

Generation of a Historical Weapon Ge and Its Impacts on Huaxia Culture

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Abstract

The history of Huaxia (Chinese: 华夏, a historical concept representing the Chinese nation and civilization) is full of wars. Various weapons were developed that are suitable for ground combat with horse-drawn vehicles. The weapon Ge (Chinese: 戈) was already used before 221 BC (before the Qin Dynasty, ca. 221–206 BC), and disappeared in around 25 AD (at the end of Western Han Dynasty). In most other regions in the world, this type of weapon has hardly been used. The weapon axe was used in the ancient wars (in the same period) outside Ancient China (also called the Middle Kingdom), such as in Mesopotamia (the area of the Tigris–Euphrates river system). However, the weapon axe is different from Ge, although there seem some similarities. This article provides an in-depth study and analysis of the reasons for the historic use of this unique weapon Ge, of its development in Ancient China, and of its influence on (military and civil) culture.

Keywords: Ge (戈), weapon history, geography, climate, archaeology, culture, Chinese characters (汉字)

1. Introduction

Yan Huang (Chinese: 炎黄), which was more than 4000 years ago an ethnic group in Ancient China inhabiting the Yellow River basin area. It fought a number of wars in the area of the historic "Middle Kingdom", from which Huaxia (Hua-hsia; 华夏) developed. (Shi & Hu (Eds.), 1996)

Various combat weapons were developed, e.g. the sword, polearm weapons, (cross) bow and arrow, spear, pike, battle axe, single-edged blade (such as the European glaive, the Japanese naginata, and the Russian sovnya), and also Ge. Except Ge, all the other weapons are very similar, in terms of shape, function and operation, to weapons found in other regions in the world (Zhong, 1999). Ge belongs to the polearm (or pole weapon) category. It is designed for warfare with extended reach of over 3 m (Yang, 1977). Its weight is approximately 3 kg (Lu, 1993).

The main components of Ge are: (1) sickle-shaped (or dagger-shaped) Hu; (2) front; (3) upper blade; (4) lower blade. These four components together are called Part Yuan (Chinese: 援). The backside of the weapon is called Part Nei (Chinese: 内), which is used for fixing the head in a bar to get balance with Part Yuan (see Figure 1).

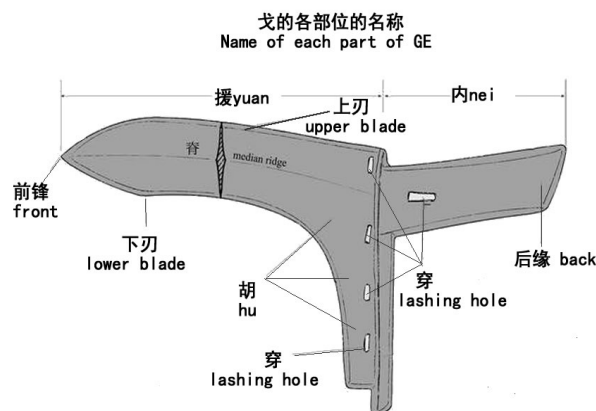


Figure 1. Illustration of the components of combat weapon Ge

It has been suggested that Ge is more or less like battle axe, as both have the shape of a long beak of a bird, and that it is similar to other blade weapons with cutting capabilities, which were found in other areas outside Ancient China, such as in Mesopotamia, Germany and Spain (See Figure 2). And that therefore the historical weapon Ge was not unique (Zhou, 2006).

The author disagrees with this view. The most, and very essential difference between Ge and battle axe is that besides cutting capabilities, the additional function of Ge is to use its lower blade and a sickle-shaped Hu (see Figure 1 (left)) to attack the enemy. The sickle-shaped Hu is especially de-signed for lopping and cutting off. The power of the function also seems a lasso-like slinging and pulling. In summary, Ge has integrated functionality of lopping, shaping, splitting, slinging, hitting, pulling, cutting and cleaving. These characteristics make Ge unique weapon. Battle axes and other combat weapons found in areas outside Ancient China do not have the same integrated functional-ity. In addition, the use of these various other combat weapons was different from the use of Ge. It should be noted that Ge was used in the period that horse-drawn combat vehicles were used. The vehicles were a kind of chariots using horses to provide rapid motive power, deployed in military as of transport as well as mobile platform for archery-based combat. Therefore, Ge is not the same as other long-ranged weapons (able to harm targets at distances greater than arm-length) or a melee weapon (intended for use in hand-to-hand combat). Section 3 will provide more details about the vehicles and the use of Ge.

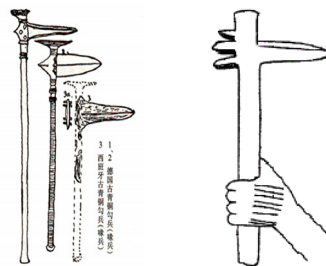


Figure 2. Illustrations of various battle axes found in other areas outside Ancient China (Left: Similar combat weapon found in Germany and Spain; Right: Battle axe found in Mesopotamia) (De Morgan, 1921)

According to the archaeologist J. Li (1932), Ge is a unique combat weapon invented in Ancient China. Based on research of the Ruins of Yin (Chinese: 殷墟, which is near current Anyang, Henan province, People's Republic of China), Li concluded that among the five weapons made in the Shang Dynasty (c. 1600–1046 BC), Ge was the only one that has never been found in any other areas of the world. The other four weapons were also created in other regions, such as ancient Europe, Egypt and Siberia (Li, 1932). Ge was only used in the period from roughly 221 BC to 25 AD (end of West-ern Han Dynasty), in Ancient China, and in some nearby areas influenced by Chinese culture, for instance Korea and Japan (Zhong, 1999).

