (Wu, Figure 992)

Subtype IIb: With draft animals, horses on both sides

IIb₁: Solid or circular wheels

Forty-three examples, with wheels and carriages depicted in various ways. Some have solid circular wheels, while others have circular wheels with square carriages, making the depictions more vivid, as shown in Figures 29 to 31.



Figure 29: Subtype IIb₁ (Wu, Figure 514)



Figure 30: Subtype IIb₁ (Wu, Figure 660)



Figure 31: Subtype IIb₁ (Wu, Figure 1251)

IIb₂: Wheels omitted

Ten examples, with no depiction of wheels, but with carriages and shafts. Some carriages have standing figures, one of whom appears to hold a weapon, as shown in Figures 32 and 33.



Figure 32: Subtype IIb₂ (Wu, Figure 1252)



Figure 33: Subtype IIb₂ (Wu, Figure 219).

3. THE CHRONOLOGICAL ISSUES OF VEHICLE PETROGLYPHS ON THE INNER MONGOLIA PLATEAU

Among the vehicle petroglyphs, some only depict wheels with varying numbers of spokes. This type of petroglyph is distributed in certain quantities in northern China and the Eurasian steppe. Since the movement and load-bearing of vehicles mainly depend on the wheels, the depiction of wheels alone in petroglyphs may be to emphasize their importance or simply to represent vehicles through the wheels. We have separated the wheel into its own category; however, due to the lack of criteria for periodization and chronological assessment, the dating of this type of petroglyph will not be discussed here.

Type B vehicle petroglyphs feature single-shaft vehicles, most with two wheels. Whether or not there are draft animals on both sides, and regardless of whether the wheels are solid, circular, or omitted, the single shaft is clearly depicted, and vehicles with draft animals typically have two horses facing the shaft, forming a typical representation in vehicle petroglyphs. This type of vehicle petroglyph is also the most common in the petroglyphs of Mongolia, Kazakhstan, Kyrgyzstan, Tuva, Russia, and other regions (Bayannur, 2012) (Figure 34). Their common characteristics are: identical vehicle forms, basically single-shaft and two-wheeled, and similar representations or forms of vehicles. Four-wheeled single-shaft vehicles are very rare, with only two examples found (Figure 25). Based on the available data, four-wheeled vehicles are neither as fast nor as convenient as spoke-wheeled two-wheeled chariots, which is why two-wheeled chariots quickly became popular and were used as war chariots. From our previous analysis of the emergence of vehicles and the origins of chariots, four-wheeled single-shaft vehicle petroglyphs are older than two-wheeled single-shaft vehicle petroglyphs.

From the perspective of harnessing methods, the main methods of harnessing ancient Chinese chariots were the yoke-and-trace method, the breastband method, and the collar method, corresponding to the periods from the Shang and Zhou dynasties to the Warring States period, the Han to Song dynasties, and the Yuan dynasty and later, respectively (Sun, 1984). In 1963, a bone plate depicting two vehicles and four horses was unearthed from Tomb M102 at Nanshan Gen in Ningcheng, Chifeng (Note 19). The excavators believed that the upper limit of the tomb's

There are not many double-shaft vehicle petroglyphs, distributed in the Xilingol region. Two of these petroglyphs depict passengers inside the carriage, and another two show vehicles used for transporting goods. The harnessing method of the double-shaft vehicles in the petroglyphs cannot be identified, or this detail is not depicted in the petroglyphs. However, based on the previous analysis, these double-shaft vehicle petroglyphs are later than the single-shaft ones and may date from the Han Dynasty or later.

