THE ORIGIN AND SPREAD OF THE WAR CHARIOT

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RESUMO

Origem e Difusão do Carro de Guerra

Uma das mais bem sucedidas tecnologias da Idade do Bronze foi o carro de guerra. O seu sucesso levou a uma dispersão inaudita através da Ásia. A problemática das suas origens é tradicionalmente abordada numa base regional. O presente estudo pretende abordar o assunto de um ponto de vista trans-regional, focando as ligações existentes entre diferentes regiões, de forma a gerar uma visão mais abrangente do problema. Para além disso, procura evidenciar as ligações existentes entre as regiões mais periféricas, a Índia e a China, e o tradicional núcleo de desenvolvimento do carro de guerra, a Ásia Ocidental e as estepes Eurasiáticas.

Considerando as ligações entre as estepes a sul do Urais e a Ásia Ocidental, é possível concluir que os primeiros passos no desenvolvimento do carro de guerra ocorreram nas estepes da região de Sintashta, c. 2000 BC. Contudo, na Ásia Ocidental, essa tecnologia foi mais tarde adaptada a modelos autóctones, de forma a criar um veículo melhor equipado para lidar com as necessidades locais. Apesar da existência de pequenas adaptações locais, as semelhanças entre os vários modelos de carros de guerra permitem rejeitar a possibilidade de um desenvolvimento independente em diferentes regiões. De facto, é possível identificar uma só tradição referente ao carro de guerra ao longo do continente asiático, da Ásia Ocidental à China, e das estepes Eurasiáticas à Índia.

PALAVRAS-CHAVE: carro de guerra, estepe, Ásia, Índia, China, origem do carro de guerra, difusão do carro de guerra, ligações trans-regionais.

Abstract

The Origin and Spread of the War Chariot

One of the most successful Bronze Age technologies was the light war chariot. Its success meant an unprecedented spread throughout all of Asia. The subject of its origins is traditionally approached on regional basis. The present work seeks to address the issue from a trans-regional standpoint, focusing in the connections between different regions, and thus creating a broader understanding of the problem. Furthermore, it seeks to highlight the connections between the more peripheral regions, India and China, and the traditional cluster of development of the war chariot, West Asia and the Eurasian steppes.

Considering the connections between the steppes south of the Urals and West Asia, it is possible to conclude that the first developments towards the light chariot took place in the Sintashta region, c. 2000 BC. However, in West Asia, that particular technology was adapted to native chariot designs, in order to produce a vehicle better suited to specific regional needs. Despite minor local adaptations, the similarities between all chariots' designs discard the possibility of independent development in different regions. In fact, a single and continuous chariot tradition can be seen throughout the continent, from West Asia to China, from the Eurasian steppes to India.

KEY-WORDS: war-chariot, steppe, Asia, India, China, origin of the war chariot, spread of the war chariot, trans-regional connections

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ABBREVIATIONS

ARM	*Archives Royales de Mari*
CTH	*Catalogue de Textes Hittites*
EIEC	*Encyclopedia of Indo-European Culture*
KBo	*Keilschrifttexte aus Boğazköy*
RHA	*Revue Hittite et Asiatique*
RV	*Rig Veda*
ŚBM	*Vājasaneyi Madhyandina Sākhā*
TS	*Taittirīya Saṃhita*
VSM	*Vajasaneyi Madhyandiniy*

Introduction

When one considers the late Bronze Age major battlefields, there is one common element among them, from Europe to China, the war chariot. While vehicles had been used in the battlefield before, they were slow and cumbersome, relegated to support functions. The introduction of the war chariot in military formations marked a clear departure from these early traditions. Built for speed rather than strength, the war chariot allowed for the use of vehicles in the heart of battle. This was nothing short than a revolution.

In the same way that a disciplined infantry formation multiplies the combat efficiency of individual fighters, becoming an entity greater than the sum of its parts, the war chariot allowed man and horse to function as one, thus increasing the martial potential of both parties. Whether used as a close quarter fighting vehicle or as a fast moving firing platform, the chariot provided an unprecedented increase in the effectiveness of the warrior/archer. Therefore, these men became the elite warriors of the world greatest armies.

What is truly remarkable, however, is how fast this new technology spread throughout all of Asia, from the Eurasian steppes to China proper. The oldest chariots known today, dating c.2000 BC, were found in the Eurasian steppes. However, its use in large scale battle was first attested in the battle of Megiddo, c. 1457 BC, between Egypt and a coalition of Canaanite forces, in West Asia. It is possible that chariots had been used before, but no record remains. Simultaneously, literary evidence place chariots in the north-western part of the Indian subcontinent in c. 1500 BC, in connection to the migration of Indic speaking peoples into the region. In addition, chariot remains were found at the Shang capital of Anyang, dated c. 1200 B.C.

Since all these chariots shared the same basic design, it is highly improbable that such complex technology could emerge simultaneously and in a similar fashion in such distant locations. Therefore, a common origin must be found.

Several possibilities have been presented as possible places of origin of the chariot. However, this approach to the subject carries with it the assumption of a single origin, that the entire design was developed in a single location, and maintained afterwards. However, that might not be the case. In fact, evidence suggests different designs in different regions. It is accepted that the war chariot was used in different

ways in different locations, and naturally, the way they were used and their design would condition each other. Therefore, it is reasonable to expect that warfare conditions in specific locations would change the design of the war chariot. These were not drastic modifications, but enough to force us to consider them when discussing the subject of origins. The war chariot, in its final form, might have arisen from a combination of small improvements made in different regions. In this case, in order to identify a possible origin, one must not focus in a specific location, but rather in trans-regional connections between different regions; namely, the Eurasian steppes and West Asia.

It is the objective of this work to review the antagonistic theories regarding the origin of the war chariot, addressing each component individually, in order to build a composite view of the vehicle, and thus presenting a new understanding of its origins, based on both West Asian and steppe evidence. Furthermore, the cases of India and China will be addressed, with the objective of highlighting the connection between these regions and the potential origin of the war chariot, while at the same time demonstrating the existence of a single and continuous chariotry tradition across Asia.

Considering the complete lack of investigation in this particular field in Portugal, much of the present work seeks to establish a starting point to new forays into the subject. Rather than a final word, it should be understood as the first step of a future investigation. While the basic connecting lines between Eurasia, West Asia, India, and China, regarding the war chariot are presented here, a closer in-depth approach to each one is necessary. However, such thorough task is far beyond the scope of a master thesis. It should be noted that an encompassing study of the subject must also include Europe. However, the current work is focused exclusively in Asia, a limitation imposed by the geographic specificity of the relevant master's course.

Furthermore, considering the lack of specialized collections and the virtual inexistence of volumes pertaining to chariot warfare and steppe archaeology in Portuguese generalist libraries, the current thesis aims to be a readily available source of useful and quality information regarding the subject.

Because the present work represents the first attempt to address such matters at this scale in Portugal, the English language was chosen. This seems to be a paradoxical statement. However, considering that no prior tradition exists in Portugal, any hopes for the future rest solely in internationalization, in the sense that further Portuguese research must be made available to foreign scholars so that a channel of communication can be

established. While this is true to any field of research, it is especially important in these traditionally more marginal subjects in Portuguese historiography.

The present work is divided in two sections. The first pertains to the origins of the war chariot, consisting of the first chapter. In it, the current trends regarding the subject will be summarized, while at the same time reviewing the main evidence supporting them. This chapter is divided in three distinct parts: the spoked wheel, the Arkaim-Sintashta culture, and the horse domestication. The first part discusses the earliest evidence for the development of the war chariot, with exceptional focus on the spoked wheel. While the box of the war chariot varied from region to region, the spoked wheel is one of the common elements found in every design, therefore being used as indicator for its presence. A second element can be used for this purpose, namely the brittle and harness. However, it is not possible to make a direct connection between one particular type of harness and this specific type of vehicle. The second part, Sintashta, addresses the economic, social and military context of Sintashta-Arkaim type settlements in relation to the eventual development of the light chariot. It seeks to ascertain whether or not there was a necessity for such technology, and if the conditions required for its development were gathered at the Bronze Age southern steppes. The final part deals with the horse domestication. It seeks to identify the first known instance of large scale domestication, and through it, locate the broader geographical region where the process took place. Furthermore, it seeks to set a chronological limit for the introduction of the horse in the Near and Middle East. Because the light chariot was developed as means to harness the new animal's full potential, by ascertaining an approximate date for the introduction of the domestic horse in the Near and Middle East, one can establish the earliest possible date for the beginning of a putative autonomous development of lighter vehicles in the region.

The second section, comprising chapter two and three, deals with the introduction of the war chariot in India and China, respectively. It seeks to highlight the differences and similarities between the chariots used in both regions and those found at Eurasia and West Asia, while at the same time trying to identify the origin of their chariotry tradition and its diffusion channels. Considering India, the *Rig Veda* is used as a main source in the attempt to reconstruct an Indian chariot, due to the lack of archaeological evidence. Furthermore, considering the accepted connection between the introduction of the chariot in the region and the arrival of Indic speaking peoples, a possible route of migration is also discussed. In China, the abundant archaeological

record provides detailed information on the specifications of Chinese chariots. This chapter seeks to demonstrate the influence of western cultures in the formative stages of Chinese civilization, while at the same time trying to identify the origins of the Chinese chariot, through the analysis of the stylistic consistency of rock carvings depicting war chariots found throughout all of Asia.

I. Origins of the war chariot

The chariot is often compared with a modern tank. Such comparison can be understood if one considers the key contribution made by the armoured divisions in the great wars of the last century, or even the military revolution set in motion by the tank's first deployment, against the impact of the war chariot in ancient times. Nevertheless, if one considers the actual role of both the tank and the chariot in the battlefield, such comparison is, at the very least, flawed.

The tank is a slow moving machine, relying on its heavy armour and firepower to overcome the opponent, shattering its lines. In that sense, it's more akin to a hoplite phalanx, or a roman *cohort*, rather than a light war chariot.

In fact, the strength of the chariot relied on its speed, manoeuvrability, and versatility, rather than in sheer force. The notion that it was used to charge enemy infantry lines is well spread, but highly inaccurate, at least for the relevant time period. Such tactics were indeed used, but much later, with sturdier chariots, and bigger, stronger, and partially blinded horses.

A more fortunate comparison could be made between the war chariot and the helicopter. The war chariot was a fast moving fire platform, capable of support fire to the infantry, with the ability to quickly insert and extract key elements in critical areas of the battlefield, patrol enemy routes, obtain information and enforce sieges. Its effectiveness is the result of the combination of three essential factors: the spoked wheel, for lightness; the horse, for speed and manoeuvrability; and the weapons carried by its crew. This realization is of extreme importance when dealing with the subject of the geographical origin of the war chariot, since it is the combination of these three elements that make the light chariot a war machine.

Regarding the origins of the war chariot, two schools of thought have emerged in the last century, and still dominate today, albeit with slight changes and adaptations. Both these theories emerge after confronting the enormous bulk of evidence originated from West Asia in the Late Bronze age (after c.1600 B.C.). When considering the similarities shared by war chariots from such distant locations as the North Caucasus and Egypt, scholars assumed that all these designs must share a single origin. For the

better part, that notion prevails today. However, identifying this origin proved to be a much more daunting task, one that has produced a heated debate that rages on today.

Throughout most of the 20th century, the homogeny found in chariots from the Southern Ukrainian steppe, West Asia and Egypt, lead scholars to the assumption of a common origin. That concept was further expanded into the notion that a single people was responsible for the development and spread of the war chariot. Therefore, it stands to reason, that in order to identify the origin of the technology, one simply had to find a foreign element associated with it, within pre-existing societies. Thus, in the Near East, two different groups of people, both to an extent foreigners, became the focus of the discussion: the Hurrian and Kassite speakers[1]. Of the two, the former was of particular interest, in great measure due to the Mitanni political system, where an Indo-European superstrate existed over a Hurrian substrate[2].

Mittani, in general, and the Indo-European element, in particular, were closely associated with chariotry and horse-breeding. A particular text (CTH 284), authored by Kikkuli of Mittani, dealing with horse breeding and training, attests this association. Despite being written in Hittite language, the author introduces himself has "Kikkuli, master horse trainer of the land of Mitanni"[3]. Additionally, the Kikkuli text is notorious for the presence of a significant number of Indo-European loanwords, which further emphasizes the connection.

So, in light of this evidence, the theory that the light horse-drawn chariot had been introduced in the Near East, in its final form, by groups of Indo-European speakers from beyond the Caucasus arose. This view was crystallized in the early 1960's by Albrecht Goetze. In 1963 he wrote:

"What is important [...] is the role played […] by the Hurrians and by the thin layer of Indians which revitalized them from about 1650 on. For to them can be traced a fundamental change in the technique of warfare which is recognizable everywhere in the Near East at that time and characterizes the period as nothing else. It is the introduction of the light horse-drawn chariot. […]The result was that henceforth warfare was essentially different from what it had been before.[4]"

He further added:

[1] Moorey. 1986, p.197
[2] Thieme, 1960
[3] Nyland, 2009, p.9
[4] Goetze, 1963, p.124-125

"Nothing much further need be said about the Hurro-Indic origin of the innovation. To the philologists it is proved by words used in connection with horse and chariot."[5]

From the above statements, it is possible to extract the fundamental notions of the theory. First, the war-chariot is seen as a whole, and thus, the source of one innovation must be the source of them all. Second, it was introduced in West Asia as a finished product, having had an immediate and drastic impact on the region. Lastly, it was introduced by Indo-European speakers, which is unequivocally proven by the great number of Indo-Aryan loanwords addressing chariotry and horse-breeding, present in otherwise unrelated languages. These were virtually undisputed points in the first half of the 20th century.

However, in the late 1970's, two new hypotheses arose, that replaced, although at variable levels, this established view. These two hypotheses, albeit corrected, reformulated, and sometimes rewritten over the years, are at the root of today's schools of thought regarding the subject.

The first of these theories to emerge was first drafted[6] by Piggott in 1978, and then expanded in two other publications[7], although without significant change. In its essence, it is very similar to the previously accepted view, although reflecting a new understanding on the nature of linguistic groups. Unlike its predecessors, Piggott avoided attributing the origin of the chariot to a specific ethnic or linguistic group, opting to identify a geographical origin. However, he maintained several of the previous hypothesis's fundamentals:

"[…] the horse-drawn light cart or chariot was as a whole a new invention, and that the new factor involved was speed provided by a new motive force"[8]

And:

"In the […] civilizations of the ancient Near East, the adoption and development of the chariot in the earlier second millennium B.C. […] was not an

[5] Goetze, 1963, p.124
[6] Piggott, 1978
[7] Piggott, 1979 and 1983
[8] Piggott, 1979, p. 10

internal evolution, […] based on improved carpentry techniques and the substitution of a new draught equid Equus caballus, for the previous Equus hemionus. It was rather the result of a ready social acceptance of the light, spoked-wheel, horse-drawn vehicle from […] prehistoric peoples within the natural territory of the wild horse, who included some within the Indo- European language family, whose vocabulary contributed to the jargon of chariotry."[9]

Here lies the fundamental difference between Piggott's approach and that of most of its predecessors. Piggott deliberately avoids associating a technology with a linguistic group. He simply states that the war chariot was developed in a geographical area which included populations who spoke an Indo-European language, and later contributed to the lexicon of technical terms related to chariotry. Although not stated, this leaves open the possibility that these indo-european groups weren't the developers of the chariot, although having contributed to its later spread.

This hypothesis, albeit updated to accommodate recent evidence, has been given new life in the last decade of the 20th century, with the discovery of several chariot graves with spoked wheels, horses, and bits, in the Ural-Tobol steppes, in southwest Russia and northern Kazakhstan[10]. The calibrated radio-carbon dates advanced for the earliest of these vehicles is c. 2000-1800 B.C[11]., which makes them the oldest evidence available of a potential full working light war-chariot.

The second theory was first published in its finished form in 1979, by Littauer and Crouwel[12]. This new hypothesis represented a radical departure from the conventional wisdom of the day; a departure fully acknowledged by the authors:

"The material considered […] strongly suggests the possibility of a local evolution of the light, spoked-wheeled, horse-drawn chariot in the Near East itself, in contrast to the long held theory that this was introduced from outside in an already evolved form by Indo-European-speaking steppe tribes."[13]

[9] Piggott, 1978, p.42
[10] Littauer and Crouwel, 1996, p. 934
[11] Anthony, 2007, chapter 15
[12] Littauer and Crouwel, 1979
[13] Littauer and Crouwel, 1979, p.67

Unlike its predecessors, Littauer and Crouwel, through an extensive analysis of evidence relating to wheeled vehicles and animal breeding in the Near East *before* c.1500 BC, have concluded the existence of chariot prototypes of local origin.

It approaches the subject on very different grounds than ever before: the chariot is not seen as a whole, but rather as the sum of a series of innovations; these innovations can be seen in earlier vehicles, and therefore, the chariot is not a foreign element in the Near East; considering the long history of wheeled vehicles originated in the Near East, the later Indo-European loanwords are far too late to be of any relevance to the matter of origin.

Regarding the horse, Littauer and Crouwel trace back their presence on the Near East to the second half of the 3rd millennium, much earlier than originally thought. This matter, however, shall be discussed later.