Although the weapon Ge went out of use at the end of the Western Han Dynasty, its impact on Chinese culture is essential. Many Chinese characters (Chinese: 漢字) related to war or military, use "戈" Ge as radical, i.e. as structural component. Furthermore, Ge is used in traditional idiomatic ex-pressions (Chengyu, usually composed of four characters), essays and poems. In addition to becom-ing an important symbol, "Gan Ge" (Chinese: 干戈) is an alternative term for war in Chinese. Note that "Gan" means shield (Chinese: 盾牌).

This combat weapon was very widely used in Ancient China in a certain period. However, no con-vincing evidence was found of the use of Ge in any other area in the world. To the knowledge of the author, until now no adequate in-depth study was made of the peculiar position of Ge, of the rea-sons of the development of this unique combat weapon, and of its impacts on culture. The research questions of this paper are:

- 1) How did the weapon Ge is develop?
- 2) Why it is uniquely applied in China in a certain period, especially during the Shang and Zhou dynasties?
- 3) What is the impact of Ge on ancient Chinese warfare and culture?

The paper is structured as follows: The next section investigates the background and development of Ge based on archaeological findings. Furthermore, it explores the reasons for and the factors influ-encing its development, as well as the reasons for using it only in a specific period (before 25 AD), and only in a certain area of Ancient China, based on in-depth studies of historical and geographical data. It also analyses the various impacts of Ge on

associated military weapons and Chinese culture, and the reasons for these impacts. Moreover, it further discusses weapon development related to Ge, such as relation to different historical periods, change of material, and relation to associated weap-ons. Finally, conclusions are drawn.

2. Investigation of the Generation and Development of Ge in Ancient China

Ge was found by archaeologists in various areas in the current P.R. China (see Figure 3). The archaeological findings show that the weapon Ge was invented with different shapes at the very beginning, also named Ge (Zhou, 2006). The focus of this paper is on the development and use of Ge from the Shang Dynasty (c. 1600–1046 BC) to the period of the Warring States (475–221 BC), when combat vehicles were used.

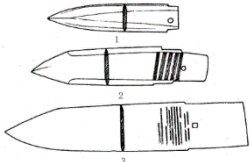
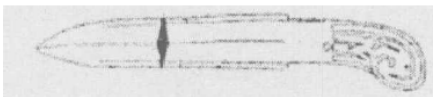
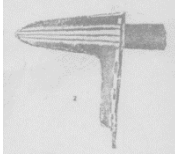
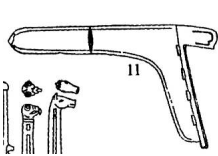



	<p>Ge used in Xia Dynasty (c. 2100–1600 BC), made from stone.</p> <p>The lengths are respectively: 1) 21.9 cm; 2) 30.2 cm; 3) 43.0 cm.</p> <p>Archaeological site: <i>Yanshierlitou</i>, Henan Province (Chinese: 河南省偃师二里头) (Guo, 2009)</p>
	<p>Ge used in the Xia Dynasty (c. 2100–1600 BC), made from bronze, with length 32.5 cm, and width 3.8 -4.8 cm.</p> <p>Archaeological site: <i>Yanshierlitou</i>, Henan Province (Chinese: 河南省偃师二里头) (CASA, 1976)</p>
	<p>Ge in Shang Dynasty (c. 1600–1046 BC), with length 15.5 cm, and width 6.5 cm.</p> <p>Archaeological site: <i>Chenggu</i>, Shanxi Province (Chinese: 陕西省城固县) (Tang, 1980)</p>
	<p>Ge in Western Zhou Dynasty (1027– 771 BC), made by bronze, with length 27 cm, and weight 325 g.</p> <p>Archaeological site: <i>Lingtaibaicaopo</i>, Ganzu Province (Chinese: 甘肃灵台百草坡) (GPM, 1977)</p>
	<p>Ge in late Spring and Autumn Dynasty (571– 476 BC), made from bronze, with length 17.6 cm, and width 3 cm. It is also called <i>Xugong Ge</i> (Chinese: 许公戈)</p> <p>Archaeological site: <i>Xujialing</i>, Henan Province (Chinese: 河南省淅川县徐家岭) (Yang, 2015)</p>
	<p>Illustration of Ge in Warring States (475–221 BC). Left: (Zhou, 2005); Right: (Du, 2007)</p>
	<p>Illustration of Ge in Western Han Dynasty (206 BC – 25 AC) (Zhou, 2006)</p>

Figure 3. History of Weapon Ge, based on archaeological findings in the area covering Ancient China

The combat weapon Ge originated during the Shang Dynasty (ca. 1600-1046 BC). In the late Shang Dynasty (approximately ca. 1320–1046 BC), Ge was especially further developed to adapt to the emerging use of combat vehicles. The form of Ge was changing. Originally the sickle-shaped Hu was short. It developed to a much greater length until c. 1046 BC. Furthermore, the angle of Yuan (援) and sickle-shaped Hu changed from a right angle 90° to an obtuse angle (>90°). In addition, the lower blade became curved. When the horse-drawn combat vehicles approached a group of the ene-mies, warriors (standing on the vehicles) used Ge to attack the enemies. This was somehow like cut-ting and harvesting with a sickle. In period of the Warring States (c. 475–221BC), with the use of cavalry, the use combat vehicles sharply decreased, and Ge was not used anymore.