4. THE FUNCTION OF VEHICLE PETROGLYPHS

Initially, chariots served not only as means of transportation for the nobility but also for hunting and warfare. There are numerous records of hunting activities in oracle bone inscriptions (Note 22), including descriptions of Shang kings hunting in chariots. The *Book of Rites: Wang Zhi* (Liji) also records: "When the son of Heaven and the princes had no (special) business in hand, they had three huntings in the year. The first object in them was to supply the sacrificial dishes with dried flesh; the second, to provide for guests and visitors; and the third, to supply the ruler's kitchen. Not to hunt when there was no (special) business in the way was deemed an act of irreverence. To hunt without observing the rules (for hunting) was deemed cruelty to the creatures of Heaven. The son of Heaven did not entirely surround (the hunting ground); and a feudal prince did not take a (whole) herd by surprise. When the son of Heaven had done killing, his large flag was lowered; and when the princes had done, their smaller flag. When the Great officers had done, the auxiliary carriages were stopped; and after this, the common people fell a hunting (for themselves) (Note 23). The text describes that when the Son of Heaven and feudal lords went hunting, after the ministers had killed the wild beasts, they would order the attendants who assisted in driving the animals to cease their efforts, indicating that hunting was conducted with chariots. However, hunting activities also served as military exercises, with an even more important purpose—military training. Yang Kuan argued that the ceremonial archery (the 'She Li') originated from military training conducted through hunting, with the aim of selecting talents. Ceremonial archery was a significant component of pre-Qin rites and had already become widespread during the late Shang period. Noble disciples were required to master this skill, and during archery competitions, the Shang king and members of

various noble classes would participate. The archery rituals of the Zhou dynasty were derived from those of the Shang but included many specific details and formalities (Note 24). Hunting-related activities were often associated with "rites" or rituals.

Most of the war chariots and noble vehicles mentioned in pre-Qin literature were single-shaft horse-drawn chariots. As previously mentioned, these single-shaft vehicles used the yoke-and-trace harnessing method. These vehicles had large wheels, small carriages, and lightweight bodies, which could achieve considerable speed when drawn by horses. However, driving skills were required to control them effectively, which is why 'charioteering' was one of the six ancient arts. A Chinese bronze vessel from the Warring States period, a hunting-pattern vase housed in the Minneapolis Institute of Art, depicts scenes of chariot hunting. Another similar chariot and horse pattern is found on a bronze mirror housed in the Freer Gallery of Art (Li, 2001) (Figure 36). The functions of the chariot are clearly depicted, with charioteers and chariot soldiers on the single-shaft vehicles. A shell in the collection of the Cleveland Museum of Art (Note 25) vividly depicts chariot hunting (Figure 37).

One side of the shell: Above, a single-shaft chariot drawn by four horses is racing forward, chasing a wild animal. In front, a fleeing sheep or deer looks back in panic. Below, another single-shaft chariot drawn by two horses is also racing forward in pursuit of an animal. Both chariots have charioteers and bowmen. The sense of distance is depicted through the proportion of the figures, and the galloping horses and fluttering banners are vividly represented, creating a tense atmosphere of hunting. The other side of the shell: A single-shaft chariot drawn by four horses, with two people on board. One person holds a bow and arrow. In the center, a deer kneels on one leg with an arrow in its body, looking up and neighing. Two servants run toward the deer. Animals scatter in all directions, including sheep, wild boars, and birds. The overall scene depicts a successful hunting expedition. This shell painting is a masterpiece of contemporary painting. A bone plate unearthed from Tomb M102 at Nanshan Gen in Ningcheng, Chifeng, depicts two vehicles with hunters positioned in front of the vehicles rather than on them, possibly due to space limitations on the bone plate. However, the meaning of chariot hunting is generally accepted.



Figure 36: Copy of a Chariot and Horse Hunting Pattern Mirror from the Cleveland Museum of Art (Note 26)



Figure 37: Shell Painting and Line Drawing from the Cleveland Museum of Art (Note 27)