I.1. The Wheel

Considering the wheel alone, it's impossible to determine an exact date for its first use. The best one can hope for is to establish a time period when its use became widespread, and then proceed from there to create a timeline.

That which might be the first archaeological evidence of the use of a wheeled vehicle are track marks found beneath a gravestone, found in Flintbeck, north Germany, and dated c. 3600 BC. Still, there is no conclusive way to determine exactly how they were produced, and for this reason, should be treated with extreme precaution. On the other hand, considering this is an isolated finding, even assuming they are indeed track marks produced by wheels, it is in no way evidence of general use, which is the relevant question.

That which is potentially the oldest evidence of a wheeled vehicle comes from a clay mug found at a waste pit from Bronocice, south Poland. In the same pit were found animal bones dating from c. 3500 BC to 3350 BC. The said mug shows an incision on its surface depicting a four wheeled wagon with harness pole. Although not shown, one can assume these wagons were pulled by oxen, considering the several sacrifices found on late *Baden Culture* graves, c.3500 – 3000 BC, in Budakalász, Hungary, and on *Globular Amphorae* culture graves, c.3200 – 2700 BC, in southern Poland[14]. Still, if one considers the traditional decorative motives of the *Trichterbecker* culture, from which the clay mug originates, it becomes apparent that the wagon depiction is an anomaly, one of a kind. This suggests that the wagon was a rare object, worthy of being depicted, and thus not of common usage.

In Mesopotamia, clay tablets found on the ruins of Temple C in Eanna precinct, Uruk IVa, show pictograms depicting four-wheeled vehicles, with an upper structure. These tablets where preserved due to a fire, which was also responsible for the destruction of the temple. The presence of charcoal allows dating the wood used in the construction of the temple through radiocarbon, yielding the approximate dates of 3500 – 3370 BC for the roof timbers. Nevertheless, these dates need to be taken with caution. In a tree, only the bark and the wood immediately beneath it consist of living tissue, the core being dead. Because of this, the date advanced by radiocarbon concerns not when the temple burned, but rather when it was built. So, the tablets must date after c.3500-

[14] Anthony, 2007, p.67

3370 BC, probably c.3300-3100 BC[15]. Another relevant fact relates to the amount of occurrences of the said pictogram. In over three thousand nine hundred texts, the pictogram for "wagon" is illustrated three times, against the pictogram for "sledge", which occurs thirty-eight times[16], thus showing that it remained the main means of transportation, at least for heavy loads.

Considering the previously mentioned findings, it is possible to state that the wheel technology became widespread in the second half of the 3rd millennium BC.

The oldest evidence of the use of the spoked wheel known today is dated c. 2000-1850 B.C., consisting of the imprint of the lower half of a wheel; left in the earth, as the wood rots away, found in graves in southern Urals and northern Kazakhstan.

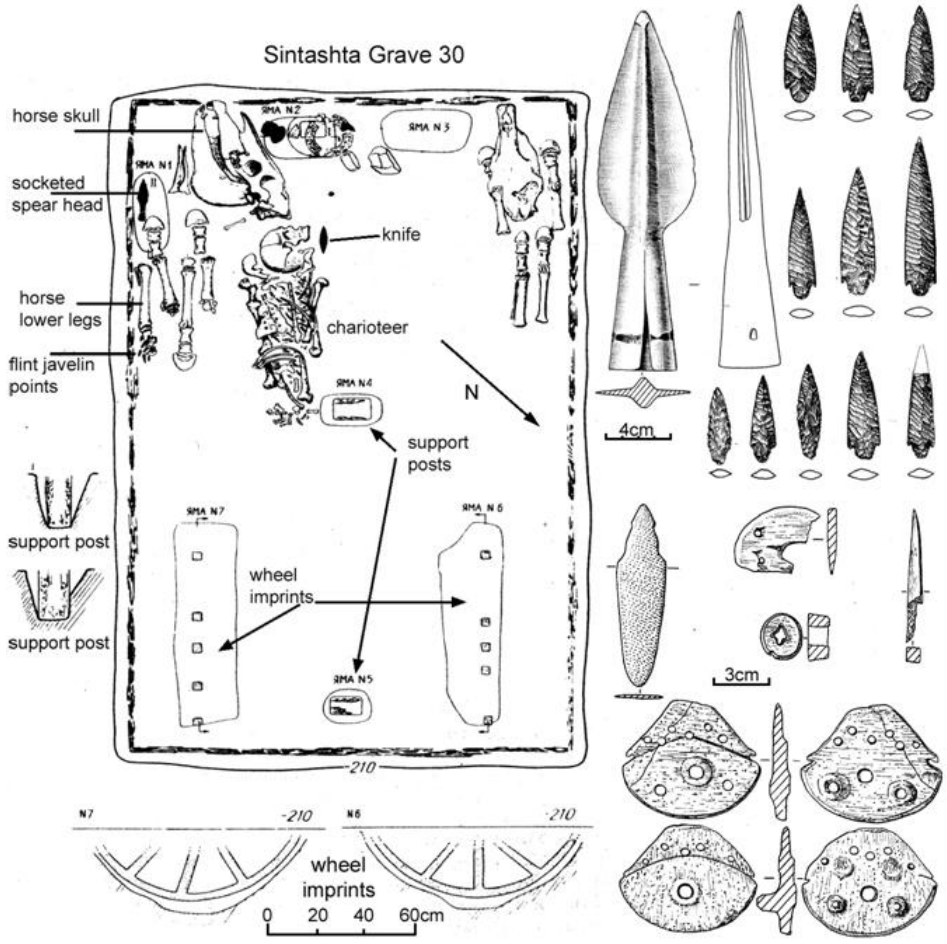


Fig. 1 Sintashta SM gr.30 after David W. Anthony, Dorcas R. Brown, *The Secondary Products Revolution, Horse-Riding, and Mounted Warfare* http://users.hartwick.edu/anthonyd/harnessing%20horsepower.html (November 2009)

The most conservative estimation of the number of chariot graves places it at sixteen, all of them centred in a small geographical area, enclosing both the Sintashta

[15] Anthony, 2007, p.66
[16] Littauer, 1983, pp. 334 - 345

culture in the Ural-Tobol steppes, and the Petrovka culture in northern Kazakhstan. These imprints show half a wheel, average 1-1.2m in diameter, with between 10 and 12 spokes[17].

These chariots were buried with human remains, probably its owners and/or charioteers, with their respective weapons. At least on one occasion (Sintashta SM gr.28), a chariot was buried with two male adults, suggesting that it might be its crew, considering its wheel span of approximately 1.5m. In addition to human remains, horse remains were also found in many of these graves, and often in pairs, suggesting that the tractor team was sacrificed and buried with their owner. A few of these chariot graves produced disk cheek-pieces, thus proving the use of bitted horses.

Due to the fragmentary nature of the steppe archaeological record, we do not possess evidence regarding the development of the wheel on the steppe, but, like any new technology, the spoked wheel took some time to become widespread. Assuming that the steppe is indeed the origin of the spoked wheel, it is reasonable to expect that, just like the finished product, its prototypes spread to other areas. By analyzing such wheel types, although used in other places, and often, in later times, it is possible to deduce the evolution of the technology in the steppe, as long as a clear and undisputed relationship between the two areas can be proved.

Considering Western Asia and the Middle East, the archaeological record is far less fragmentary, being possible to assemble a continuous evolutionary timeline for the wheel technology, from the earlier 3rd millennium B.C., to c. 1500 B.C., when the war chariot became widespread in the Near East[18].

The first military vehicle used in west Asia consisted of slow-moving, four wheeled wagons, as shown on the famous *Standard of Ur*. The earliest of these vehicles date to the earlier third millennium B.C. (ED period), and remained in active use until c. 2300 B.C. after which were relegated to a ceremonial function[19]. These vehicles suffered from severe limitations, derived from their design. The narrowness of the floor (avg. 0.5m) made it an awkward fire platform, considering that the javelin thrower would travel behind the driver. The axles, much larger than the platform (avg. 0.7 - 1.0m), and fixed to the cart with the wheels revolving on them, show no evidence of

[17] Anthony, 2007; p.397; Epimakhov, 2002
[18] A detailed overview on the subject can be found in Littauer and Crowler, 1980
[19] Littauer and Crowler, 1980

horizontal articulation, which would have a considerable detrimental effect on the manoeuvrability of the vehicle.

Block wheels used in these vehicles, whose diameter varied between 0.5m and 1.05m, were made of three wooden pieces, joined together by slats, with the centre one functioning as the nave.

These carts were pulled by teams of equids, either the wild ass (*Equus asinus*) or the onager (*Eqqus hemionnus*), or more probably, a hybrid between the two. There is a possibility that such carts were pulled by horses, but considering how rare they were in the Near and Middle East at the considered time, it is highly unlikely. Despite being shown four equids, only two were actually yoked, with the remaining ones being used as reserves. These weren't bitted equids, being controlled through the use of nose rings, which was detrimental to the cart's already poor manoeuvrability, since such a method would only allow for breaking and advancing, not turning.

These limitations severally impacted the usefulness of these wagons in combat, making them more suitable for escorting convoys or protecting supply lines. Nevertheless, these vehicles are often depicted overrunning fallen enemies, showing that it had symbolic value, probably as a transport means for high ranking individuals.

In this same time period there was another wheeled vehicle that might have had military applications: a two wheeled car commonly referred to as "straddle car". It consisted of a main log, to which the wheels were attached, where the driver (single occupant) would sit astraddle, thus justifying the name. The wheels were the same type as the ones used on regular four wheel wagons. These vehicles, despite being armed with javelin sheaths, were never depicted in a strictly military context, and thus might have been used only for hunting[20].

The former type of vehicles became progressively obsolete in the final quarter of the third millennium B.C., with the advent of a new wheel type. This new wheel, the cross-bar wheel, is first seen in a seal found in Tepe Hissar, in modern day northern Iran, and dated c. 2100 BC (Tepe Hissar III b). This wheel type is distinct from others due to its asymmetrical nature. A large diametrical bar is placed inside the felloe, in order to accommodate the hub of the wheel, while two or more cross-bars are placed perpendicular to it, in order to reinforce the entire structure. In relation to the central-bar, the smaller cross-bars might either traverse it, with both ends imbued into the inside

[20] Littauer and Crouwel, 1980, §1

of the felloe, or being mortised into the sides of the larger bar, effectively increasing the number of cross-bars to four[21]. Either way, it is the first evidence of a new trend towards lighter vehicles in the Near East.

This new trend becomes clearly dominant after 2000 B.C., where numerous examples of experimentation with new designs of lighter wheels can be found. While the traditional four wheeled wagons are relegated to ceremonial use, a new type of four wheeled vehicle emerges, shown in seals originated in Karum Kanesh II, in Anatolia, and dated c. 2000 -1875 B.C. Although some of these vehicles (fig.2) continue to use the cross-bar wheel, others show a new design: the spoked wheel, similar to the ones found in northern Kazakhstan, but of simpler design (fig.3). The relation between the two, as well as the relation between these and the cross-bar wheel will be addressed later.

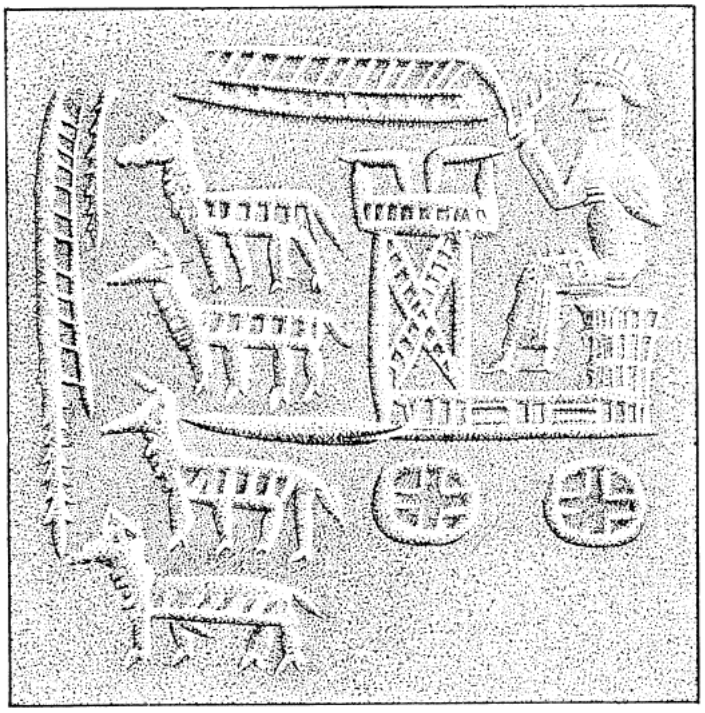


Fig. 2 Enlarged detail from a cylinder seal of Karum Kanesh II showing cross-bar wheels (c. 2000-1850 B.C.) after Littauer and Crouwel, 1979, fig. 24

The spoked wheel consists in an outer rim united to an independent inner hub, through a variable number of spokes, four in the considered case. These are the earliest examples of the use of spoked wheels in the Near East. Besides these four wheeled carts, the seals of Karum Kanesh II also show another type of vehicle: a lighter, two

[21] Littauer and Crouwel, 1977, p.95

wheeled version of the first. However, despite the fact that these are the earliest known two wheeled vehicles with a spoked wheel, they are not yet war chariots. As it can be seen from the image (fig.4), not only are the animals controlled by nose rings, not bits, they are even-toed ungulates, and therefore, neither are they horses nor any other species of equids, which are odd-toad ungulates.

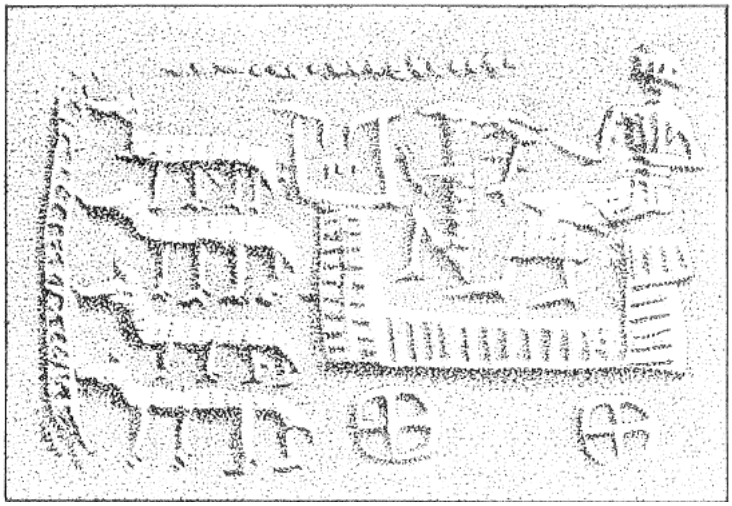


Fig. 3 Enlarged detail from a cylinder seal of Karum Kanesh II showing spoked wheels (c. 2000-1850 B.C.) after Littauer and Crouwel, 1979, fig. 25

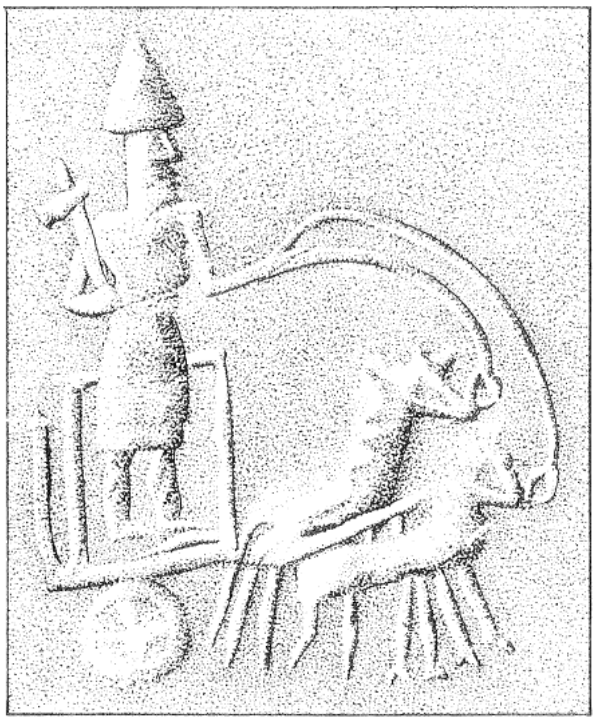


Fig. 4 Enlarged detail from a seal impression from Karum Kanesh II (c. 2000-1850 B.C.) after Littauer and Crouwel, 1979, fig. 29

After c. 1600 B.C. the chariot became widespread in the Near East, from Egypt to Anatolia. Between c.1800 and c.1600 B.C. new innovations took place. These can be seen in the Egyptian chariots, the main source of evidence for this period. Perhaps the most relevant innovation is the shift in position of the axle, being attached to the chariot at the very rear of the cab, instead of right underneath it. This new design, despite putting extra pressure on the horses' necks, does increase the overall stability of the vehicle. This increase of stability was paramount to the use of the chariot as a firing platform, a practice now fully widespread both in Egypt and in the Levant. The box is made of bent wood and rawhide, being an average of 1.0m wide and 0.5m deep[22]. Since the focus was on speed rather than protection, the crew was shielded only by a stretched ox hide, in the front of the cab, while the sides remained vulnerable. The six spoked wheels averaged 90cm in diameter and were made with light but sturdy materials, mainly elm, ash, and almond. The wheels were of an extremely complex design: each spoke was made by gluing together two halves of bent-wood V-shaped pieces. This structure would then be attached to the nave of the wheel through the use of fresh cattle intestines that would later harden and shrink as it dried, keeping the entire structure together. The rim was made by binding four felloes to four felly-bands, united by strips of rawhide and reinforced with bronze wire, while an outer tyre, also made of rawhide, would compress the entire structure. The wheels were secured to the axle by a lynch-pin. The axle was much larger than the superstructure, averaging 1.45m in length. This allowed for sharp turns, and contributed to the stability of the vehicle, by providing significant shock absorption. [23]

Each chariot was manned by a crew of two: the charioteer, often carrying a shield, and a "chariot warrior", armed with bow and arrows, as well as maces, axes and *khopesh*, presumably for dismounted combat. However, the main weapon was the composite bow, and the chariots were fitted with quivers of arrows for extra ammunition.