In view of several experts (Zhong, 1999; Yang, 1977; Shi & Hu (Eds), 1996, Shen, 1992), the main reason that Ge developed and was widely used in Ancient China was the special use of the combat vehicles, especially from the late Shang Dynasty (c. 1320–1046BC) to the Western Han Dynasty (206 BC – 25 AC). In this period, combat vehicles were the main equipment of the army. Ground combats occurred frequently, and Ge became the main weapon for such combats.

When the horse-drawn combat vehicles approached enemies (the opposite side), the horses from both sides would not ride to each other and hit head-on, but would pass each other at a very short distance. Only in such very short time frame and on a relatively fast moving combat vehicle with high vibration, warriors on the combat vehicles could use weapons to attack each other. If other pole weapons would be used, such as battle axe, pike or lance, these could only be effective if they could target the fast-moving object very accurately in a small two-dimensional vertical range (height and width). However, on (fast) moving combat vehicles, it would be very difficult, if not impossible, to attack the moving target in a short time frame very accurately by using such pole weapons. With the weapon Ge, if the warrior could point to the targeted objective at relatively accurate height range, within the operational range (length of reach) of Ge, the warrior could attack the enemy effectively. Using Ge does not only substantially increase the probability for the warrior to attack the target, but exploits the advantage of the kinetic energy of the (fast) moving combat vehicles to significantly increase the impact of the use of Ge. It can therefore be concluded that using Ge would be much easier, more practical and more effective than using any other weapon (available at that time) in such specific situation. Figure 4 illustrates the combat vehicle used in Ancient China when Ge was used.

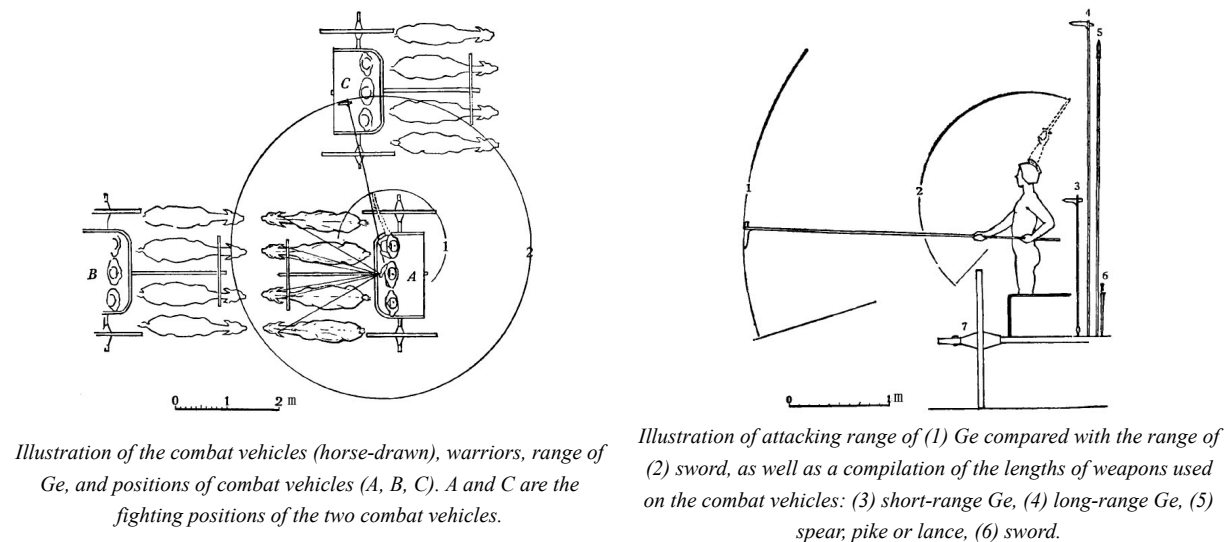


Figure 4. Illustration of the use of combat vehicles and Ge in ancient warfare (adapted after Yang, 1977)

Combat vehicles, as important military equipment in the ancient world, have been widely used in other areas in the same period, e.g. by the Hittites, and in ancient Egypt and Assyria, including Mesopotamia that was conquered by Assyria (Jin, 2007).

There are two different views concerning the combat vehicles used in Ancient China. One considers that these were originally invented in Ancient China (Zheng, 1995); the other assumes that these were inspired by examples from other areas, including Middle East, spreading to Ancient China. The author supports the latter view, which is supported by archaeological evidence (Wang, 2001). When the technique of building combat vehicles entered Ancient China, the vehicles were further developed to adapt to the specific climatological and geographic situation (Guo, 2004).

Until now two issues still puzzle the researchers, for which no convincing solutions have been found.

1) In various regions and areas combat vehicles were also widely used in (large-scale) battles, such as in military campaigns in the Ancient Egypt of Thutmose III (1504–1450 BC), and in the Battle of Kadesh (or Qadesh) between the forces of the Egyptian Empire and the Hittite Empire at the city of Kadesh, (Shi, 1996; Healy, 1993). However, it was not found that such simple, pragmatic and highly effective weapon Ge was used in these area. In the rest of this paper we use the term "Middle East" to refer to the aforementioned areas (Hittites, ancient Egypt and Assyria).