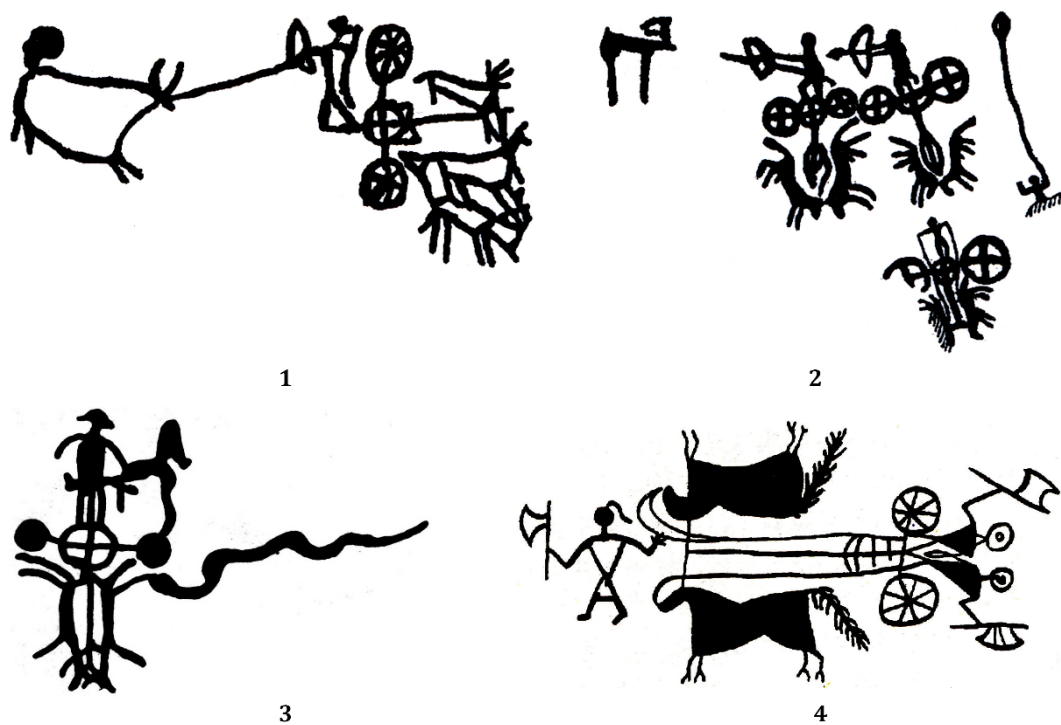


Figure 38: Petroglyphs of Chariot Hunting and Warfare

1. Lusen petroglyph site in Tianjun County, Haixi Prefecture, Qinghai; 2. Arpauzen petroglyph site in South Kazakhstan; 3. Petroglyphs along the Chuluut River in Kharkh Province and Khuvsgul Province, Mongolia; 4. Katapayinashinu petroglyphs in India.

In the Inner Mongolia Plateau petroglyphs, some vehicle petroglyphs depict charioteers, possibly holding weapons (Figure 30) or bows and arrows, standing on horse-drawn chariots (Figure 33), showing scenes of hunting or warfare. In the Lusen petroglyph site and the Wild Bull Gully petroglyph site in Haixi Prefecture, Qinghai, there are clear depictions of hunting scenes with vehicles (Figure 38:1). Tang Hui-sheng believes that vehicles here may only have symbolic significance, representing the success of the hunting ritual (Tang, 1991). Indeed, petroglyphs of chariot hunting and warfare are also distributed in the Eurasian steppe and South Asia. In the vehicle petroglyphs at the Arpauzen site in South Kazakhstan, two people standing on each chariot aim their bows and arrows at a sheep in front (Figure 38:2). In the petroglyphs along the Chuluut River in Kharkh Province and Khuvsul Province of Mongolia, the figures on the vehicles are clearly depicted with weapons on their waists (Figure 38:3). In the Indian petroglyphs at Katapayinashinu, the figures all hold weapons, and the soldier leading the horse in front wears a helmet and is dressed as a warrior, indicating a scene of warfare (Figure 38:4) (Note 28).

In summary, vehicles depicted in petroglyphs served not only as means of transportation but also for hunting and warfare. Additionally, vehicle images may have had ritualistic or ceremonial significance related to 'rites' or ceremonies.

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ANNOTATION

Note 1: The original image is from the website https://www.d-maps.com/carte.php?num_car=22422&lang=en and has been marked by the author.