For protection, these warriors wore either textile armour (linen layers mixed with resin) or scale armour (made of bronze or hardened leather). In addition to these two crew members, the chariots were deployed in conjunction with light-armoured

[22] Littauer and Crouwel, 1980, §4
[23] Fields, 2006, p.16

infantrymen, armed with a light leather shield and a short spear, and whose purpose was to assist the crew.

Pictorial evidence demonstrates that Levantine chariots were similar to the Egyptian ones, and were probably used the same way. (fig.6)

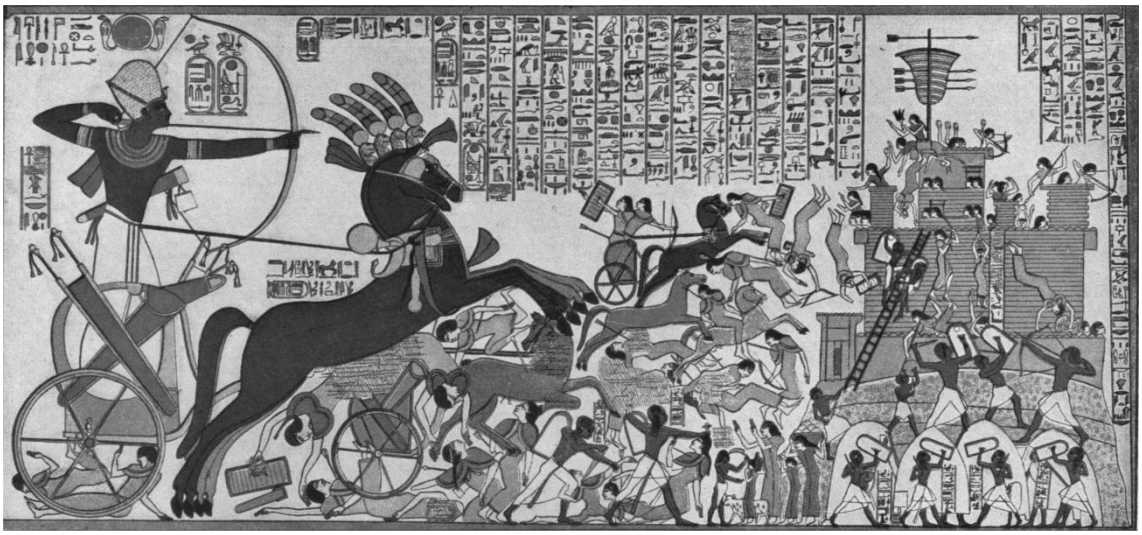


Fig. 5 Ramesses II's victory over the Cheta people and the Siege of Dapur. Ramesses II's temple in Tebes, after Nordisk familjebok (1907), vol.6, Till art. Egypten. VI

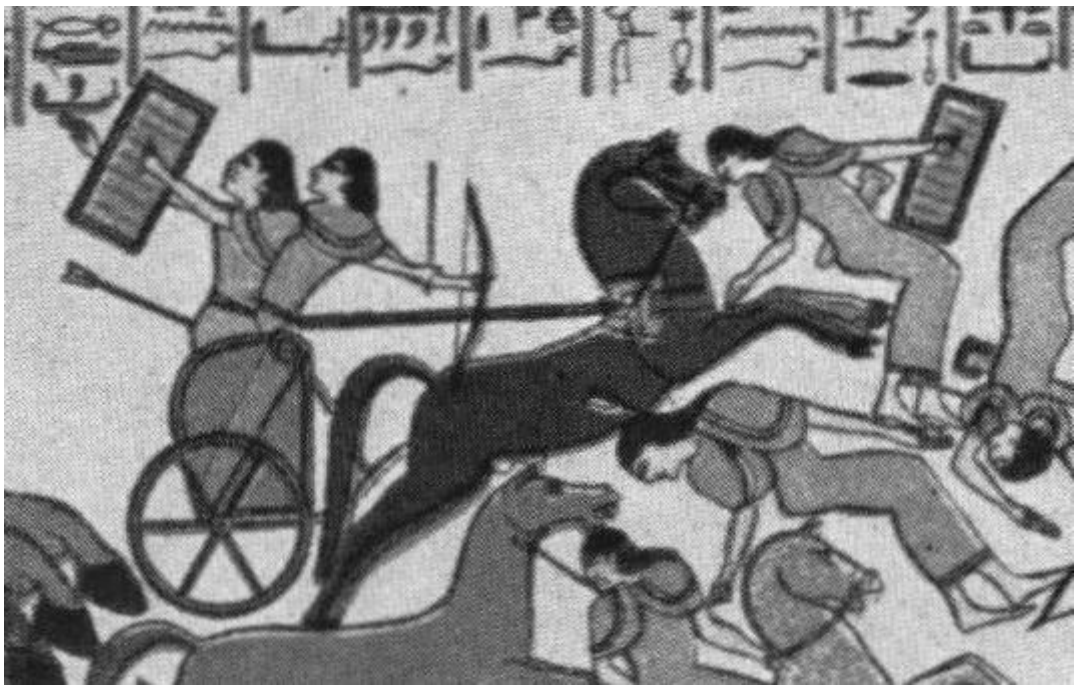


Fig. 6 Syrian Chariot (detail) Ramesses II's victory over the Cheta people and the Siege of Dapur. Ramesses II's temple in Tebes after Nordisk familjebok (1907), vol.6, Till art. Egypten. VI

A second type of chariot was used at the time, named the "Hittite Chariot" or "Anatolian Type Chariot" [24]. Unlike the Egyptians, the Hittites did not use the chariot exclusively as a firing platform, also using it to fight at close quarters. Therefore, their chariots were of heavier build, having a fully filled riding, probably with leather or wood, in order to protect the crew. Since the "hittite chariot" wasn't used to fire projectiles at the enemy, it did not require the added stability, and therefore maintained the axle centred beneath the box. On the other hand, chariots with their axles placed at the rear of the box significantly increased the pressure on the horses' necks; while this increased pressure might have been tolerable on light-rail chariots, it might not be the case on these heavier types. Nevertheless, there are depictions of the Hittite chariot being used as a fire platform. The shift to close-quarter battle is a later development, as early chariots from the heart of the empire were depicted with a driver and a bowman.

The heavy Hittite chariots' cab had approximately 1.25m width by 1m deep, in order to accommodate the third crewman. The riding of the cab was built out of wood slats, covering all sides but the rear. The standard wheels show six spokes, being c. 90cm in diameter. The draught pole runs under the cab, all the way to the rear, for added strength.

Besides the driver, the Hittite chariot carried a spearman, whose mission was to thrust a spear, not hurl it, into the enemy, as well as a shield-bearer, protecting the other two (fig. 7). The latter is sometimes depicted carrying throwing spears. However, early examples of Hittite chariots are seen carrying a driver and an archer, armed with a composite bow, in similar fashion to the Egyptian ones. The Hittite chariot warriors wore heavy scale armour, covering most of their bodies, and bronze helmets, while the driver and the shield-bearer wore light textile armour.[25] It has been suggested by Littauer and Crouwel[26] that both designs are resultant of the evolution of previous cars found either in Anatolia or in the Near East, hence being a local development. According to them, the light chariot had its origins "either as a flat car with open railing (Anatolia), as a shallow open-railed vehicle with curving pole (Mesopotamia), or (Syria) as a gradual modification of the old platform car".[27]

[24] It should be noted that "Hittite Chariot" or "Anatolian Type Chariot" are a specific type of chariot and do not represent the entirety of the chariots used by Hittites. They deployed many different types of chariots, reflecting the many nations under their control.
[25] Fields, 2006, pp.19-20
[26] Littauer and Crouwel, 1980
[27] Littauer and Crouwel ,1980, §3

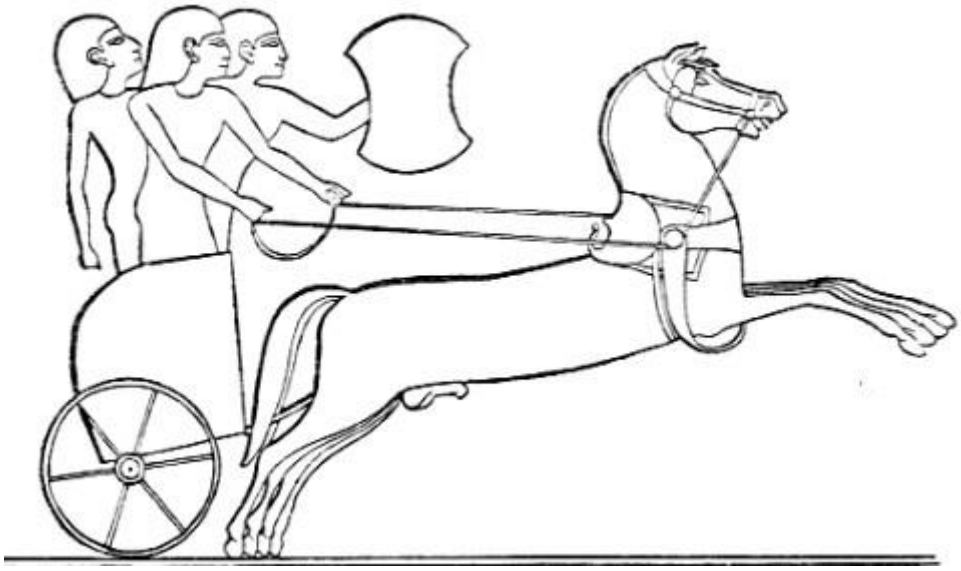


Fig. 7 Hittie Chariot, after Paul Volz: Die biblischen Altertümer (1914), p. 514

This certainly seems to be the case with the Egyptian-type chariot. Its design and bent wood technology can be seen as the culmination of an evolutionary process, inherent to the Near East, with the goal of making lighter vehicles, and whose genesis can be seen in the early depictions of two wheeled cars found at Tepe Hissar, fitted with cross-bar wheels. However, this posed a significant problem. By the authors' own admission, the idea of a local Near Eastern development of the spoked wheel is only viable under the assumption of an early spoked wheel made by mortising the spokes into a round inner nave[28], mainly because that is the only design that might result from the evolution of the cross-bar wheel. However, that is not the case of Egypt. The earliest known evidence of spoked wheels outside the steppe are found in Anatolia. The lack of detail inherent to seal impressions does not allow any conclusion regarding how the wheels were made, and therefore, it is impossible to know if these wheels were made in a similar fashion as those found in Egypt. However, it opens the possibility that the spoked wheel is not derived from the development of the earlier cross-bar wheel[29]. In fact, considering the close dates between Hissar II seals and the Karum Kanesh seals, allied with their respective geographical location (Northern Iran and Anatolia

[28] Littauer and Crouwel, 1977, pp.102-103

[29] This view was later considered by Littauer and Crowel.
"The seniority of the cross-bar wheel is suggested by the Hissar II seal and by the early occurrence of the wheel in vehicles carrying deities. This seniority, however, cannot have been of more than a few centuries. It could represent an independent attempt, roughly contemporary with the first spoked example, to make the lighter wheel that was evidently demanded at the time." Littauer and Crowel, 1986, p. 396

respectively), it is most likely that both wheel types are unrelated to each other, and that their apparent similarity is nothing but convergent design.

This hypothesis seems to be confirmed by wheels found in Acemhöyük, south of Ankara. These are the earliest evidence of actual spoked wheels found in Anatolia, dating from the late 18th century B.C. The angles of the spoke with the naves suggest that the wheel was made in a similar fashion as in Egypt. On the other hand, Sintashta wheels, having ten spokes, have a much steeper angle between the spokes and the nave, and although it does not automatically discard the Egyptian method, it strongly suggests a different one, with the spokes mortised into the nave. However, ceramic models found in modern-day Slovakia, slightly later than the Sintashta-Arkaim imprints, show a construction method similar to the one used in Acemhöyük, and therefore, similar to the one used by Egyptian chariot makers two centuries later.[30] Considering that a construction method for spoked wheels can be found from Slovakia to Anatolia, in a 200 years span, it certainly suggests a common origin, from which the innovation stemmed. In light of current evidence, the most plausible origin is the steppe.

In regards to the design of the Egyptian chariot, it has been shown that the spoked wheel is, with all likelihood, an external innovation. The superstructure, however, is a local near eastern development from former types. The particular bent-wood railing found in Egyptian chariots is seldom found outside Near East (with the exception being the 13th century B.C. Mycenaean rail chariot), and so is its use on the battlefield. The lack of arrowheads in steppe chariot graves suggests that the bow wasn't used in that particular context, and therefore, regardless of the origin of the weapon itself, the union between chariots and bows must be a Near or Middle Eastern innovation.

The differences between the Anatolian type chariot and the light-rail chariot used in the Near East are clear, both in construction and deployment. However, this doesn't mean that they do not share a common origin. Still, assuming that is the case[31] and considering that the Anatolian design is used nowhere else in West Asia but in the heartland of the Hittite empire, it is safe to assume that its development took place in Anatolia, regardless of the origin of its former model[32].

[30] Littauer and Crouwel, 1986, pp. 395- 398
[31] Littauer and Crouwel ,1980, §3
[32] See page 18

However, in light of the similarities between the Hittite chariot and yet another type of vehicle, the Mycenaean box chariot, I would like to suggest another hypothesis.

The Mycenaean box chariot (fig. 8a) was used in the Mycenaean world from c-1550 B.C. to c.1300 B.C. (LH I – IIIA), when it was replaced by a light-rail type chariot, similar to those used in the Near East. Unlike those, the box chariot was built for strength rather than for speed and manoeuvrability. The four-spoked wheels were made more robust, while the entire structure, although made with bent-wood, was thoroughly reinforced. An additional horizontal shaft placed above the draught pole united the yoke to the front of the car, and it probably bent downwards to join with the floor. The draught pole runs all the way to the rear of the cab for added strength, while the axle was placed centred beneath it. The railings were filled with ox hide or wickerwork, and the floor was made by interwoven rawhide stripes, for shock absorption, in similar fashion to the Near East.[33]

The crew consisted of two men, one driver and one warrior. The driver wore a quilted linen tunic, with greaves and a boar tusk helmet. The warrior wore a similar tunic, and above it he wore knee-length bronze plate armour. In addition, he wore a boar tusk helmet with cheek-pieces made of either bronze or horn (fig.8b). He was armed with a long sword and a spear. Spearheads found at Grave Circle A in Mycenae are exceptionally long, some with 65cm, which prove that such weapons were thrusting spears rather than throwing ones, as they were extremely unbalanced for a ranged weapon.[34]

The robustness of the chariot, in addition to the weapons and armour used by its crew show that, like the Hittite chariot, the Mycenaean box chariot was used for close-quarter battle. The exceptionally long spearheads make for a very unbalanced weapon, and therefore it had to be handled with both hands by the chariot warrior, which in turn made it impossible for him to carry a shield. This disadvantage was circumvented by the use of heavy armour (fig. 8b).