2) Weapons such as battle axe, spear, pike and lance also have their own specific powerful functions for cutting, cleaving, and thrusting. Although Ge has integrated functions, and delivers more lopping power against a moving target area (which also makes it more effective for attacking warriors and horses protected by armours, due to concentrating more of its weight in the head), it is not for thrusting, and most capacities of Ge (if we look at these in isolation) are not better than those of the other pole weapons. However, Ge was widely used in a certain period in the battles of Ancient China, and the symbol was found in many Chinese characters (汉字) related to war and weapons. S. Zhong (1999) stated that only from a functional perspective, it is difficult to explain why in the Shang Dynasty (c. 1600–1100 BC) and the Zhou Dynasty (c. 1100–221 BC) Ge was used instead of battle axes, and this is still a puzzle.

3. Ge - A Unique Weapon in Ancient Chinese History

Based on in-depth study of historical and geographical data, as well as educated guess, we explore the reasons for the fact that Ge was only used in a certain period and only in certain areas. We start with comparative analysis of the structure of the "Middle-East Combat Vehicles" and the ones used in Ancient China, in terms of: (1) tactics (tactical grouping); (2) style of fighting, conducting operations, warfare against enemies and battle; and (3) geographical, environmental and climatological conditions. Then we analyse other factors that may influence the creation and development of Ge.

3.1 Comparative Analysis of the Structure of the Combat Vehicles in Mid East and Ancient China

There are some similarities between the combat vehicles used in Middle East and Ancient China. For instance, both types of combat vehicles used wheels with spokes; the shape and the length of the hub (around the axle for fixing the spokes) in the two regions were very similar; there were hardly any differences in the shape, the components and the materials of the saddles, and the technique for making the combat vehicles were the same. (Wang, 2001) These observations indicate that the combat vehicles have the same source.

However, we notice some differences between the two, mainly reflected in the size. The combat vehicles used in Ancient China were much higher and stronger. They had larger wheels (or wheels with larger diameter) and a substantially larger number of spokes.

From literature and archaeological findings (see, e.g. (CASA, 1961)), in the Shang (商) Dynasty (c. 1600–1046 BC), the wheel diameter was between 1.3 m and 1.5 m, and the number of the spokes was mainly around 18 (although it was also found that some combat vehicles had 22, or even 26 spokes). During the Western Zhou period (西周) (c. 1046–771 BC), the horse-drawn combat vehicles were quite similar to those in the Shang (商) Dynasty, with minor developments, for instance: the wheel diameter was between 1.25 m and 1.45 m, and the number of the spokes was between 18 and 28 (and most in the range 18–22). In the Spring and Autumn period (春秋) (770–476 BC) the wheel diameter was between 1.25 m and 1.56 m, and the number of spokes was normally 25 or 26. During the Shang (商) Dynasty, the same vehicles were not only used for battles, but also for transport of people and goods (i.e. non-military use).

In the Spring and Autumn period (春秋), to adapt to the various needs and requirements, dependent on the types of battles, concerning combat vehicles (e.g. in terms of speed, manoeuvrability and toughness), vehicles were categorised according to different functions and the vehicles used for battles were distinguished as "combat vehicles" for attack in combat, and "logistics vehicles" for transport of people and goods. The former needed higher speed and more flexibility, therefore, the wheel diameter was a bit smaller (mainly around 1.24 m), while the latter had relatively larger wheels, with maximum of 1.7 m (Guo, 2004).

The combat vehicles use in the Middle East had small wheels, normally with less than one metre diameter. Before 1400 BC, in the Middle East the two-wheel vehicles powered by a horse often had wheels with 4 spokes. It was also found that before 2000 BC the combat vehicle in the Hittite Empire had sometimes had wheels with only 8 spokes. After 1400 BC the combat vehicle in Middle East had normally wheels with 6 spokes. Around 1000 BC the combat vehicles found in the Hittite Empire and Persia had wheels with 7, 8 or 12 wheel spokes. The combat vehicles in Assyria and Persia, even after 700 BC, had wheels with not more than 11-15. (加茂仪一, 1943)

Six well-preserved combat vehicles were found in 1922 in the tomb of the Egyptian pharaoh Tutankhamun (who ruled ca. 1332–1323 BC according to the conventional chronology). The diameters of the wheels are 0.74–1.0 m and the number of spokes is 4–6 (Wang, 2001).

Different designs of the wheels are determined by specific functional requirements. These differences will influence vehicle performance, such as usability for driving long distances in various terrain conditions, weight, load capacity and speed. From the comparative analysis of the wheels and the vehicle structure and materials, we found differences of focuses of the combat vehicles in different regions. The combat vehicles in Ancient China

(which were high and strong, with a high chassis) target weighting capacity and driving long distance in various terrain conditions; the combat vehicles in the Middle East (which were small, light and flexible with low chassis) target speed and manoeuvrability. The combat vehicles in Ancient China are heavier than those in the Middle East also due to use of different materials: in the Middle East, the main framework of the vehicles was made from wood, and the side and bottom parts were made from feather or ropes; in Ancient China, nearly all parts of the combat vehicle were made from wood.

3.2 Comparative Analysis of Tactical Grouping and Battle Style in the Middle East and Ancient China

The combat vehicles in the Middle East were light, for high speed and good manoeuvrability. The combat vehicles used during period of the Egyptian pharaoh Tutankhamun, weighed only 35kg. The vehicle performance was tested by using a reproduced vehicle drawn by two ponies. It was found that it could reach a speed of 38km/h, and that it could travel a distance of 50-60 km per day (Anglim & Jestice, 2003). During a battle, such chariot could use its advantage of high speed, quickly move to a proper position in a battle field; the warriors could use bow and arrows to attack the ene-mies from a certain distance and could quickly escape (if they could not defeat the enemy). There were hardly any combats at very short range in the ancient Middle East. Therefore, a military force was grouped by combat vehicle and infantry units. These two types of tactical troops operated independently. (Shi & Hu (Eds). 1996)

The combat vehicles in Ancient China, compared with those in the Middle East, were heavier (due to the fact that all components were made from wood), with larger wheels. Consequently, there were disadvantages in terms of speed and manoeuvrability. Due to lower speed, the combat vehicles could not quickly escape when they were attacked by an infantry. Therefore, the combat vehicles would need protection and support from an associated infantry unit. Consequently, a combat vehicles unit and an infantry unit were components of one troop, and the two units fought in coordination, which was the basic model of the military force in Ancient China (Shi & Hu (Eds). 1996). Apparently the combat vehicle speed was low enough for the infantry to follow and provide support. It should also be emphasised that the ancient combat vehicle did not use tyres (Wang, 2001).