Note 2: Епимахов А. В., Чечушков И. В., Евразийские колесницы: конструктивные особенности и возможности функционирования, Археология Южного Урала, Степь (проблемы культурогенеза), Челябинск: Рифей, 2006; Чечушков И. В., Колесничный комплекс эпохи поздней бронзы степной и лесостепной Евразии: от Днепра до Иртыша, Диссертация на соискание ученой степени кандидата исторических наук, Екатеринбург, 2013. Quoted from Wang Peng, "The Bronze Wheel-tooth Chariots of the Zhouyuan Site and East-West Cultural Exchanges," *Archaeology*, 2019, Issue 2.

Note 3: Епимахов А. В., Относительная и абсолютная хронология синташтинских памятников в свете радиоуглеродных датировок, Проблемы истории, филологии, культуры, XVII, Москва-Магнитогорск-Новосибирск, 2007. Quoted from Wang Peng, "The Bronze Wheel-tooth Chariots of the Zhouyuan Site and East-West Cultural Exchanges," *Archaeology*, 2019, Issue 2, Footnote 18.

Note 4: Sun Ji, *Material Culture of the Han Dynasty: Illustrated Edition* (Revised Edition), Shanghai Ancient Books Publishing House, 2008, pp. 111-133. Examples of vehicle forms can be referenced from the double-yoke ceramic ox cart unearthed from Qin Tomb BM103 at Baqi Tuan, Fengxiang, Shaanxi, and the double-yoke chariot from the late Warring States period found in the chariot and horse pit of Tomb 1 at Huaiyang, Henan.

Note 5: Xia: 2070 BCE – 1600 BCE. Early Shang: 1600 BCE – 1300 BCE. Late Shang: 1300 BCE – 1046 BCE. Western Zhou: 1046 BCE – 771 BCE. (The above data is based on the *Xia-Shang-Zhou Chronology Project (1996-2000)*). The Eastern Zhou is divided into, Spring and Autumn Period: 770 BCE – 476 BCE; Warring States Period: 475 BCE – 221 BCE. And Qin Dynasty: 221 BCE – 207 BCE. Western Han Dynasty: 206 BCE – 8 CE. The Bronze Age in China: Xia, Shang, and Zhou (including Western and Eastern Zhou). The Early Iron Age: Approximately during the Spring and Autumn and Warring States periods.

Note 6: The image is sourced from Sun Ji, "From Chest-Style to Saddle-Style Harnessing Methods: A Brief Discussion on Ancient Chinese Chariot Design," *Archaeology*, 1980, Issue 5.

Note 7: The image is sourced from Епимахов А. В., Чечушков И. В., Евразийские колесницы: конструктивные особенности и возможности функционирования, Археология Южного Урала, Степь (проблемы культурогенеза), Челябинск: Рифей, 2006; Чечушков И. В., Колесничный комплекс эпохи поздней бронзы степной и лесостепной Евразии: от Днепра до Иртыша, Диссертация на соискание ученой степени кандидата исторических наук, Екатеринбург, 2013.

Note 8: The image is sourced from Sun Ji, "From Chest-Style to Saddle-Style Harnessing Methods: A Brief Discussion on Ancient Chinese Chariot Design," *Archaeology*, 1980, Issue 5.

Note 9: The image is sourced from An Zhimin, Zheng Naiwu, "The Stone Coffin Tomb No. 102 at Nanshang, Ningcheng County, Inner Mongolia," *Archaeology*, 1981, Issue 4.