[33] Fields, 2006, pp. 22-23
[34] Fields, 2006, p.23

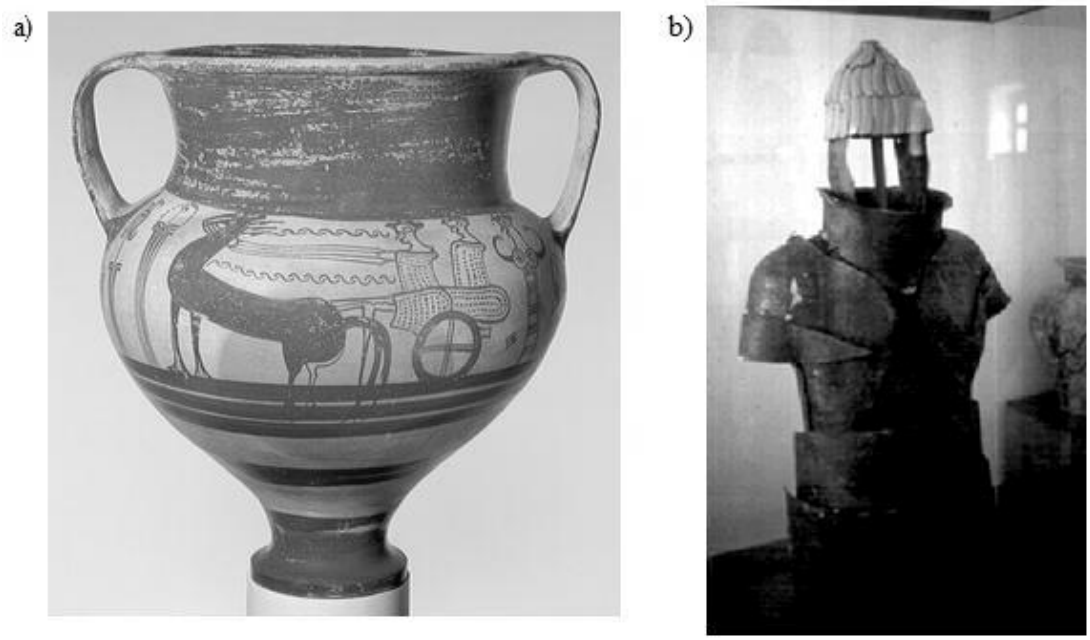


Fig. 8 a)"Mycenaean chariot krater [Mycenaean] (74.51.966)". In Heilbrunn Timeline of Art History. New York: The Metropolitan Museum of Art, 2000
http://www.metmuseum.org/toah/works-of-art/74.51.966 (October 2006)
b) Dendra Panoply, Bronze panoply of armor found in Mycenaean warrior's grave at Dendra, near Mycenae, c. 1200 BC
http://web.ics.purdue.edu/~rauhn/bronze_age_aegean.htm (July 2010)

The similarities between both vehicles, and more importantly, the way they were used in battle, distinguishes them from their Near Eastern and Egyptian counterparts. Despite sharing the same fundamental technology, each design represents two different and opposite philosophies regarding its application. Therefore, it is reasonable to assume they might have different origins.

Much has been said regarding the effectiveness of steppe chariots as a war machine. The short distance between the wheels of some of the Sintashta/Krivoe Ozero chariots has been interpreted as proof of its ineffectiveness in battle[35], on the grounds of its poor manoeuvrability. However, this interpretation is made under the assumption that the chariot was used exclusively as a firing platform[36].

In fact, if one considers the smallest examples of chariots found in Sintashta and on Krivoe Ozero (SM gr.5, 12, 19, 30; k.9 gr.1)[37], it's gauges average 1.2 – 1.3m, and therefore, far too short to be used as a fire platform in a similar fashion as in the Near East, for the simple fact that the cab wasn't big enough to accommodate two

[35] Littauer and Crouwel, 1996
[36] The Hittite and Mycenaean box chariot are dismissed as transport vehicles.
[37] Anthony, 2007, p.399

crewmembers. Although Egyptian tomb paintings sometimes show the pharaoh driving and firing his bow singlehanded with the reins around his hips, and such practice is known from later times during chariot races, that doesn't seem to be the case, when considering steppe chariots. For a modicum of stability, the nave of the wheel must project itself along the axle (20cm each side on small 1.54m width Egyptian chariots). Therefore, 1.2m width chariots like the ones found in Sintashta and Krivoe Ozero aren't large enough to accommodate large naves, thus, lacking in stability. On the other hand, short axles have a detrimental impact on manoeuvrability, making sharp turns impossible, which would increase the ineffectiveness of the steppe chariot as a mobile firing platform for an archer.

However, if such chariots were used for some form of close combat, such limitation would either disappear or be greatly decreased, since it would not require added stability nor increased manoeuvrability. Findings at the graves seem to support this view. The general absence of arrowheads found in chariot graves suggest that bows weren't, as a rule, used in this context. On the other hand, many graves (SM gr. 4, 5, 30) showed long-stemmed points, rather than the triangular ones traditionally used in arrows (fig. 9).

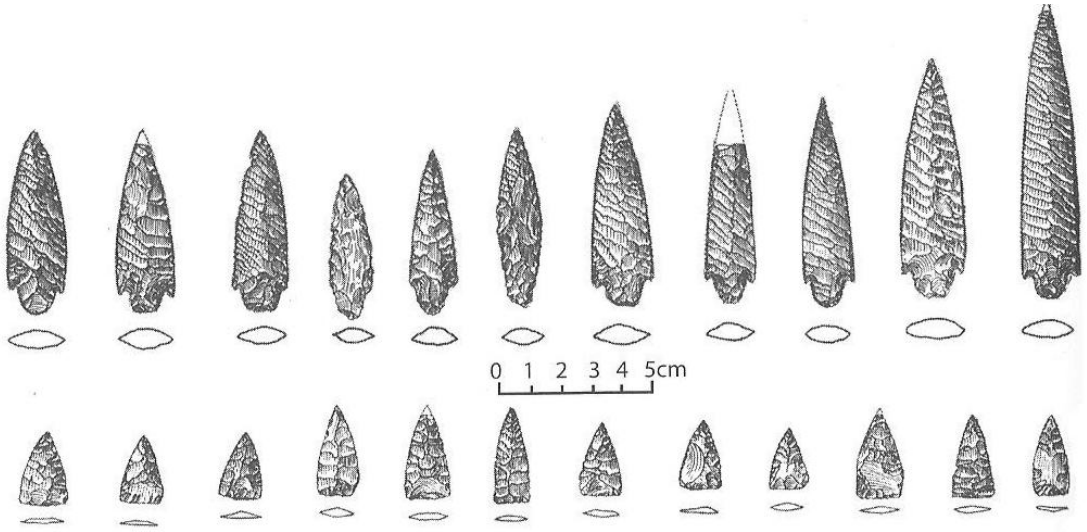


Fig. 9 Flint projectile points of the Sintashta culture. Top Row: new type, possibly related to the introduction of the javelin. Bottom Row: old type, possibly used for arrows. after Gening et al. 1992

These new points are better suited for javelins, rather than arrows, thus suggesting that the former was the preferred ranged weapon in the steppe. Unlike the bow, a javelin can be easily hurled at a target with one hand, and would not require particular stability.

This does not prove that the chariot was used in close quarter battle. However, in SM gr.30 (fig. 1), in addition to one of the smallest war chariots, was found an arsenical bronze spearhead, which, by its length and mass, could not be used in as a throwing weapon, thus suggesting its use in close battle. If that is indeed the case, then one can assume that, as in the Hittite and Mycenaean vehicles, the steppe chariot was built for strength rather than for speed and manoeuvrability, and therefore be an effective weapon, regardless of its small gauge between wheels.

This opens the possibility that both the Mycenaean and the Hittite chariot have their origins in the steppe. Despite some discrepancy on the date and extent, connections between Anatolia and the Trans-Caucasian steppes are generally accepted. So, there is no reason to assume that technological exchanges between the two regions were not possible. That seems to have been the case with the spoked wheel, and it is as likely to be with the chariot itself.

We can identify two different types of war chariot in West Asia in the Bronze Age. One, native to the Near East, is a light-rail chariot, whose focus is on speed and manoeuvrability. It was used as a mobile firing platform, and thus displayed particular adaptations for increased stability, notably the axle at the rear of the cab. The origins of this type of chariot lie in either a shallow open-railed car originating in Mesopotamia, or in a "platform car" type vehicle originating in Syria. When considering the development of these former vehicle types into the light-rail chariot, one trend emerges, one which aims at lighter vehicles. The first known evidence of this trend can be found in Tepe Hissar, northern Iran, where two-wheeled carts were fitted with cross-bar wheels, a first attempt to produce lighter wheels than the traditional block ones. However, this wheel type was abandoned for a new type, the spoked wheel, introduced around two centuries later in Anatolia, probably from the steppe. Therefore, the light-rail war chariot results from the application of foreign technology, the spoked wheel, to a Near Eastern bent-wood design.

The second type, the "Hittite Chariot", was built with strength in mind, rather than speed. Nonetheless, it still represents an improvement regarding speed and manoeuvrability from its former types. Its origins are unclear. On the one hand, it might lie in a flat car with open railing originating in Anatolia; on the other hand, it might have a foreign origin. When considering the size and design of the wheels and axle of steppe Sintashta chariots, as well as the artefacts found with them, one can extrapolate

its probable use on the battlefield, and by comparing it with the one used by the Hittites, a parallel can be drawn, raising the possibility that the origin of the Anatolian type chariots lies in the trans-caucasian steppe. However, the lack of evidence regarding the steppe chariots' superstructure does not allow for definitive conclusions. On the other hand, the role of the steppe chariots as anything more than a symbolic vehicle is still under discussion.

I.2. Sintashta

When considering the steppe origin hypothesis for the war chariot, Littauer and Crouwel raise a series of points which question its validity. Not only do the authors consider the previously-mentioned design limitations, to which a possible explanation was advanced, but they also analyse the economic and technological context in which the steppe chariot would have appeared, deeming it improbable. They instead suggest that the steppe chariot is nothing but a crude imitation of Near Eastern chariots, and whose sole purpose is status display. The reasoning behind this claim lies in the apparent superfluous nature of the chariot on the steppe.

According to the authors, when compared with the Near East, the chariot is fairly useless on the steppe, especially considering the availability of a more effective alternate method of transportation, the mount itself.

It is an undisputed fact that the chariot suffers from severe limitations on the steppe and its immediate surroundings. The terrain is far from optimum: snow, high grass, deep mud, and hard ground found on the steppe itself had a considerable impact on the speed and manoeuvrability of the chariot. On its fringes, the closed woods, steep terrain, soft sand and swamp terrain would have the same effect.

Secondly, considering the socio-economical context of the steppe, there was no use for such a vehicle. Besides its already-mentioned limitations in battle, its inability to match the speed and agility of herded horses and wild animals meant that the mount would be a better alternative for both herders and hunters. The chariot would be of minor importance for migrating nomadic groups due to its inability to carry heavy loads, its lack of comfort over great distances, and its complexity, which would make it impossible to repair *en route*. Heavy carts or pack animals would be a much better alternative.

These limitations, in conjunction with the existence of better alternatives, and the lack of prototypes, made, according to the authors, the steppe chariot a needless and superfluous object.

In contrast, in the Near East, a fast transportation method was needed, and the absence of a suitable mount made the technological development of faster and better vehicles a priority. According to Littauer and Crouwel, this need arose from the social and economic context found in Near East and southern Mesopotamia in the early 2nd

millennium BC, which "consisted of a number of city-states, with a common language, religion and shrines. Industry and commerce were highly developed, as were the arts and crafts; architecture was ambitious. Literacy fostered written laws and litigations and facilitated trade. Although transport of all types could come downstream by river, it had to go upstream by land, and land travel was encouraged by the level terrain"[38]. The chariot was developed to allow better communication between different communities, who shared similar institutions and a striving industry and commerce, but that were geographically apart.

Therefore, in the Near East, the chariot was a much-needed conveyance, a product of a developed and complex society, in order to suppress the combined limitations of its social, economic, and political organization and geography. This necessity was what motivated the improvement of already existing methods of transportation that led to the development of the light chariot.

According to the authors, "The scenarios are one of improvement and development out of an established and very useful artefact versus one of the new creation of a superfluous artefact"[39]. Unlike its near eastern counterparts, for the development of the steppe war chariot, another motivation rather than necessity must be found.[40]

However, this is a very simplistic approach to the problem. It fails to take into account the particular circumstances gathered at the southern Uralian steppes during the Sintashta period that might have contributed to the development of the war chariot.

Located in the steppes southeast of the Urals, near the margins of the Sintashta River, from which it takes its name, Sintashta is a large circular town, with approximately 140m in diameter. Originally encompassing between fifty and sixty buildings[41], Sintashta was surrounded by a timber reinforced earthen wall, followed by a man-tall ditch. Although small fortified settlements have been found in prior cultures (mainly Yamnaya period), Sintashta represents a new type of settlement in the steppe, mainly because of its dimensions, the extent of its fortifications, and its particular

[38] Littauer and Crouwel, 1996, p.936
[39] Littauer and Crouwel, 1996, p.938
[40] Littauer and Crouwel, 1996, p.935
[41] The ruins of 36 structures have been unearthed at Sintashta. Approximately half the settlement was washed away by the Sintashta River

purpose. Fortified settlements are a clear break from traditional steppe organization (fig. 10).

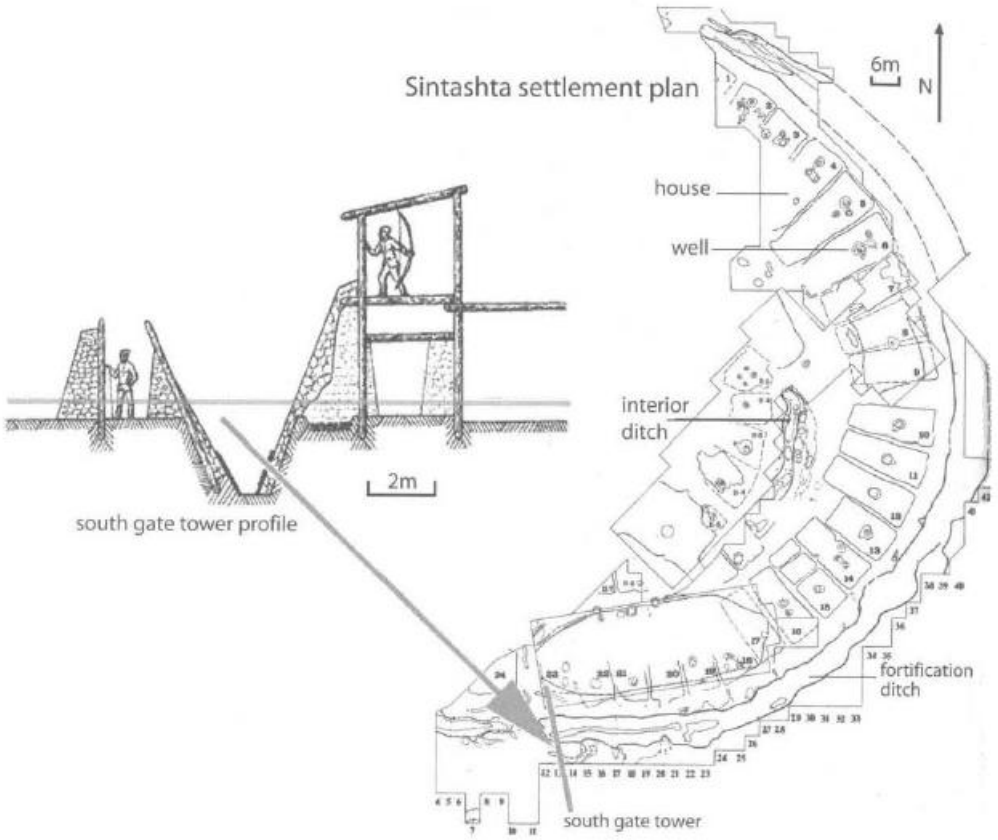


Fig. 10 Sintashta settlement: layout and fortifications, after Gening et al. 1992, fig. 7 &12

The presence of fortifications denounces the intention of permanently protecting a specific location, which is a very uncommon practice amongst groups of nomads. Something pushed these groups to settle in a particular location, which was potentially desired by hostile populations, hence the need for defences.

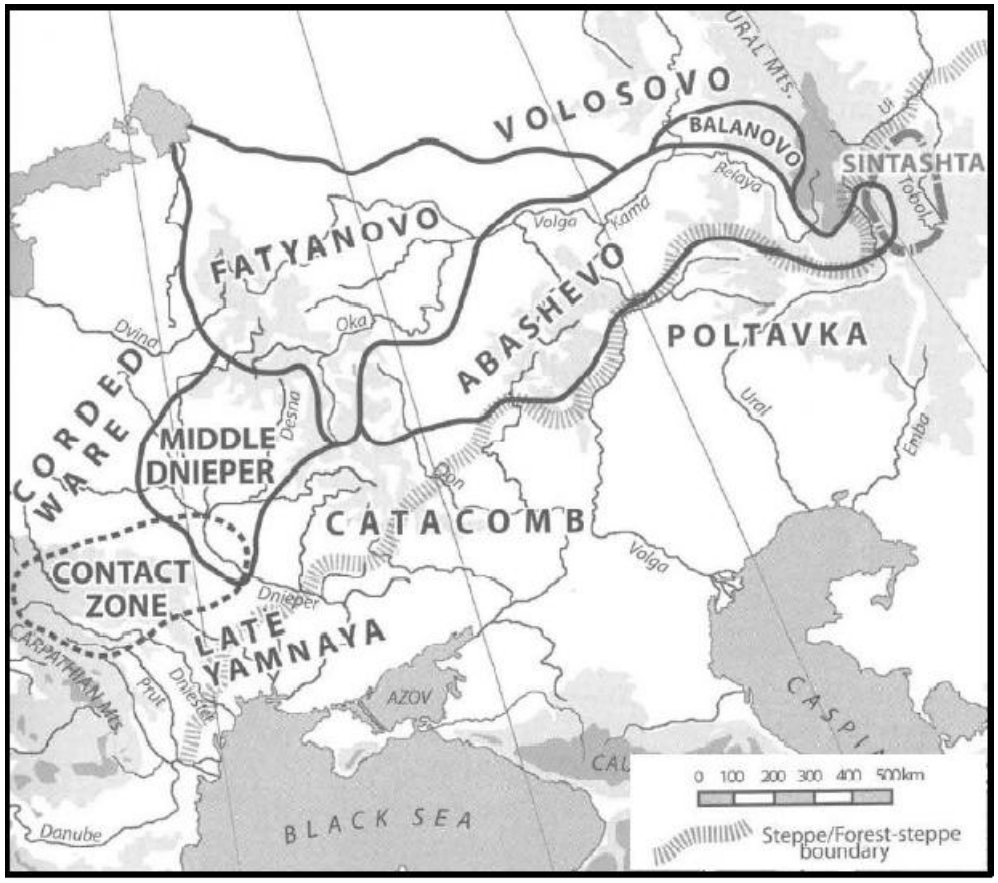
It has been shown that groups of nomadic peoples tend to orbit towards critical locations in times of need[42]. When faced with low production and/or increased competition, populations tend to settle near critical resources, in order to protect them for themselves. This seemed to be the case with the Sintashta type settlements.