In the same period, in other parts of the world, combat vehicles were using wheels with tyres made from leather to reduce the vibration of the moving vehicles with high speed (Wang, 2001). This difference (of the use of tyre) explicitly proves that the combat vehicles used in Ancient China were of lower speed, because of which there was no need to reduce vibration. Wang (2001) also provides evidence that wars, and large-scale wars with the involvement of combat vehicles happened more frequently during the Spring and Autumn period (Chinese: 春秋), (770-476 BC): 483 battles, including 376 large-scale combats, are reported in Zuo Zhuan (Chinese: 左傳; "Zuo Tradition" or "Commentary of Zuo" - an ancient Chinese narrative history that is traditionally regarded as a commentary on the ancient Chinese chronicle Spring and Autumn Annals). The basic unit of a military force was called Cheng (Chinese: 乘). A Cheng is composed of one combat vehicle powered by four horses, three warriors (on the vehicle), and seventy-two infantry (Shi & Hu (Eds). 1996). In general, the warriors were from the nobility, while the infantrymen came from lower social classes. In Chinese, Cheng was also used to describe the size and scale of a military force, e.g. thousands of Cheng and ten thousands of Cheng. When the battle started, a general model was that 1) the combat vehicles, accompanied by infantry, drove to the enemy; 2) when the opposite sides closed to each other adequately, they first used bow and arrow to attack each other; 3) and then the combat vehicles drove towards each other and warriors on the vehicles fought face-to-face with polearms. (Chen, 1991)

From this comparative analysis, we find that: during the wars in the Middle East, mainly bows and arrows were used (from the fast moving combat vehicles), and there were hardly fights between combat vehicles at a very short distance; in Ancient China, besides using bows and arrows, fights were at a very short distance on the moving vehicles. In such situation, the pole weapon Ge would be much more effective for attacking the enemy than any other weapon, such as battle axe, spear, pike and lance. Therefore, Ge became part of the standard components of the use of combat vehicles, and the most important weapon for the combat with horses-drawn vehicles.

From the abovementioned analysis, the first puzzle concerning the reasons of the use of Ge in Ancient China is solved. However, in that period, both in Ancient China and in the Middle East, the technique for making combat vehicles was mature, and every country in the Middle East could also make large vehicles as in Ancient China; and small combat vehicles could also be made in Ancient China as in the Middle East; but why did this not happen, why did the two regions make a different choice.

3.3 Comparative Analysis of Geography and Climate in the Middle East and Ancient China

Most areas in the Middle East belong to tropical and subtropical zones, which are often influenced by high (atmospheric) pressure at the Tropic of Cancer and trade-wind zones. The climate is dry and hot, with arid or sub-arid zones.

Mesopotamia (in the Middle East), had an extremely moistures period approximately before 4000 BC. Around 3500 BC, the climate in this area became dry. Due to this sharp change, the marsh-lands in the area of Babylonia (which was situated at the southern part of the Tigris–Euphrates river system) gradually dried, and the land became rich and fertile. In the same period, the climate in Af-rica saw a substantial change: the oases in the Sahara desert gradually disappeared, lakes dried, dunes developed and the desert appeared and extended. Ancient people, who lived next to oases and lakes had to leave their homes and migrated to the Nile River valley and the Nile Delta zone. With the increase of population density, tribes were generated, countries were established, and conflicts be-tween countries also occurred frequently.

In Mesopotamia, the northern mountainous area belonged to the Mediterranean Climate, while oth-er areas were in the sub-tropical zone, with arid and sub- arid climate. Due to scarce and very limited rainfall (by nature), agriculture in the area depended on artificial irrigation. At the very early stage, various irrigation systems in this area were built. For instance, an important large-scale public activi-ty in Mesopotamia was to build canals. Many data indicate that (Song & Li, 2014; Nemet-Nejat, 2002) in the old Babylon period, each King took irrigation as most important, and took the activities of building canals as important merits and virtues, and as contributions to society giving immoertal status (Song & Li, 2014).

Ancient Egypt, which was another area in the Middle East, situated in the Nile River basin, which was very dry and hot, with hardly any rain. The Nile River Delta and the northern part of the area along the coast were in the subtropical Mediterranean climate zone, which had a relatively temper-ate climate, compared with other areas at the same latitude. However, the major of ancient Egypt (outside the Nilke valley and delta area) had an arid tropical desert climate. Due to scarce rainfall, vegetation in this area had (semi-)desterilised characteristics. Cultivation was centralised in the areas of the Nile River basin and the Delta plain (or flatland) along the coast, and the irrigation mainly depended on the periodic flooding of Nile River.