Note 10: Representative discussions can be found in the following studies: Zhai Defang, "An Initial Exploration into the Origins of Chariots in the Shang and Zhou Periods," *Huaxia Archaeology*, 1988, Issue 1; Wu En, "On Ancient War Chariots and Related Issues," in *Essays on the Archaeology of Inner Mongolia*, Encyclopedia of China Publishing House, 1994; Zhang Changshou, Zhang Xiaoguang, "The Western Zhou Wheel Chariot Found at the Jing Shu Tomb Site," *Acta Archaeologica Sinica*, 1994, Issue 2; Zheng Ruokui, "On the Origins of Ancient Chinese Chariots," *Huaxia Archaeology*, 1995, Issue 3; Wang Wei, "A Brief Study on the Origins of Chinese Chariots," in *Proceedings of the International Academic Conference on Shang Culture*, edited by the Institute of Archaeology, Chinese Academy of Social Sciences, Encyclopedia of China Publishing House, 1998; Lin Yong, *Collected Academic Works of Lin Yong*, Encyclopedia of China Publishing House, 1998, pp. 296-301; Yang Hong, "On Chariots and Chariot Warfare: Two Discussions," *The Palace Museum Journal*, 2000, Issue 3; Lin Meicun, "Bronze Age Chariot-Making Tools and the Origins of Chinese Chariots," in *Ancient Roads and Western Winds: Archaeological Discoveries and Sino-Western Cultural Exchanges*, Life, Reading, and New Knowledge Publishing House, 2000; Wang Haicheng, "The Origins of Chinese Chariots," *Eurasian Studies Journal*, Vol. 3, Zhonghua Book Company, 2002; Gong Yingyan, "The Evolution and Spread of Chariots: A Discussion on the Origins of Ancient Chinese Chariots," *Journal of Zhejiang University (Humanities and Social Sciences Edition)*, 2003, Issue 3; Xia Hanyi, "The Origins and Historical Significance of Chinese Chariots," *Strange Views of Ancient History*, Shanghai Ancient Books Publishing House, 2005; Jing Zhongwei, Zha Ce, "The Nail-Teeth Bit and the Bridle: A Comparative Study of Western and Chinese Horse-Riding Equipment from the 2nd Millennium BCE to the 3rd Century BCE," *Acta Archaeologica Sinica*, 2013, Issue 3; Wang Peng, "The Bronze Wheel-Tooth Chariots of the Zhouyuan Site and East-West Cultural Exchanges," *Archaeology*, 2019, Issue 2.

Note 11: Kuzmina, E. E. (Russian), translated into English by M. M. Mayweheng, and Li Chunzhang (Chinese), *Prehistory of the Silk Road*, Science Press, 2015, pp. 90-91.

Note 12: The line drawing is sourced from Terigen Bayannur, "Distribution Characteristics and Content Analysis of Vehicle Petroglyphs in the Central and Eastern Eurasian Steppe," *Grassland Cultural Relics*, 2012, Issue 2.

Note 13: Vilà C, Leonard J A, Gotherstrom A, Marklund S, Sandberg K, Liden K, Wayne R K, Ellegren H. Widespread origins of domestic horse lineages. *Science* (New York, N.Y.), 2001, 291(5503). Mitochondrial DNA and the origins of the domestic horse. *Proceedings of the National Academy of Sciences of the United States of America*, 99(16), 10905-10. doi:10.1073/pnas.152330099.

Note 14: Yuan Jing, "Archaeozoological Studies of Ancient Domestic Animals in China," *Quaternary Research*, 2010, Issue 2. Lv Peng, Luo Yunbing, and Yuan Jing, "Building an Archaeozoological Discipline System with Chinese Characteristics, Style, and Flair," *China Cultural Relics News*, December 6, 2019.

Note 15: The line drawings of the vehicle petroglyphs from Xilingol are taken from Wang Xiaokun et al., *Xilingol Petroglyphs* (hereinafter referred to as *Xilingol*), published by Social Sciences Academic Press, 2019. The figure numbers in parentheses below each line drawing correspond to the figure numbers in the book for easy reference.

Note 16: The petroglyph data and line drawings for this region are sourced from Gai Shanlin, *Yinshan Petroglyphs* (hereafter referred to as *Yin*), Cultural Relics Press, 1986; Gai Shanlin, *Ulanqab Petroglyphs* (hereafter referred to as *WU*), Cultural Relics Press, 1989; Altad S. Terguunbayar, *New Discovery of a Large Number of Chariot Petroglyphs in the Olon Owoo Area and Their Preliminary Identification and Interpretation*, *Journal of Rock Art*, Volume 2, Issue 2, 2023, pp. 1-47. Each line drawing is accompanied by a bracketed reference indicating its figure number in the original publication for ease of reference.

Note 17: At Aolun Aobao, there is a single rock carving of a vehicle with an A-shaped frame. Since this subtype of rock carving has only been found once on the Inner Mongolia Plateau and remains an isolated case, it is not included in the typological analysis.