From c.2500 B.C onward, the climate in the Eurasian steppes became colder and more arid[43]. This change was felt particularly hard in the steppes east of the Urals, naturally drier and colder than the Volga steppes to the west. The increased aridity meant a significant decrease in marsh-like areas, favoured by pastoralists as winter

[42] Rosenberg, 1998
[43] Anthony, 2007, p.389

refuge, due to abundant forage. In turn, this led to a significant increase in competition for locations, prompting some groups to settle near them.

Groups of Poltavka and Abashevo pastoralists began to settle in key locations near marshlands. It is relevant that most of the Sintashta settlements, despite their obvious need for protection, were located on the fringes of the floodplains of small and medium rivers, sacrificing the added protection offered by higher ground. This shows that the primary concern of these populations was not the protection of the settlement itself, but rather the protection of the access to marshland.



Map. 1 Culture groups in the Middle Bronze Age (2800 - 2200 BC), after Anthony 2007 fig. 15.5

Even the smallest of these settlements were heavily fortified (Chernorech'ye III, aprox. six structures). This suggests a state of endemic warfare. It is not possible to identify one single reason for this conflict. The simplest explanation would be competition between hostile tribal groups for the same resources. However, this might not be the only reason.

Sintashta type settlements specialized in metallurgical production. Almost every structure excavated at major settlements showed remains of smelting furnaces and

slag from copper ore (fig.11). The great majority of bronze objects were made with arsenical bronze, avg. 1-1.25% arsenic, with only 2% of objects excavated made of tin bronze. From a mining site of Vorovskaya Yama, east of the Ural River, an estimated six thousand tons of quartezitic rock was extracted for the ground[44]. This intense production meant a great demand for metal. These levels of production suggest foreign trade, rather than an exclusive domestic use. That seemed to be the case.

The shift in production visible in Late Bronze Age steppe settlements can be understood as part of a much broader process, which also includes South Central Asia urban complexes

Of all the bronze objects unearthed at Sintashta sites, only 2% were made of tin bronze. The reason for this is the extreme scarceness of tin throughout the old world. However, tin was one of the most important commodities in Near East and Mesopotamia.

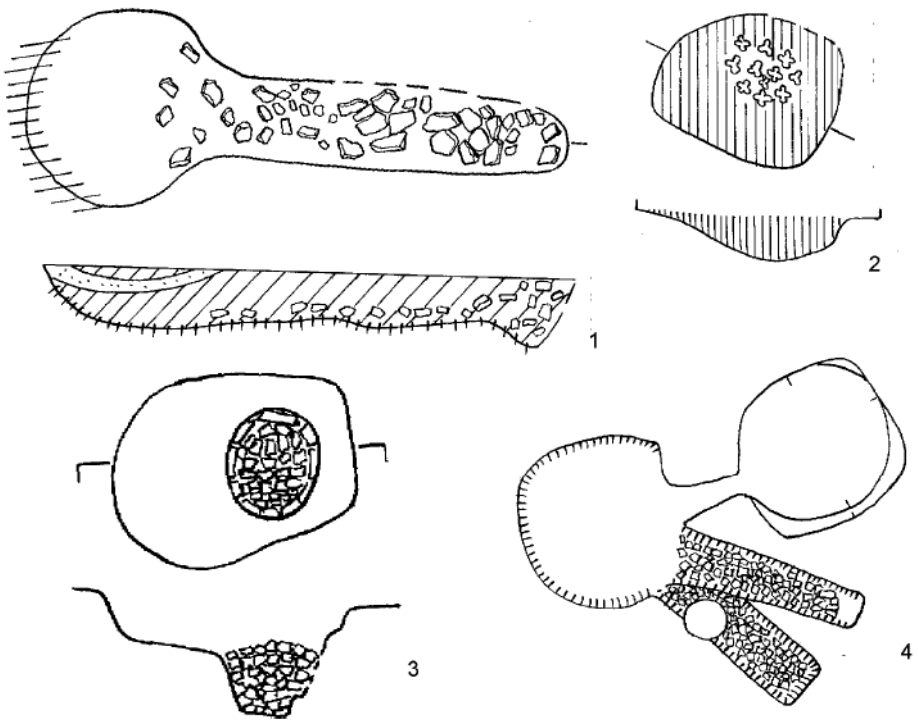


Fig. 11 ***The furnaces of Sintashta settlements*** **1,3,4 - Arkaim, 2 – Sintashta from S.A.Grigoryev, The Investigation of Bronze Age Metallurgical Slags of the Sintashta Culture in the Southern Ural, Southern Ural Branch of History and Archaeology Institute UB of the Russian Academy of Sciences, Chelyabinsk, Russia**

The origin of the tin imported to the Near East and Mesopotamia is still under debate. J. E. Dayton[45] lists several possible locations for the sources of tin traded in the

[44] Anthony, 2007, pp.391-392
[45] Dayton, 1971

Near East, and concludes that it lies in Europe. That might have been the case, considering Europe had vast deposits of tin or copper ore with high percentages of tin. However, this poses a problem. By the author's own admission, most of the European sites were not explored by the end of the 3rd millennium[46]. On the other hand, evidence suggests that significant quantities of tin were imported to Anatolia and the Near East from the *east*, not the *west*. This does not mean that there was no tin being imported from Europe, but that there was another source available.

After 2000 B.C., tin was exported to Anatolia from northern Syria, while Mari imported its tin from Anshan and Susa, in Elam[47]. Although the source of the northern Syrian tin is not known, it is possible that it might be the same as in Mari. An alternative source for tin is the Indus valley cities of Mohenjo-Daro and Harappa. About 30% of tested bronze object found in Mohenjo-Daro and Harappa were made of tin bronze; despite in low percentages (70% had a 1% tin to a 99% copper ratio). Tin bronzes were found in sites in Oman, in the Arabian Peninsula, in conjunction with other imports from the Indus[48]. This opens the possibility that some of the tin used in Mesopotamia and Near East had its origin in the Indus Valley.

However, this also raises a problem: neither Elam nor the Indus valley cities had significant tin deposits available. Therefore, one must conclude that they also imported tin from elsewhere. The most probable origin for the tin imported by Elam and Mohenjo-Daro and Harappa is the Zeravshan River valley, where the oldest known tin mines were found. Evidence shows the existence of links between this region and Sintashta type steppe cultures, at least since c.2100 B.C. In upper Zeravshan, cheek-pieces, found in a burial site at Zardcha-Khalifa, are direct copies of the ones found in Sintashta. Furthermore, a closer link can be found between the two regions. Ceramic found at the settlement of Tugaj is very similar to the one seen in Petrovka culture sites, a variant of Sintashta culture in Northern Kazakhstan[49]. However, that which might be the best evidence regarding the exchanges between both cultures are the appearance of horses and horse motifs in the southern urban societies after c. 2000 B.C. This matter will be discussed later in this chapter.

Considering that many settlements seem to have been abandoned around 2000 BC, most notably the sites of Sarazm and Zaman Baba, some authors have suggested an

[46] Dayton, 1971, pp. 54-58
[47] Anthony, 2007, pp. 418-419
[48] Anthony, 2007, p. 419
[49] Masson, 2002, pp. 548-549

actual migration of steppe peoples to this region at the time[50]. That might have been the case. Prior to c.2000 B.C., bronze objects found at Bactria-Margiana Archaeological Complex (BMAC) tended to made with arsenical bronze, while other metal objects were made of either unalloyed copper or a 8-10% lead copper alloy. However, after 2000 B.C. tin bronze became much more common in BMAC sites, reaching over 50% of the objects in some cases. However, this is true only in Bactrian sites. In Margiana sites, tin bronze remained a rare commodity[51]. This might be explained by the proximity between Bactrian sites and the Zeravshan river valley. This allows for two different conclusions. First, considering that no tin was found in Zeravshan sites before the 2nd millennium B.C., it is possible to conclude that the mines began to operate c. 2000 B.C., closely after the establishment of Sintashta steppe cultures in northern Kazakhstan and shortly before the appearance of Petrovka culture pottery in the region. Secondly, there was direct trade between Bactrian BMAC towns and Zeravshan settlements.

Considering that the BMAC towns had extensive contacts with both the Iranian Plateau and with the Indus Valley, a possible tin trade route emerges. Tin gathered at Zeravshan river valley, either by Petrovka miners, or at the very least, by populations with close contact with Sintashta-type cultures, was transported to the south, through BMAC towns, until it reached either Elam or Mohenjo-Daro and Harappa. This places the steppe cultures of southeast Urals at the beginning of an important trade route. This explains the major shift in production, as well as the extreme specialization, observed in Sintashta-type settlements in the early 2nd millennium B.C. By c. 2100 B.C., Sintashta sites were no longer herding settlements, but heavily fortified, highly specialized, metallurgical military complexes.

As mentioned earlier, the initial stimulus for permanent settlement came from the need to secure critical resources in a time of scarceness, brought by climatic change. Between 2100 and 1800 B.C. more than 20 fortified settlements were created between the Ural and Topol rivers[52]. The high proliferation of settlements indicates fierce competition for the available resources, while the presence of fortifications suggests that numbers alone were not enough to protect a certain location. These circumstances indicate a change in warfare. Traditionally, steppe warfare between nomadic groups was

[50] Anthony, 2007, p. 421
[51] Anthony, 2007, p.425
[52] Anthony, 2007, p.390

limited to cattle raiding and tribal skirmishes. However, if that was the case in the Sintashta period, the concentration of several groups in one settlement would be sufficient to deter any further hostilities, and thus, render the fortifications unnecessary. However, that was not the case. Not only were the settlements heavily fortified, there is evidence that there is fierce competition between hostile groups, not for the control of the settlement itself, but for its location. G. B. Zdanovich and I. M. Batanina[53] have demonstrated that newly-arrived populations preferred to raze previous settlements and then proceed to build on the same location, rather than build a new settlement in a new location: "It is interesting to note that it would have seemed preferable for the newly arrived population to build a new fortified center in a new site, even if it is near the old one. However, this did not happen. The bearers of the new geometrical symbols ruined the old structures with their own buildings and intentionally crossed them to create their own original settlement landscape"[54]. This shows that, despite its impressive fortifications, there were warring groups strong enough to take and destroy an entire settlement. This was an age of fully-fledged conflict: "«Squares» demonstrate an especially «hostile» attitude towards «ovals» and «circles». The destroyed circumferences are at the bottom of the cultural layers of the square settlements Rodniki, Stepnoe, Ustye, probably Kamysty, and Chekatai. Aerial photographs show the imposition of different defence systems and help to suggest the succession of changes in the settlements planning schemes"[55]

The necessity to control key locations in order to secure access to critical resources, combined with a constant flow of wealth originating from long-distance metal trade, made possible the formation of alliances and the gathering of large groups of warriors, thus creating a vicious circle of escalation in conflict, which in turn led to an exponential increase in the intensity of warfare.

The state of intense warfare, fuelled by a constant flow of wealth, became the breeding grounds for new customs, new tactics, and new weapons. This increase in conflict can be seen in the Sintashta culture graves. For the first time in the region, large deposits of weapons are found buried next to human remains. Earlier burials seldom displayed weapons, and in the rare cases when that happened, mainly in Abashevo

[53]Zdanovich and Batanina, 2002
[54] Zdanovich and Batanina, 2002, p. 124
[55] Zdanovich and Batanina, 2002, p. 124
"Squares", "ovals", and "circles" refer to different groups of people, categorized according to the geometrical shape of their defensive system.

graves, it was limited to a single axe or projectile weapon. In contrast, in Sintashta culture graves, a great number of different weapons can be found, as well as numerous projectile points. At the same time, the frequency of weapons burials increased drastically. David Anthony suggests an increase from less than 10% of all graves containing weapons in earlier Bronze Age cultures, to a maximum of 54% of adult graves in Sintashta culture graves[56].

Another clear indicator of increased conflict is the emergence of new weapons. This development in armaments can best be seen in projectile points. Older lanceolate arrowheads with flat bases became longer. A new type of projectile-stemmed point appeared, consisting of a long (avg.4-10cm long) blade with a thick medial ridge. Being stemmed, it was probably used in javelins rather than in arrows, as mentioned before. Besides these projectile points, a new type of socketed spear head, made of bronze or copper and heavier than its predecessors was also found[57]. Because of its mass and weight, this spearhead might have been used in close combat rather than as a throwing weapon.

In this period of martial technological development, the war chariot might have arisen.

According to Littauer and Crouwel, the war chariot is a superfluous artefact in the steppe, mainly because of the existence of a more suitable alternative, the horse. That might have been the case in conventional tribal warfare, consisting on occasional skirmishes and cattle raids. This type of conflict is characterized by small and quick engagements. Rather than being used as a weapons platform, the horse was probably used to create a surprise element, and later a swift retreat. In comparison with modern-day horses, Bronze Age horses were little more than sturdy ponies. While some could carry a man, they certainly could not endure the hardships of battle. They could not carry a fully armoured warrior for long periods of time, and being an animal with a fight or flight response heavily geared towards flight, in the case of mares and geldings, or of extreme aggression, in the case of stallions; it would be extremely difficult to manage in any sort of formation or tactical use. While this was no serious drawback in earlier tribal warfare, when the horse served as transportation to light-armoured warriors, during the Sintashta period, where large-scale battles were fought between large groups of

[56] Anthony, 2007, p395
[57] Anthony, 2007, p395

organized, and judging by their graves, heavily-armed troops, the horse simply could not be used effectively in the battlefield. It was possible to use it as a mount, but it wasn't possible to use it as *cavalry*.

It is reasonable to expect that Sintashta warriors were aware of the horses' potential as a weapon. However, a way to circumvent its natural limitations had to be found before horses could be used to full effect on the battlefield. The chariot is the solution to this problem.

Therefore, the war chariot, rather than a superfluous object in the steppe, is a much-needed war machine that allowed horses to be deployed on the battlefield, during a time where large-scale conflict was endemic. At the time, the necessity was far greater on the steppe than in the Near East, thus providing a stimulus for its local development.

That seems to have been the case. The discrepancy (fig.12) in size of known steppe war chariots has been interpreted by Littauer and Crouwel as a sign of its inadequacy as a war machine, discarding them as imitations of Near Eastern ones. However, these discrepancies, if anything, suggest experimentation with a new technology, rather than imitation of an already-established one.

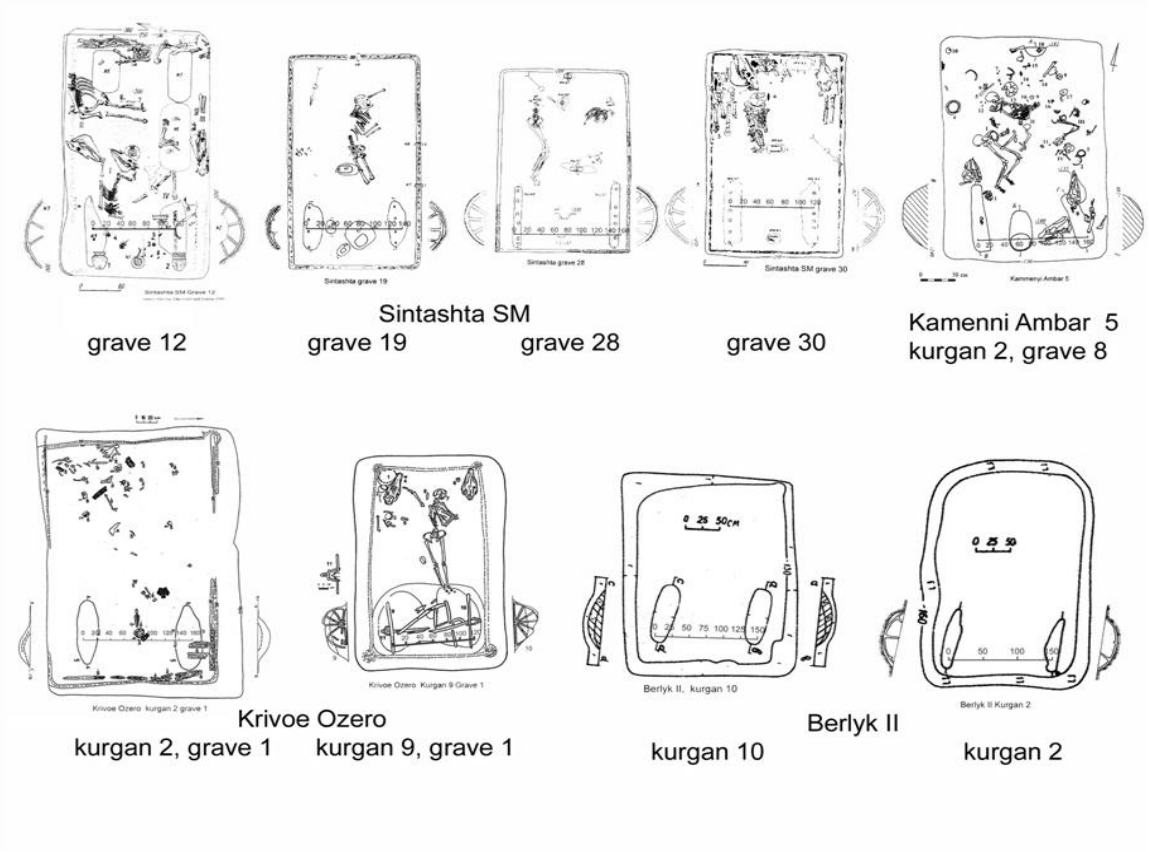


Fig. 12 ***Gauge discrepancies in different steppe chariots*** **after David W. Anthony, Dorcas R. Brown, The Secondary Products Revolution, Horse-Riding, and Mounted Warfare http://users.hartwick.edu/anthonyd/harnessing%20horsepower.html (November 2009)**

Chariots and draught teams are difficult and expensive to maintain. However, considering that Sintashta society relied heavily in the control of critical locations and long distance trade, it is expected that whoever controlled these two factors had the means to maintain chariot troops. It is safe to assume the existence of a military elite in Sintashta settlements, if for no other reason, because of its graves.