From this geographic and climate information, one can conclude that in the region of the ancient Middle East (due to arid climate with scarce rainfall) the moisture content of the soil was very low, and that therefore the soil was rather hard. Except in agriculture fields (through artificial irrigation), vegetation in most fields was sparse. Therefore, there were hardly any obstacles in the fields for moving vehicles. Such geographic environment is suitable for driving combat vehicles at high speed. Therefore, it is very reasonable that small wheel combat vehicles were used in The Middle East, with the advantages of speed and manoeuvrability.

The geography and climate in Ancient China, before the Qin Dynasty, were completely different from the Middle East. According to K. Zhu (1972), the climate in the Yellow River basin had only a short cold period in the early Western Zhou period, and most of the time it was rather warm, even warmer than at present in the same area. It was indicated that the northern boundary of the distribu-tion of bamboo in Ancient China moved approximately 3 degree latitude to the north compared with the current situation. Animals, such as elephant, rhinoceros, river deer and water buffalo, that we can currently only find in tropics and subtropics, appeared in Ancient China (Zhang, 2007). In An-cient China, the climate of the Yellow River area was similar like the current climate of the Yangzi River (Zhu, 1972), and the irrigation system mainly depended on rainfall (Wang, 2001).

A lot of oracle inscriptions (on tortoiseshells or animal bones) about praying for rain were found, including from the oracle bone script (Chinese: 甲骨文) in the Shang Dynasty (c. 1600–1046 BC) (Guo (Ed.), 1982; Dong, 1948; Liu & Huai, 1954; Fan, 1965; Guo, 2012). Rainfall had a big impact on agriculture in Ancient China. The reason is that most areas belonged to a continental monsoon climate, and the main source of rainfall was the monsoon in the summer. In that period of Ancient China, it was hot and rainy in the summer, and the weather in the autumn was very comfortable (no rain and with moderate temperature).

Such weather and climate were very good for agriculture in Ancient China. Therefore, artificial irri-gation was not needed in that period, and started much later compared with the Middle East (Wang, 2010). Except in the Chinese myth about Yu the Great (Chinese: 大禹), a legendary monarch of the Xia Dynasty (c. 2070–1600 BC), who became famous for his introduction of flood control, recorded in the Records of the Grand Historian (Chinese: 太史公書 or 史記) Sima Qian (Chinese: 司馬遷), finished around 94 BC, no convincing evidence of large-scale irrigation projects before the Warring States period (Chinese: 战国) (475–221 BC) was found.

Furthermore, concerning the geographic environment before the Qing Dynasty, in the middle and lower reaches of the Yellow River, there were not only a lot of rivers, but also many lakes and marshes. Zou (1987), based on the literature Zuo Zhuan (Chinese: 左傳) and the Classic of Moun-tains and Seas (Chinese: 山海经; around the 4th century BC), counted in this period 24 lakes and marshes in the current Henan Province, and inferred that there were many more lakes and marshes in the ancient plain of the Yellow River and Huai River (Chinese: 淮河; located about mid-way be-tween the Yellow River and Yangtze).

戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩, 戩. Table 1 provides some examples of Chinese characters with Ge as radical in Oracle bone script, Chinese bronze inscriptions, and seal script, and illustrates how the characters were developed. The Chinese character "戈" has also been widely used in ancient essays and poems, as well as in more than 80 Chinese idioms (see Table 2)

Table 1. Examples of Chinese characters with radical Ge (Chinese Dictionary Ed. Group, 1993)

No.	Name	Description (Current vs. Original)	Current character	Oracle bone script	Chinese Bronze inscriptions	Seal script
1	wu	Current: military; valiant; fierce Original: to march with <i>Ge</i>	武			
2	zhan	Current: fight Original: to fight with <i>Ge</i> and bow	战	-		
3	lu	Current: kill; slays Original: to cut the head of a tribe leader	戮	-		
4	fa	Current: attack; cut down; strike Original: to cut the head with <i>Ge</i>	伐			
5	Ji	Current: an ancient weapon based on <i>Ge</i> Original: weapon used by army	戟	-		
6	qiang	Current: injure; harm; undermine Original: to kill when one is in bed	戕			
7	ge	Current: a weapon Original: a polearm with blade and <i>Hu</i>	戈	 		
8	rong	Current: army; military affairs Original: <i>Ge</i> and shield, i.e. basic equipment of ancient soldiers	戎			
9	shu	Current: defend; garrison Original: a military guard with <i>Ge</i> on his shoulder	戍			
10	jie	Current: guard against; warn; stop Original: to hold <i>Ge</i> in two hands, i.e. alert and ready to fight	戒			
11	wu	Current: the fifth of the ten Heavenly Stems Original: to fix an axe head on <i>Ge</i>	戊			
12	xu	Current: the 11th of the 12th Earthly Branches Original: combat axe, which is bigger than <i>wu</i> 戊	戌			
13	qi	Current: a <i>Ge</i> -like weapon in ancient China; sorrow; relative Original: combat axe with two-side sharp teeth	戣			
14	zai	Current: (used in exclamations) Original: war disaster (fire + military)	哉			

15	<i>guo</i>	Current: country Original: to defend a city with <i>Ge</i>	国	𠄎	𠄎	𠄎
16	<i>sui</i>	Current: year; year of age Original: to cut two feet, i.e. to punish by using <i>Ge</i>	岁	𠄎	𠄎	𠄎
17	<i>xian</i>	Current: all; everyone is equipped Original: big axe + get together	咸	𠄎	𠄎	𠄎
18	<i>er</i>	Current: two Original: to cut something in to two parts	贰	-	𠄎	𠄎
19	<i>wo</i>	Current: I Original: to hold a big axe and shout	我	𠄎	𠄎	𠄎
20	<i>cheng</i>	Current: succeed; accomplish Original: to conquer a place by military force	成	𠄎	𠄎	𠄎
21	<i>di</i>	Current: brother Original: to bind a rope around an up-side-down <i>Ge</i> "戈"	弟	𠄎	𠄎	𠄎
22	<i>wei</i>	Current: power; impressive strength Original: equipment 戍+female 女, i.e. to punish a lady	威	-	𠄎	𠄎