Note 18: The line drawings are sourced from Terigen Bayannur, "Distribution Characteristics and Content Analysis of Vehicle Petroglyphs in the Central and Eastern Eurasian Steppe," *Grassland Cultural Relics*, 2012, Issue 2.

Note 19: Sun Ji argues that these two diagonal lines are connected from the inner shafts of the two yokes, or from positions equivalent to them, to the two diagonal lines at the front of the carriage, representing the two traces.

Note 20: In an early Scythian royal burial in the Tuva Republic, Siberia, a rock engraving depicting a vehicle was unearthed. Researchers believe it represents a fragmentary image of a "two-wheeled chariot" (Gino Caspari, Timur Sadykov, Jegor Blochin, Matthias Bolliger and Sönke Szidat, *New Evidence for a Bronze Age Date of Chariot Depictions in the Eurasian Steppes*, *Rock Art Research* 2020, Volume 37, Number 1, pp. 53-58). However, the author of this paper argues that the engraving from this burial only preserves one wheel and an axle, making it impossible to determine the vehicle's structure, whether it was horse-drawn, or its function. Therefore, the conclusion that it represents a chariot remains debatable. Based on the burial's dating, researchers estimate that the rock engraving was created no later than 833-800 BCE, which aligns chronologically with single-shaft vehicles found on the Inner Mongolia Plateau. This study further concludes that the time span of single-shaft vehicles in the Inner Mongolia Plateau is broader, and both single-shaft and double-shaft vehicles were used simultaneously.

Note 21: The image is sourced from Sun Ji, *Driving and Chasing: The Chariot and Horse Culture of Ancient China*, Shanghai Ancient Books Publishing House, 2016, p. 82, Figures 4-5.

Note 22: For detailed content, refer to Meng Shikai, "The Nature and Role of Hunting Activities in the Shang Dynasty," *Historical Research*, 1990, Issue 4.

Note 23: *The Book of Rites (Liji)* - English-Chinese Version, edited by Dai Sheng (AD 80), translated by James Legge, Intercultural Press, Beijing and Washington, p. 54.

Note 24: Refer to Yang Kuan, *New Explorations in Ancient History: A New Study of Ceremonial Archery*, Zhonghua Book Company, 1965, p. 313; Liu Yu, "Ceremonial Archery in Western Zhou Jin Inscriptions," *Archaeology*, 1986, Issue 12; Song Zhenhao, "A Study of Late Shang Ceremonial Archery Based on Newly Discovered Oracle Bone and Jin Inscriptions," *Chinese Historical Relics*, 2006, Issue 1; Yang Hua, Yao Erfeng, "Research on Ceremonial Archery in the Shang and Zhou Dynasties and Related Issues," *Historical Monthly*, 2015, Issue 12.

Note 25: The shell measures 7.5 cm in height and 9 cm in width. Its exact excavation site is unknown, and it is currently housed in the Cleveland Museum of Art, USA. Lin Shuzhong previously introduced the shell; see Lin Shuzhong, "Records of Overseas Paintings, Part II: Hunting Scenes,"

Journal of Nanjing Arts Institute (Fine Arts and Design Edition), 1996, Issue 3. Qi Dongfang also discussed this shell in his research on shells and shell-shaped boxes, placing it within the category of pre-Qin shells; see Qi Dongfang, "Shells and Shell-Shaped Boxes," *Huaxia Archaeology*, 2007, Issue 3. Based on the structure of the vehicle depicted inside the shell and its overall content, this study suggests that the shell dates to the Spring and Autumn or Warring States period.

Note 26: The line drawing is sourced from Yang Yingjie, "An Interpretation of Pre-Qin Banners," *Cultural Relics*, 1986, Issue 2.

Note 27: The image is sourced from the Cleveland Museum of Art website: <https://www.clevelandart.org/art/collection/search?i=1&search=shell>. The line drawings were created by Wenzhi Zhang.

Note 28: The line drawings are sourced from Terigen Bayannur, *Distribution Characteristics and Content Analysis of Vehicle Petroglyphs in the Central-Eastern Eurasian Steppe*, Prairie Cultural Relics, 2012, Issue 2.

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