However, there is clearer evidence of this military elite and its nature. According to V. M. Masson:

"Judging by the presence of monumental cult complexes in Margiana (Gonur, Togolok) and Bactria (Dashly, Djarkutan), this tendency towards a theocratic form of social organization was also preserved in the urbanized societies of south Central Asia in the 2nd millennium BC.[...]Nevertheless, it is characteristic of that in the epoch of the Early Iron Age, when traditional urbanized centers of the Bronze Age become destitute, monumental temple complexes and rich glyphic inscriptions disappeared simultaneously. Citadels on powerful platforms were put in the foreground as organizational centers. This can prove military and aristocratic dominance in the way of politogenesis. Furthermore, due to the armed elite which moved in chariots, the military and aristocratic way of polotogenesis [sic] *was characteristic of steppe societies of the Sintashta-Arkaim period."*[58]

Masson identified a direct correlation between the organizational centres of a society and its political organization. During the Late Bronze Age, urban societies of Central Asia had their organizational centres in temple complexes, similar to early Sumerian city-states. However, during the early Iron Age, this system of organization changed, with the temple complexes being replaced by fortified citadels, of close similarity with the ones found in complex steppe societies of the previous period. Considering that there is a direct link between organizational centres and political organization, and that the late Central Asia Iron Age societies display the same organizational model (the same centres) as the earlier Bronze Age steppe societies, it is safe to assume that these also shared a common political system.

[58] Masson, 2002, p.553

Therefore, one can conclude that the Sintashta societies were organized as military aristocracies, a system that was later implemented in central Asia, as groups of steppe dwellers began to migrate south. These migrations can be seen in the change of architecture and burial rites in the middle and late 2nd millennium BC. Not only did several Sintashta-Arkaim type settlements begin to appear further south, a new type of culture emerged, formed by elements of both cultures in symbiotic union (Vakhsh type cultures). Furthermore, in cemeteries in Bactria and Margiana, new types of graves appeared, where stone laying and ceramic facing in the walls were reminiscence of northern burial types[59].

Ultimately, the war chariot was a much-needed artefact in the steppe, and the conditions required for its development were all gathered in the Sintashta steppes. The abundance of wealth and intensive warfare create the condition for experimentation in both weapons and tactics. Despite the horse being used as a mount before, the advent of a new type of large-scale conflict created the need to circumvent the animal's natural limitations. This was accomplished by the development of the war chariot. Its martial potential was further enhanced by parallel developments in ranged weapons, the most significant of which is the introduction of a long-bladed javelin.

The organizational changes occurred in steppe societies after c.2500 BC, in conjunction with contact with new urban cultures that led to interaction in long-distance trade systems, allowed for the development of military elites, which controlled great wealth, and thus could afford to train and maintain the highly-specialized chariot troops.

[59] Masson, 2002, p.554

I.3. The Horse

The war chariot was developed in order to harness the speed, strength and agility of the horse. Therefore, it stands to reason that the animal can be understood as an intricate part of the device. In order to understand the origin of the war chariot, one must forcibly consider the "origin" of the horse, that is to say, when and where it was domesticated.

The subject of horse domestication is a complex one, in great measure due to the difficulty in identifying domesticated horse (*Equus Ferus Cabalus*) specimens through archaeological remains. It is not clear which of the wild horses' species is the direct ancestor of the domestic horse, and what were the limits of their natural habitat. Secondly, wild horse (*Equus Ferus*) populations from the Holocene display significant dimorphism amongst themselves, according to geography and climate. It is expected that specific traits would be passed on to domestic populations, according to the same factors. Finally, unlike other species, horses lack clear morphological indicators, such as horns (cattle and sheep) or developed canines (pigs), which might have been affected by the domestication process. In order to trace back the origins of domestication, one must identify the natural habitat of the domestic horse ancestor. Domestication is the final stage of a complex and lengthy process, that requires extinctive coexistence between man and horse.

During the Pleistocene, until c. 10.000BC, large groups of several caballine equids roam the greater part of the northern hemisphere. It was originally thought that the various breeds of modern horses were descendants of different prehistoric populations. However, it is now accepted that all but one species of horses survived into the Holocene, the *Equus Ferus*.[60] This extinction was caused by drastic changes in the environment, as the last Ice Age came to an end and most of the arctic steppe and tundra was replaced by dense woods. By mid-Holocene, horses had become extinct in North America, and were confined to small pockets in isolated areas of Europe. The exception to this is the Eurasian steppes, where a climate close to the Ice Age steppe persisted. There, in Mesolithic and early Neolithic sites, horse bones amount to more than 40% of the total findings. Elsewhere in Europe, where horse bones were found, they seldom

[60] Forsten, 1988

account for more than 5%, with the exception being the coastal plains of northern Germany, where amounts up to 10% were found in a few sites[61]. However, these low percentages show that, unlike the Pontic-Caspian steppes, the wild horse was not extensively hunted. Therefore, steppe Neolithic hunters were much more familiarized with the horse than their western European counterparts. It is reasonable to expect that they were in a better position to initiate the domestication process. That seemed to have been the case.

Recent genetic studies[62] have shown that modern horses' mtDNA shows great diversity, in severe contrast with Y-Chromosome Marker Analyses, which revealed one single haplotype[63]. This shows that the domestication process began with a single episode: the presence of one single haplotype, shared by all modern-day domestic horses, shows that there was very limited genetic diversity in the first domesticated male population. All of today's horses could be descendants of a single stallion, or at least, from very few stallions that shared a common and very homogenic gene pool. However, mtDNA diversity leads to the conclusion that, unlike their male counterpart, the female population was extremely diverse. After the first isolated incident, the domestication process continued in several independent stations. To the original gene pool, new genes were added by introducing wild mares to domestic populations, in different and unrelated places. However, the introduction of new stallions was very limited, probably due to their natural aggressiveness. If a single stallion was docile enough to allow domestication, which might have been the case, and with its descendants being artificially selected to be progressively less aggressive and more manageable, then the introduction of wild male horses in the population would be counter-productive. The more manageable descendants of the original population would have been kept as stallions, while offspring of wild males would be either killed for meat, or kept has geldings.

This genetic study also provides some insight regarding the direct ancestor of the domestic horse. Two wild horse variants are known: the Przewalski's Horse (*Equus Ferus Przewalskii*) and the Tarpan (*Equus Ferus Ferus*). This study has shown that all the modern domestic horse (*E. Cabalus*) populations share one single haplotype in Y-Chromosome. However, a small population of Przewalski's Horses has shown two

[61] Anthony, 199
[62] Kavar and Dovč, 2008
[63] Kavar and Dovč, 2008, p.1-14

different hapoltypes through Y-Chromosome Marker Analysis, which is remarkable, considering that all extant exemplars are descended from a mere 13 animals[64]. This shows that the Przewalski's Horse cannot be the ancestor of domestic horses. In fact, despite producing viable hybrids, they do not share the same number of chromosomes. While the Przewalski has 2n=66 chromosomes, the domestic horse has only 2n=64[65]. Interbreeding is possible due to a Robertsonian nonreciprocal translocation, where the non-homologous chromosomes are partitioned by the centromere, leading to the fusion of the long arms containing essential genes, while the short arms, containing less, redundant or useless genetic material, either fuse or are discarded.

The first episode, the domestication of a handful of animals, is impossible to date. However, the beginning of the second stage of domestication can be limited to a particular time stage.

The earliest indicator of horse domestication is the presence of ritually-prepared horse heads and lower legs found in conjunction with domesticated cattle and sheep remains, in human funeral sites, dated c.4800 - 4500BC, at Khvalynsk, S'yezzhe and Nikol'skoe, the first two in the Volga region, and the last near the Dnieper River.

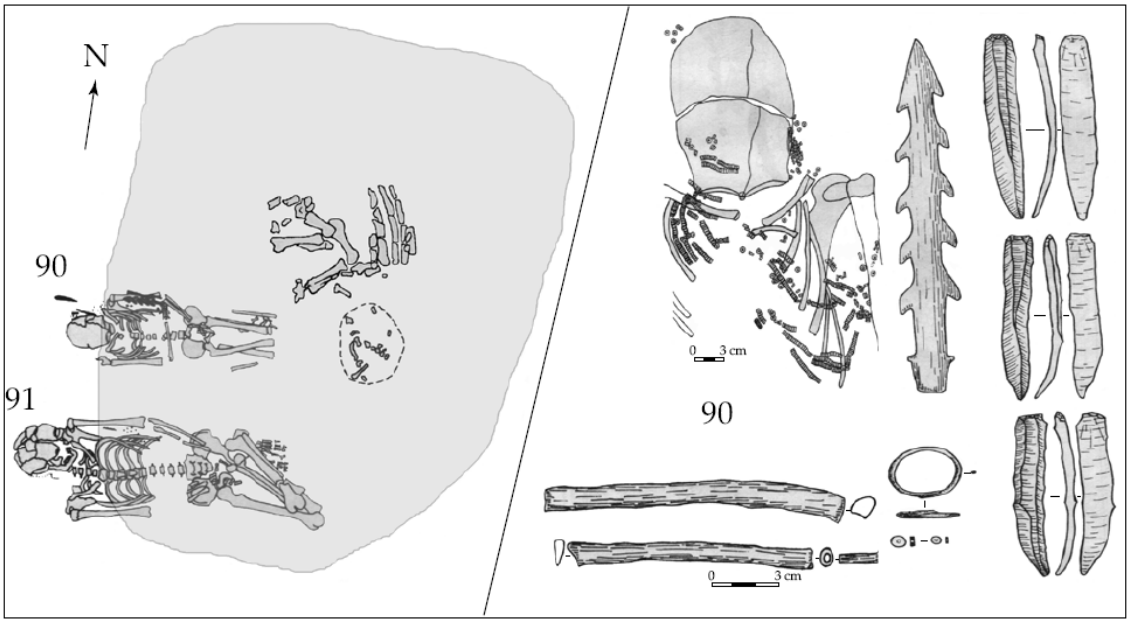


Fig. 13 Graves 91 (adult male) and 90 (adolescent), covered by Ritual Deposit 4 at Khvalynsk cemetery, with cattle, sheep, and horse after (Agapov et al. 1990, figs. 2a, 3 & 13)

[64] Bouman, 1986
[65] Olsen, 2008, p.246

Later, c. 4200BC, in the Dnieper and the lower Danube valley, a new type of grave appears[66]. In these new graves, Suvorovo type graves, horse-head shaped maces are found, which indicates the increase in importance of the animal in the region. These maces, although found at earlier sites, near Khvalynsk and Varfalomievka, are absent from the earlier Karanovo VI, Gumelnitsa, and Varna cultures in the Danube region.[67] The introduction of new grave types, new symbolic objects, and the abandonment of older tell type settlements in the region, suggest the arrival of new groups that might have introduced horse domestication in the region.

Map. 2 The Pontic-Caspian Steppes c.4800 - 4000BC after David W. Anthony, Dorcas R. Brown, *The Secondary Products Revolution, Horse-Riding, and Mounted Warfare* http://users.hartwick.edu/anthonyd/harnessing%20horsepower.html (November 2009)

[66] Anthony, 2007, p.201
[67] Anthony and Brown, 2007

However, it was after c.3800BC that the spread of domestication became truly apparent. Large-scale domestication and horse-centred economy can be found in Botai culture sites northern Kazakhstan, c.3700BC[68]. After c.3500BC, horse remains begin to surface outside the steppe, in the Upper Danube Valley, Central and Western Europe, North Caucasus, Transcaucasia and Western Anatolia, thus providing unequivocal evidence for its domestication[69]. This raises a question: if horses were first domesticated c.4800BC, why only after 3800BC did the practice spread? Horses are strong and temperamental creatures, which makes them unlikely candidates for domestication. That is the most likely reason why it was domesticated long after cattle or sheep. That is also why, after it had been domesticated, the practice took so long to become widespread. However, unlike other domestic species, horses are extremely well-adapted to cold climates. Unlike sheep or cattle, horses are able break ice in order to drink, and to pierce ice-crusted snow with their hooves, in order to reach the winter forage beneath it. That meant that horses were much easier to feed during winter times. That might have been the initial reason for domesticating horses: access to an optimum source of food during winter time. This might have been the reason behind the increase of horse domestication after c.3800 BC.

Between 4200 and 4100BC, climate began to change, leading to lower annual temperatures and severe winters, especially between 3960 and 3821 BC. This has led to the adoption by agricultural societies in the Danube region of more cold-tolerant vegetal species [70]. Considering that the climate change affected the entire northern hemisphere, there is no reason to assume that similar practices were not adopted outside the Danube area. To the pastoralist steppe societies, that meant a shift to a more cold-tolerant animal species, namely, the horse. That can easily explain the rapid expansion of horse domestication after c.3800 BC.

The adoption of the horse as a meat source by an increasing number of populations, leads to significant breakthroughs in domestication, culminating in a fully horse-centred economy in the steppes of northern Kazakhstan, after c.3800 BC. The Botai sites revealed the oldest known evidence of large-scale horse domestication. Represented by four settlements, Botai, Krasnyi Yar, Vasilkovka and Roshchinskoe,

[68] Olsen, 2008, p.257
[69] Anthony and Brown, 2007
[70] Bailey, 2002

most of the evidence has been unearthed from the first two. The most remarkable feature of the Botai culture is its almost exclusive dependence of horses for survival. More than 99% of the bones found at Botai settlements deposits belonged to horses.[71]

Map. 3 Botai culture sites c.3700 - 3000 BC after Olsen 2003 fig.7.1 (adapted)

Through the analysis of different pieces of evidence found at Botai sites, it is possible to build a complete picture of the extent of horse domestication in the steppes southeast of the Urals.

By analysing the mortality patterns for both age and gender, through horse mandible and maxillae bones, Sandra Olsen has shown that there was an even proportion between adult males and females, and that the majority, over 65%, of the slaughtered individuals were over 2.5 years old, with greater distribution between 6 and 7 years old. Alone, this data is inconclusive. The preference given to adults, indicating hunting rather than breeding, can be explained in the case of horses by the need of adult females for reproduction and milk, and of adult males for riding or transportation of heavy loads[72].

Through the analysis of marks in the bones, it is possible to extrapolate the method of slaughter. At least three different horse bones were found at Botai sites with

[71] Anhony, 2007, p.217
[72] Olsen, 2008, p. 259

puncture marks made by harpoon points[73]. Slaughter of domestic animals with throwing weapons in extremely impractical, therefore suggesting that at least to some extent, wild horses were being hunted. However, one horse cranium was found with a blunt round fracture in the maxilla. This type of fracture is usually the result of pole-axing, a method of slaughter used throughout Russia and Kazakhstan in the Bronze Age[74]. Unlike harpooning, pole-axing was mostly used in the slaughtering of domestic animals. The animal is immobilised by two ropes tied around its neck, and hold in place by two individuals. The animal is then struck in the cranium with a pole-axe, which if done correctly, would cause instant death, leaving the characteristic round fracture (fig. 14)

Fig. 14 Modern day Mongolian horse cranium with pole-axe inflicted fracture, after Olsen, 2008, fig.17.4

However, in the Botai cranium, the fracture was located in the maxilla[75], rather than on the internal periorbital region. This can be explained by a botched attempt at killing the animal, but it can also be a completely unrelated fracture.