Table 2. Examples of Chinese idioms, essays and poems, in which Chinese character "戈" is used

Chinese Idioms (Chinese: 成语, mainly composed by four characters)	韬戈卷甲 止戈为武 干戈载戢 鲁阳挥戈 被甲枕戈 挥戈退日 投戈讲艺 朽戈钝甲 枕戈以待 枕戈坐甲 投袂援戈 枕戈达旦 解甲投戈 横戈跃马	铁马金戈 枕戈待命 鲁戈挥日 鲁阳麾戈 枕戈寝甲 寝苦枕戈 总戈成林 枕戈待敌 囊弓戢戈 偃革倒戈 止戈兴仁 束戈卷甲 枕戈泣血 挥戈回日	挥日阳戈 挥戈反日 挥戈返日 倒戟干戈 倒戈卸甲 反戈一击 兵戈扰攘 铸甲销戈 大动干戈 操戈入室 枕戈击楫 投戈讲艺 横戈盘马 化干戈为玉帛	杯酒戈矛 韬戈偃武 枕戈饮胆 倒置干戈 砺戈秣马 同室操戈 衽革枕戈 枕戈待旦 操戈同室 反戈相向 鲁戈回日 擐甲挥戈 枕戈汗马	弃甲倒戈 抛戈弃甲 解甲倒戈 枕戈饮血 金戈铁甲 卷甲韬戈 入室操戈 偃武息戈 以戈舂黍 投袂荷戈 前徒倒戈 倒持戈矛 金戈铁骑	止戈散马 枕戈尝胆 擐甲挥戈 弃甲投戈 倒戟干戈 泣血枕戈 买牛息戈 金戈铁马 被甲枕戈 持戈试马 倒持干戈 枕戈割刃 枕戈披甲
Essays and Poems in Ancient China	<i>Spring and Autumn</i> period (571–476 BC): "左传·宣公十二年" by Q. Zuo (Chinese: 左丘明 c. 502–422 BC) <i>Warring States</i> period (475–227 BC): "楚辞·国殇" by Y. Qu (Chinese: 屈原 340–278 BC) <i>Western Han</i> period (206 BC – 25 AC): "礼记·檀弓下", "尚书·牧誓", "尚书·顾命" (authors unknown) <i>Eastern Han</i> period (25–426 AC): "说文解字" by S. Xu (Chinese: 许慎, c. 58–147 AC), "后汉书·公孙述传" by Y. Fan (Chinese: 范曄, 398–445 AC) <i>Tang</i> Dynasty (Chinese: 唐朝, 618–907 AC): "饮马长城窟行" by Empora S. Li (Chinese: 李世民, 598–649), "送张说巡边" by Empera L. Li (Chinese: 李隆基, 685–762 AC), "新城甲仗楼" by J. Zhang (Chinese: 张籍, c. 766–830 AC), "塞上曲" by W. Geng (Chinese: 耿漳), "自河南经乱关内阻饥兄弟离散各在一处因望月有感" by J. Bai (Chinese: 白居易, 772–846 AC), "从军词三首" by Y. Wang (Chinese: 王涯 764–835 AC), "经乱离后天恩流夜郎忆旧游书怀赠江夏韦太守" and "登金陵冶城西北谢安墩" by B. Li (Chinese: 李白, 701–762 AC), "昔事文皇帝三十二韵" by M. Du (Chinese: 杜牧, c. 803–852 AC) <i>Song</i> Dynasty (Chinese: 宋朝, 960–1279 AC): "京口北固亭怀古" by Q. Xin (Chinese: 辛弃疾, 1140–1207 AC), "過零丁洋" by T. Wen (Chinese: 文天祥, 1236–1283 AC)					

5. Discussion

We have compared the use of combat vehicles in Ancient China and the Middle East. In Homer's Iliad, we can find descriptions of Greek combat vehicles (called chariots), which were used for racing, and for transporting warriors to a battle. The main reasons that these combat vehicles were different from the ones used in ancient China are: (1) the topography in ancient Greece was completely different; and (2) development of cavalry. Ancient Greece was composed of small plains, hills and mountains. It was not suitable for combat vehicles, as these could only be functional when used in a large flat area without or with limited obstacles. Ancient Greece had a long history to use infantry-men. The number of cavalry and vehicles used in military forces were not large. In addition, when city-states were established in Ancient Greek, cavalry was already mature. A similar situation was also applicable in ancient Rome. Therefore, there was no need to have a combat vehicle unit. (Shi & Hu (Eds), 1996)

Concerning the development of the materials for ancient weapons, Ge was first made from stone, from the Stone Age to Xia Dynasty (c. 2070–1600 BC) (Zhong, 1999). During the Shang Dynasty (c. 1600–1046 BC), the main weapons were Ge, spear, pike, lance, battle axe, sword, bow and arrow. The main material used in this period was bronze. In this period, large amounts of bronze weapons were produced and used. However, it took a long time for bronze to completely replace stone and other materials, e.g. horns of animals. In the end of the Shang Dynasty (approximately 1320–1046 BC), although the bronze weapons were mainly used, the heads of the arrows were still made from stone or horns of animals (Wang, 2001; Lu, 1999).

In the late part of the Western Zhou period, iron weapons developed. In the Eastern Han period, bronze weapons were not used any more and completely replaced by iron weapons. During the War-ring States period (475–227 BC), then crossbow was invented. Meanwhile, due to the improvement of metallurgical technology, iron weapons were widely used, such as polearms, and the iron sword. Combat vehicles were less used. Meanwhile, infantry and cavalry became the main forces. The weapons, such as spear and knife (used by infantrymen and cavalrymen) became the important equipment of a military force. (Zhong, 1999; Wei, 2011; Lu, 1999)

The use of different materials for the weapon Ge in Ancient China is summarised in Figure 5. Note that the periods in Chinese chronology are often defined with different years in different literature.

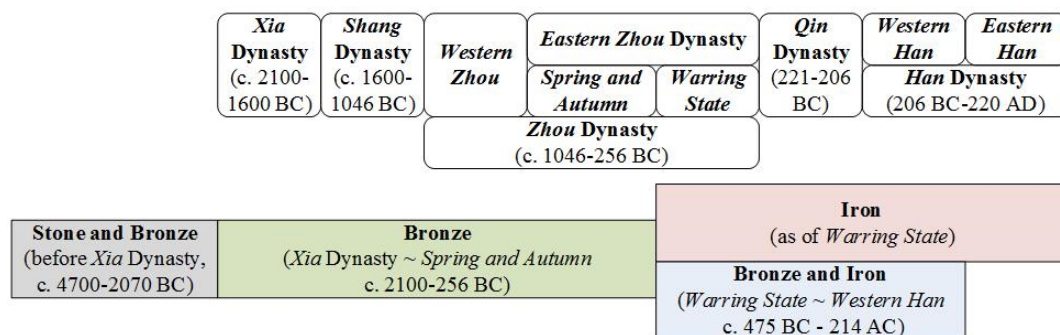


Figure 5. Illustration of materials development in Ancient China (from the Stone Age to the Bronze Age and the Iron Age) when the weapon Ge was used

6. Conclusions

Ge was a unique weapon invented before the Qin Dynasty in ancient China (also called "Middle Kingdom"), with a (horizontal) double-bladed and a sickle-shaped Hu. Ge was specifically designed for combat, and could cleave, cut, shape, split, and lasso-like weapon (designed as a restraint to be slung around a target, to hit and pull). It also becomes a ceremonial or heraldic symbol. (Zhong, 1999).

The weapon Ge was used before the Qing Dynasty, and popular between the Shang Dynasty and the Western Han period in Ancient China (Ye, 2013). This unique weapon was only used in ancient China in a certain period, when combat vehicles were widely used. Specific geo-graphic environmental and climatological circumstances influenced the design and use of the military equipment (including the performance of the combat vehicles). The special tactical grouping, battle style and combat vehicles used in ancient China were essential integrated factors of the invention of Ge, which had many advantages, and was more powerful and effective than other weapons for the battles in that specific period. See Figure 6.

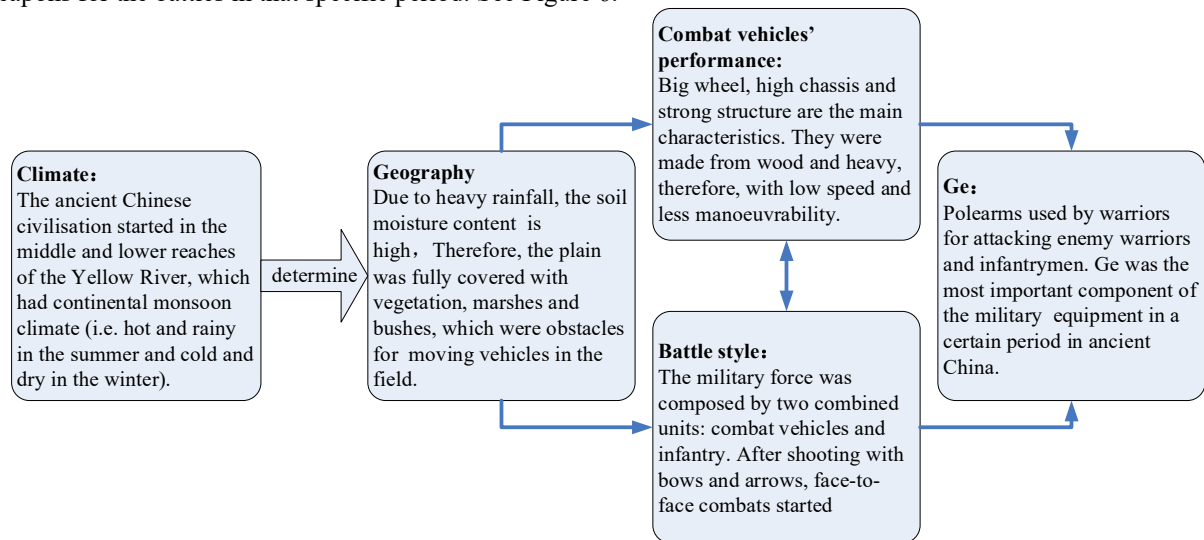


Figure 6. Summary of the generation of weapon Ge

Ge had substantial impacts on Chinese culture. "戈" (Ge) was used in Chinese character (漢字) (also as part of the structural component of other Chinese characters, called radical), id-ioms, essays and poems. It also contributed to the development of a new weapon in the mili-tary history.

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