Fig. 15 Horse cranium with circular depressed fracture in maxilla, possibly from pole-axing, after Olsen, 2003, fig 7.4

[73] Olsen, 2003, p. 85
[74] Olsen, 2008, p. 259
[75] Olsen, 2008, p.259

More conclusive data can be obtained by the analysis of the bones in regard to body –part distribution. It is common practice amongst big game hunters to strip the carcass of at the kill site, taking with them only what they can carry. Therefore, priority is given to meat and high value bones, either for nutritional value (marrow) or for crafting tools. By analysing which bones have higher marrow content, and by studying the bone artefacts found at Botai sites, it is possible, by an elimination process, to identify which bones were less desired by hunters, namely vertebrae and pelvis. However, large quantities of these bones were found at Botai, suggesting that the animals were either slaughtered at the settlement or transported there after the killing, but before stripping the carcass. Either way, it strongly indicates domestication. If the animals were slaughtered at the settlements, chances are that they were domestic horses rather than wild ones. On the other hand, if the carcasses were transported back to the settlement, packhorses had to be used, a clear indication of domestication[76]. In fact, further indication of the existence of packhorses can be found at Botai sites. Previous Neolithic sites in the same region show stone tools made from local quartzite. Botai sites, however, in addition to these tools, have produced tools made of jasper, flint and fine-grain quartzite, the source of which is unknown. This suggests that large quantities of stone were transported from an unknown location into the settlements, a task made significantly simpler through the use of pack animals[77].

As mentioned earlier, the placement of horse bones in association with domestic animals' bones in human graves can be understood as a sign of domestication. However, in the Botai sites, the lack of human graves does not allow for any conclusions. Only one human grave was found in Botai, containing three adults, two males and one female, and one infant. In the same grave, remains of at least 14 horses were found, in what appears to be ritualistic display. However, horse remains were often paired with dog remains, which can be understood as a possible indication of domestication.[78]

That which might be the clearest indication of the presence of domestic horses at the Botai sites is the presence of traces of large quantities of horse manure found in a pithouse unearthed at the settlement of Botai. Such findings were interpreted either as proof of the existence of stables or evidence of the use of horse manure as roof

[76] Olsen, 2003, pp.91 - 95
[77] Olsen, 2008, p.263
[78] Olsen, 2008, p.263

insulation. Either way, it is a strong indication of the presence of domestic horses[79]. Horse manure could have been collected from the wild, although when that happens, it is usually used as fuel, rather than for insulation. The quantities required for such purpose suggest the presence of a significant number of animals gathered at the settlements, which could only be possible with domesticated horses.

D. Anthony and D. Brown have devised a method to identify bitted horses from the archaeological record. After analysing several bitted and unbitted horses' teeth, the authors were able to identify a specific injury, in the lower second premolars (P_2s), caused by bit chewing.[80] According to their conclusions, all bits, whether hard or soft, leave a distinctive wear bevel on the mesial corner of the lower second premolar. In addition, hard bits also leave wear abrasion on the occlusal enamel of the metaconid cusp. By comparing the teeth of never-bitted modern horses, pleistocenic ancient equids and modern-day bitted and daily-bitted horses, the authors were able to establish the minimum measurement in teeth wear for a positive identification of bit use.[81]

Only 3% of the never-bitted horses' teeth showed a bevel of more than 2.0mm, while less than 1% had a bevel of 2.5mm. In bitted horses, however, the majority (58%) displays bevels of 2.5mm or more. Therefore, according to the authors, a bevel of 3.0mm or more in adult horses (older than 3 years) is an indicator of bit wear.[82] It should be noted that this does not mean that whenever a 3.0mm plus bevel is found, it is an unequivocal proof of bit wearing. Although extremely rare, such bevels can be caused by natural means. Sandra Olsen reported finding similar marks in the teeth of pleistocenic *Equus Lambei* (USNM 8426 and 11705), as well as severe variation in the P_2s of several horses found in Big Horn Basin in Wyoming, dated 18,170 to 15.620 BC [83].

In regards to Botai, Anthony and Brown, from a total of 36 P_2s, have identified 19 old enough for scrutiny, finding 5 (26%) premolars with over 3.0mm bevels[84] (4 according to Olsen[85]). According to Anthony, this suffices to prove the existence of bitted horses in the Botai settlements: "A bevel of 3 mm or more on P_2 of a mature horse is evidence for either an exceedingly rare malocclusion or a very common effect

[79] Olsen, 2008, p.264
[80] Anthony and Brown, 1989
[81] Anthony, 2007, p.211
[82] Anthony, 2007, p.213
[83] Olsen, 2008, p.261
[84] Brown and Anthony, 1998, p.344
[85] Olsen, 2008, p.260

of bitting. If even one mature horse from an archaeological site shows a bevel ≥3 mm bit wear is suggested, but it is not a close case. If multiple mature horses from a single site show mesial bevel measurements of 3 mm or more, they probably were bitted."[86]

He further added that these horses were not only bitted, but were also ridden. The 1:1 gender ratio found in slaughtered horses remains' can only be explained if both family groups (stallion with harem) and bachelor groups (young males) of wild horses were hunted in approximate proportion. The only way to achieve this was through horseback riding, since these two groups do not share the same territory (bachelor groups usually dwell in the fringes of a stallion territory), and the only way to hunt them both was to scout a large area[87]. Furthermore, bachelor groups, when confronted with a threat, tend to confront and disperse, unlike family groups, who follow the dominant mare, while the stallion protects the group. Therefore, while it is reasonably simple to drive wild family groups to a trap, it is extremely difficult to do so in bachelor groups, because of the previously-mentioned reasons. However, that might have not been the case.

Most of the circumstantial evidence presented so far seems to point to the existence of both domestic and wild horses remains in the Boati settlements. Anthony's hypothesis of horse-riding horse hunters inherently assumes the same conclusion. However, the presence of both domestic and wild animals should not produce a 1:1 gender ratio in the remains.

In a domestic population, male remains are much more frequent than female ones. Females tend to be kept for breeding and milk. However, only a small percentage of males, usually the best ones for the current needs, are kept for breeding purposes. All others are slain for meat as soon as they reach full volume. So, if wild male and female horses were hunted in the same proportions, the total percentage of male remains would be greater than half. However, if only the family groups were hunted, the higher number of wild females killed would compensate the higher number of domestic males slain, generating a 1:1 ratio. Furthermore, family groups are easier to hunt through herd-driving hunting methods. Family groups, when threatened, instinctively follow the dominant mare. Hunters simply had to steer the dominant mare towards the ambush or trap, and the whole group would follow. Therefore, the 1:1 gender ratio cannot be considered evidence for horseback riding, since herd-drive hunting can be done on foot.

[86] Anthony, 2007, p. 213
[87] Anthony, 2007, p. 220

Nonetheless, Sandra Olsen, despite considering the bevelled teeth found at Botai sites the result of normal dietary wear, points out that there was intensive manufacturing of rawhide thongs, which might have been used in horse riding or driving activities. Besides these activities, the main use of rawhide thongs is as harpoon lines. However, these instruments were not very common in Botai settlements, and do not justify the great number of *thong smoothers* (a bone instrument used stretch rawhide strips) found at the locations[88]. This suggests that rawhide was used in horse control.

Most indicators, by themselves, are not enough to allow a definite conclusion regarding horse domestication. However, if taken into account as a whole, there is strong evidence to support the hypothesis of horse domestication in Botai sites. Not only did the Botai people breed horses, they also hunted them, almost exclusively. This meant that they would have acquired detailed knowledge of the wild horse behaviour, which in turn would be paramount to the domestication process.

Evidence presented for horse riding is at best ambiguous, and should be treated with care. Even though dental abrasion might suggest bit wear, such indicators might appear in different, unrelated circumstances. Furthermore, assuming that such marks are indeed proof of bit wearing, that does not necessarily translate as horseback riding. The bit is used to drive the horses, and although its optimum use is during horse riding, it could be used in pack or draught animals as well.

Regardless whether the horses were ridden or not, the fact remains that this population had intensive and close contact with horses, and that there are strong indicators that they have successfully domesticated them. It should be noted that this might not have been the first case of horse-centred economy in the region. In fact, the absence of other domesticated species suggests that the horse domestication process was initiated elsewhere, and later adopted by the Botai culture. Nonetheless, Botai sites have produced the oldest and best evidence regarding large scale horse domestication to date.

The earliest unequivocal textual reference to the horse in the Middle East dates to the reign of Ur III king Šhulgi (2094 – 2047 BC). In a series of texts, the Sumerian

[88] Olsen, 2008, p.261

anše.zi.zi (later anše.kur.ra, ‘ass of the mountains’), derived from Akkadian sīsû (sīsā’u), is used in reference to the horse[89]:

“Šhulgi voluptuously chosen by Inanna am I,

A mule set for the road am I,

A horse for the highway who swished his tail am I,

(anše.zi.zi/ansše.kur.ra ḫar.ra.an.na)

A stallion of Šakkan eager for the course am I.”[90]

There are earlier depictions of equids, from the early Dynastic and Akakdian period, which might represent horses. However, these are too ambiguous to draw any conclusion. That which might be the first clear representation of a horse in the Middle East can be found in a tablet form Ur III, reign of Šu-Sin, 2037 – 2029 BC. There, a rider can be seen riding an equid whose mane and tail suggest being a horse[91] (fig. 15).

Fig. 16 Sealing on tablets of Šu-Sin (2037–2039 BC) from Ur, showing a man riding an equid that appears to be a horse, after Oates, 2003, fig. 9.5

Therefore, it is possible to place domestic horses in Ur prior to 2000 BC. Since horse domestication took place in the steppes of northern Kazakhstan, a link between this region and the Middle East must be found, in order to account for the horses’ presence there.

[89] Oates, 2003, p.117
[90] Klein, 1981, p. 189
[91] Oates, 2003, p. 119

Wild horses' remains are common in the Near East until the end of the Pleistocene. However, Neolithic sites have not revealed any such remains whatsoever[92]. This indicates the disappearance of the *Equus Ferus* from the region during the transition from the Pleistocene to the Holocene, after c.10.000 BC. This disappearance follows a pattern of extinction visible in all of the northern hemisphere, with the wild horse's populations being reduced and confined to isolated pockets.

Findings in Anatolia and south central Iran[93] indicate the presence of horses in the region by the late 4th millennium BC. The isolated nature of the findings, and the lack of any subsequent data, makes it impossible to draw any conclusions. However, it opens the possibility that some of the more ambiguous mid-3rd millennium representations of equids may indeed depict either horses, or at the very least, hybrids. That seems to be suggested by a metal rein ring from Til Barsip, Syria, and a Mesopotamian cylinder seal, both dated c.2500BC.

Only after c. 2100 BC did horses begin to appear regularly in the Near and Middle east. This means that sometime between c.2500 and c.2100 BC, there was an increase in the influx of horses into the region.

The oldest indicator of this process is the already-mentioned depiction of a chariot with cross-bar wheels in a seal form Tepe Hissar, dated c.2100 BC. The cross-bar wheel is the result of an effort to lighten the chariot. This necessity can only be explained by the arrival of a new draught animal that could benefit from the vehicle's added speed and manoeuvrability. Therefore, it is reasonable to expect that horses were present in northern Iran c.2100 BC.

The connection between the Ural-Topol steppes and the central Asia urban cultures of Bactria-Margiana has already been demonstrated regarding tin trade. However, perhaps the best indicator of such link is the appearance of horse-related findings, south of the Kyzl Kum Desert. A horse was found in a grave pit containing the remains of ten humans, in association with a nearby royal tomb, which in turn produced a decorative bronze horse head staff pommel, two horse-bits and two pairs of cheek-pieces, similar to the ones found in Sintashta sites. Furthermore, a BMAC style bronze axe in the shape of a horse head is known from the same period, Namazga VI, c.2100 – 2000 BC, albeit its exact origin being unknown[94]. Despite being dated to early Namazga

[92] Oates, 2003, p. 117
[93] Littauer and Crowel, 1979, pp.24-25
[94] Anthony, 2007, p. 427

V by some[95], the Tepe Hissar seal is usually dated to late Namazga IV[96], so it might predate these findings by c. 100 years. However, such delay is to be expected. Garbage deposits found at BMAC sites do not contain any horse remains, and when horses were depicted, they were so in highly symbolic objects. The horse was introduced in the Bactria and Margiana region, not as food, but as an extremely rare commodity. This rarity could explain the time span between the first record and the subsequent ones. Furthermore, the first horses to travel through south central Asia might have done so as simple trade commodities. Only later, when the first Petrovka migrants arrived in the region, did the horse acquire symbolic importance, being used in rituals and in status display. This alone could explain the lack of evidence prior to c.2000 BC.

The rarity of the horse can also explain the lack of success of the cross-bar wheel design. By c. 2100 BC, horses were extremely rare in northern Iran, that a wheel designed to harness their full potential never became relevant. When horses were being brought to northern Iran from Bactria and Margiana in sufficient numbers to justify a lighter wheel, a better alternative, the spoked wheel, had already been found.

When considering West Asia and Northern Syria, the records are more fragmentary. The oldest mention of horses in Anatolia dates from c.2000 BC, from the Kültepe texts. According to those, horses were used to transport tin (*ina si-sa-im*)[97], suggesting they were used as pack animals.

However, by the 18th century BC, there is ample evidence of the presence of horses in the Near East. Zimri-Lim tries to obtain white horses form Carchemish (RHA 35), and on another occasion mentions the excellence of the white horses from Qatna (ARM XIV 98). These two references are of extreme importance, because they identify both Qatna and Carchemish as horse-breeding centres, located on the Syrian coast and in northern Syria respectively. By the 18th century BC horses were no longer being imported to the Near East, but rather being bred, trained and traded in the region. However, there is no evidence to support the use of the horses in military contexts. The same can be said about the chariot. There is conclusive evidence of the presence of chariots in Mari in the 18th century BC.:

"Dis à Yasmah-Addu: ainsi parle Samsî-Addu, ton père.

[95] Masson, 2002, p.548
[96] Littauer and Crouwel, 2002, p.279; Parpola, 2004, p.5
[97] Oates, 2003, p.120

Il faut que l'on amène pour l'akitum les attelages et tes mules et de chevaux, pour les champions. Les chars et l'attirail de la jeunesse doivent être neufs."

ARM I 50

It is impossible to determine if these cars (*giš-gigir-hà*) are simple carts or chariots. However, the distinction between "chariots and swift chariots" (ARM VII 161) suggest the presence of both. This letter clearly proves the symbolic nature of the vehicle. It is required for the *Akitum* festival, a religious event. Furthermore, the Old Assyrian kingdom of Samsî-Addu (Akk: Shamshi Adad) was the result of the first effort to unite northern Mesopotamia since the fall of Akkad. If, in the late 18th century BC, horses and chariots were used in a military context in the region, it was to be expected that Samsî-Addu had plenty of both available, without having to rely on its son to provide them. Although not definitive evidence, this certainly suggests a symbolic role for the chariot, rather than a military one.

A possible reason why the horse was never used in battle might have had to do with the absence of bits. Two lists of chariotry equipment are known from the tablets of Mari (ARM XVIII 45 & VII 161). Neither mentions a bit, although one (ARM XVII 45) mentions a harness. If one considers the roughly contemporaneous cylinder seals from Karum Kanesh, showing equids being controlled through the use of nose-rings, it is reasonable to expect that it would also be the case in Mari.

This symbolic value can be extended to the horse as well. Although not clearly stated, the importance attributed to white horses might stem from their added value as symbolic objects. Not only was Zimri-Lim keen on obtaining white horses from Carchemish, he was forced to *settle* for red ones from Harsamna, Anatolia (RHA 35). Besides, such horses seem to have enjoyed special treatment (ARM XIV 98). Nonetheless, despite their symbolic importance, they seem to have been a new commodity in Mari. Zimri-Lim is advised not to ride horses, for such practice was beneath his majesty:

"Dis à mon Seigneur: ainsi parle Bahdî-Lîm, ton serviteur.
Mon Seigneur ne doit (donc) pas monter sur des chevaux. C'est sur un nûbalum et surs mules que mon seigneur doit monter afin d'honorer sa capital."

Even though some findings place the horse in West Asia much earlier, by the 18th century BC it was still a novelty in northern Syria. It hadn't yet replaced the traditional mule as a mount worthy of a king.

In light of current evidence, it is extremely difficult to identify the route through which it arrived in West Asia. On the one hand, it might have been introduced form the east, through Elam, as stated above. However, there is no reason to assume that the horse was introduced in the Middle East through a single route. When considering northern Syria, another hypothesis arises.

Horse remains were found in Trans-Caucasia dated c.3500 BC. Since wild horses were not natural to the area, these findings prove the arrival of domestic horses in the region, which in turn signifies contact with the upper Caspian steppes.

The Early Trans-Caucasian (ETC) culture emerged in the region c.3600 BC, and through ECT I and II remained a single homogenous cultural complex, despite minor local variants. However, after 2600 BC, ECT III sites began to show innovations. In the Upper Euphrates basin, at Malatya-Elazig, a distinctive pottery was found, combining previous ETC elements, with new north Syrian traditions (Alalakh XVI-VIII)[98]. It is possible that, sometime before the breakdown of the ETC cultural complex, Trans-Caucasian populations began to migrate south, thus introducing the domestic horse into northern Syria, before 2600 BC. It is extremely difficult to identify who these migrants might have been. In the last quarter of the 3rd millennium BC, large Hurrian city-states began to appear in northeast Syria, and evidence from Kabhur suggests that the introduction of the horse might have been associated with a Hurrian element[99].

Burney identifies the Sumerian word *ta/ibira* (copper-mining) as a hurrian derivation, proving that there was exchanges between Trans-Caucasia and Mesopotamia, at least since late Uruk. According to Burney, this metal trade gave ECT populations the stimuli needed to migrate south into northern Syria and Mesopotamia.

Because copper work in the Malatya-Elazig region (Norsuntepe, Tepecik and Arslantepe) predates ECT III; and because until ECT III, ECT was a single homogeneous cultural complex; and because the linguistic connection, regarding copper

[98] Burney, 1997, p.178
[99] Oates , 2003, p. 123

trading, between Mesopotamia and northern Syria shows a Hurrian element in the latter, Burney assumes that the entire ECT shared a common Hurrian element[100], thus providing a cultural continuity linking early 4th millennium horse remains to the 18th century BC northern Syria. Linguistic evidence seems to support this connection. A possible connection between Hurrian *ešše* (horse), Sumerian *anše.zi.zi* (horse), Akkadian *sīsû* (**sisa´um*) (horse), Luwian *aššuwa* (horse) and Armenian *ěs* (donkey) has been discussed by Ivanov[101]. However, current understanding of the spread of Caucasian and Hurrian dialects is unable to explain such a connection, assuming that it exists[102]. Furthermore, the presence of Indo-Aryan elements in the Gorgan plain (part of the BMAC horizon), in northern Iran, is attested from c. 1800 BC onwards, often related to horses and chariotry. Although no unequivocal link can be drawn, it is not unreasonable to theorize that they might represent the origins of the later 15th century BC Indo-Aryan element found in Mitanni.

The horse was first domesticated in the steppes. By c. 3700 BC, horse-centred societies began to develop in the Kazakhstan steppes, the same region where centuries later (c.2100 BC) the first examples of war chariots would be found. However, the chronological distance between the two events is too large to allow for any discernible connection. Nevertheless, it remains clear that before the development of the war-chariot, the horse had been part of the human life for over one millennium.

The horse was once thought to have been introduced in the Middle East in the 15th century BC, by Indo-European speaking populations. That was presented as an argument against a possible Middle Eastern origin for the war chariot. However, it was introduced much sooner than previously thought, maybe as early as c. 2700 BC. This date allows for the development of a light vehicle, built to harness the new animal's full potential. That seemed to have been the case in Tepe Hissar, in northern Iran. Nevertheless, despite the presence of both horses and chariots in the Near East by the18th century BC, they didn't seem to have been used in military practices. As seen earlier, the use of a nose ring as means of controlling the horse might have been the cause for this.

[100] Burney, 1997, p.178
[101] Ivanov, 1998
[102] Oates, 2003, p. 124

Whether in the steppe or in the Middle East, the domestic horse pre-dates the chariot by many centuries. However, it is undisputed that it was introduced in the Middle East by a foreign element. Furthermore, by the 18th century, it had not been used in military context. On the other hand, in the steppe, the horse is a much more familiar commodity, being domesticated and used in warfare, albeit in limited fashion, for many centuries before the advent of the war-chariot. While the horse alone does not allow for unequivocal conclusions, it definitely suggests the Sintashta steppes as the origin of the war-chariot, especially if taken in conjunction with the spoked wheel evidence and the steppe social and economic context at the relevant time, c.2100 BC.

II. India

Particular conditions gathered in the Indian subcontinent make the study of the war chariot in the region somewhat complex. Because of India's characteristic climate, archaeological evidence regarding the subject is virtually non-existent, while the earliest Indic language records (the Ašoka inscriptions c. 300 BC) are too late to be of any assistance. The only source of information regarding the early Indian chariots is the *Rig Veda*.

Despite being written down at a much later date (probably the 6th century BC), the *Rig Veda* documents a much earlier oral tradition. Written in Sanskrit, an archaic Indic language, close to Old Iranian, the hymns are thought to have been compiled for the first time in northwest India c. 1500 BC[103]. The traditions it records, however, are much older, as will be demonstrated later on.

The *Rig Veda* is a religious text, a compilation of hymns of praise to various gods, and therefore, highly symbolic and riddled with hyperboles. Nonetheless, through its critical analysis, it is possible to piece together a portrait of what an early Indian war-chariot would be, as demonstrated by R. P. Kulkarni.[104]

That chariots were used in battle, it is clearly stated:

"Maghavan, grant us that same car to bring us spoil, thy conquering car in which we joy in shock of fight." (RV I 102.3)

Furthermore, the qualities desired in a chariot also allow us to foresee its use. Although speed is mentioned (RV I 141.8), the main focus seems to be in strength and sturdiness (RV II 94.4: RV III 54.17: RV I.164.13: RV III.53.19: RV VI 54.3: RV I 35.6).

It is possible to reconstruct the Indian chariot with a certain degree of detail. *Swift chariots* (RV I 141.8) had two wheels (RV II 39.3), with a varied number of spokes, usually twelve (RV I 164.11, 48: RV IV 13.15) or five (RV I 164.13). There is no indication regarding the wheel construction method, but there seemed to be an independent nave:

[103] Mallory, p.37
[104] Kulkarni, 1994

"Its axle, heavy-laden, is not heated: the nave from ancient time remains unbroken." (RV I 164.13)

A felly is mentioned (RV I 32.5: I 38.12), and to reinforce the whole structure, a metal tyre was used (RV I 34.2: RV I 88.2: RV I 139.3: RV I.66.10: RV V 52.9)

The axle was attached to the box by an unspecified type of pivot (RV VIII 20.8), and its position, whether beneath the centre of the cab or at its rear, is unknown. It has been argued by Kulkarni[105] that RV III 53.17 shows that the axle was placed beneath the box. However, the passage itself is ambiguous, and does mention oxen, suggesting that it is referring to a vehicle other than a war-chariot, probably a heavy cart.

The nave of the wheels was attached to the axle through the use of lynch-pins (RV I 35.6: RV III 53.17: RV VI 24.35). Regarding whether or not the axle rotated with the wheels, both possibilities seem plausible. In the afore mentioned passage (RV I 164.13), the temperature of the axle (not heated) is related to the overall condition of the nave (unbroken) of the wheel. In this case, one must conclude that the axle is stationary in relation to the wheel. Only then would the heat generated by the friction between the axle and the inner part of the hub damage the nave. If the axle rotated with the wheels, friction, and therefore, heat, would be generated at the point where it would be attached to the box of the car.

However, it is stated that the wheels turn with the axle in the Marut's chariot:

"Rings are upon your shoulders when ye journey forth: your axle turns together both the chariot wheels."(RV I 166.8)

Horses were yoked to a pole perpendicular to the axle (RV I 100.16). The yoke was attached to the pole by means of leather straps (RV X 102.8), or maybe bolts. However, the passage that mentions the use of bolts uniting the pole to the yoke is ambiguous at best, and might instead indicate bolts that would hold the wheels in place in relation to the axle, which would make more sense:

"Hither, as herald to invite the Aśvins, come the great lofty song, most sweet and pleasant!

[105] Kulkarni, 1994, p. 19

Come in one car, joy-givers! to the banquet, like the bolt binding pole and nave, come hither." (RV V 43.8)

Regarding the box of the chariot, little information is given. It was meant to be spacious (RV I 48.10) and "fair of shape" (RV I 49.2). There are indications that it might have been decorated (RV VIII 20.8), but probably only for ceremonial use. The crew would ride standing side to side (RV VI 29.2), although seats are often mentioned. These, however, were probably found in different kinds of vehicles.

How chariots were used in battle is not explained in great detail. However, weapons are mentioned. The main weapons used in chariot warfare in India are the same as used in the Middle East and in the steppe, the spear and the bow:

"Borne on both shoulders, O ye Maruts, are your spears: within your arms is laid your energy and strength.

Bold thoughts are in your heads, your weapons in your cars, all glorious majesty is moulded on your forms." (RV V 57.6)

"So may the Maruts, armed with mighty weapons, rest here on heaven and earth with hearts in concord,

As Gods whose cars have dappled steeds like torrents, destroyers of the foe allies of Mitra.

They hasten on to happy termination their orders when they are made known by glory.

As on a fair bright day the arrow flieth o'er all the barren soil their missiles sparkle." (RV I 186.8-9)

As showed, it is possible to build a reasonably detailed depiction of what an early Indian chariot would be, based on the *Rig Veda*. Despite the lack of information on some areas, most obviously regarding the box, it is possible to conclude that no significant advance was made by Indian chariot makers, in relation to their predecessors. If that would have been the case, mention in the texts would be expected.

Considering India, the introduction of the war chariot is indisputably linked with the Indo-Aryan migration. Therefore, in order to identify the origin of the Indian chariot tradition, one has to take into account the origin of the Indo-Aryan speakers.

The connection between the south Russian steppes and south Central Asia has been established with the appearance of Petrovka pottery at Zeravshan sites, after c.1900 BC. These findings have been interpreted as the first signs of an imminent southwards migration by steppe peoples. Between c.1900 and c.1800 BC, new steppe cultures began to appear in the Zeravshan region. Andronovo populations settled in the Amu Darya delta became irrigation farmers, giving rise to the Tazabagyab variant. This culture produced a distinct pottery, called Incised Coarse Ware (ICW), which became increasingly common in BMAC walled sites, after 1800 BC. This coincides with a drastic reduction in size of the earliest BMAC sites, and with the advent of new post-BMAC fortifications, reminiscent of the earlier Sintashta types, according to Masson[106]. Although with considerable less occupation, BMAC walled sites continued to exist, and traditional Namazga VI type pottery continued to be produced. However, it was slowly replaced with ICW between c.1800 and c.1600 BC. Despite being initially rare, this type of ceramic was widespread[107]. This stage (c.1800 – c.1600 BC) shows a systematic replacement of traditional BMAC cultures by Andronovo – Tazabagyab steppe cultures in the region. This can be explained as the result of migration. After c.1600 BC all great BMAC urban sites are abandoned. The former trading cities of BMAC and northeast Iran are replaced by pastoralist centres, spreading all the way to Baluchistan. In Bactria-Margiana, ICW pottery becomes common[108], and from it new types of ceramic are developed: the grey polished wares of Margiana and the painted wares of Bactria.[109]

After c. 1500 BC it is possible to identify an Old Indic element in Mitanni. In Mitanni treaties (KBo I1 and KBo I 3), oaths are made to the same gods found in the *Rig Veda*: *mi-it-ra* (Mitra), *ú-ru-u̯a-na*[110] or *a-ru-na*[111] (Varuna), *na-ša-at-ti-ia*

[106] Masson, 2002, p. 553
[107] Anthony, 2007, p.452
[108] Parpola, 2004, p.5
[109] Anthony, 2007, p.454
[110] KBo I 1
[111] KBo I 3

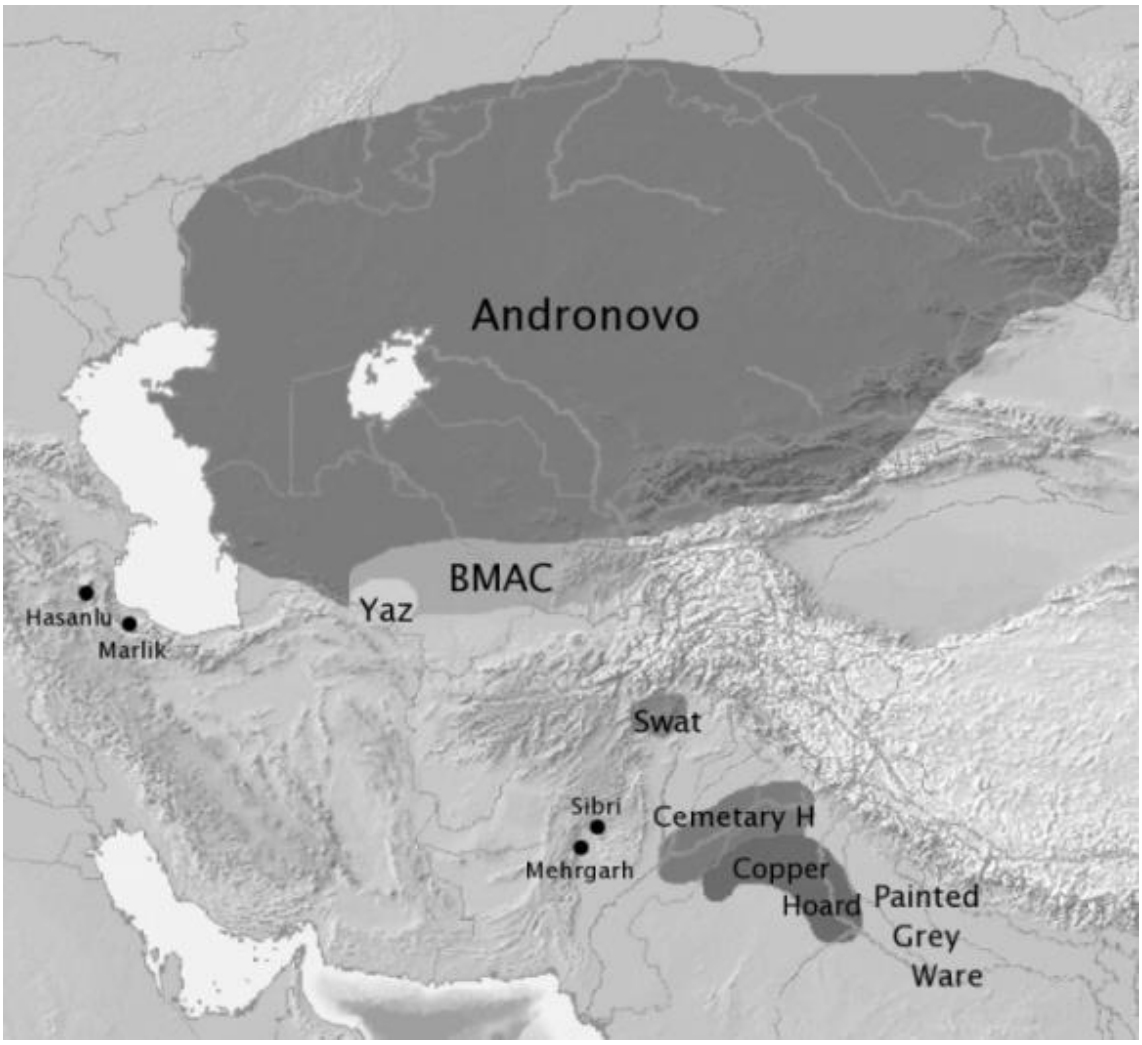
(Nasatya) and *in-dar*[112] or *in-da-ar* [113](Indra)[114]. This demonstrates that the Old Indic element in Mitanni has the same origins as the one later found in the Indian subcontinent. The presence of Indra is of extreme importance, being the most significant deity in the *Rig Veda*, with 25% of the hymns. However, its name is not of Indo-European origin. In fact, in the Iranian tradition, Indra is nothing more than a minor daemon[115]. He was adopted into the Indic *cannon* after the disintegration of Proto-Indo-Aryan, where he absorbed the attributes of the former god of strength and victory, known in Iranian record as Verethraghna. C. Watkins further expands on the connection between the two deities, by outlining their similar roles as dragon slayers in both Iranian and Indic mythological cycles[116]. This allows us to place the division between Iranian and Indic branches before the adoption of Indra by the last.

This demonstrates that, unlike the Iranian branch, the Indic one had extensive contact with non-Indo-European populations early on in its development. The best candidate is the BMAC area, during the early Namazga V period. The Tepe Hissar IIIb horse seal and the BMAC style Tepe Hissar IIIc trumpets indicate a steppe presence as early as c. 2100BC. There is no other reasonable alternative for the origin of the later Mitanni Indic element[117].

In face of these pieces of evidence, D. Anthony suggests that, while both branches had their origins in the Andronovo horizon, the Indo-Aryan branch took shape in the contact area cultures, Andronovo/ Tazabagyab/ ICW, while the Iranian branch developed in the northern cultures of Andronovo/ Srubnaya[118].

There is no consensus regarding the route taken by the Indo-Aryan populations into India. So far, the best candidate seems to be the Swat Valley, north of the Indus, located in the border of modern-day Afghanistan and Pakistan. This is one of the best routes to access both the Indus region, as well as the Ganges Basin. There are good indicators that this might have been the route taken by Indo-Aryan populations into the Indian Subcontinent.

[112] KBo I 1
[113] KBo I 3
[114] Thieme, 1960, p.303
[115] Anthony, 2007, p.454
[116] Watkins, 1995, pp.304-313
[117] Parpola, 2004, p.5
[118] Anthony, 2007, p.454



Map. 4 Archaeological cultures associated with the Indo-Iranian expansion, after *EIEC* p. 310

A significant cultural change can be seen in the region's archaeological record c. 1800 - 1600 BC. The appearance of two new types of burials, flexed inhumation in a sub-pit and cremation burial with face-urns, marks the introduction of a new culture, the Gandhara Grava culture, otherwise known as the Swat culture. This culture displays several indicators of Indo-Aryan origin. Not only are the two new types of burial mentioned in the Rig Veda[119], this is the first culture to have domesticated horses in the modern day northern Pakistan region[120]. Furthermore, despite the large variety of domestic animal remains found in the region, the horse seemed to have had special significance. Several horse trappings were found, as well as two horse burials.

Perhaps more revealing, the advent of the Gandhara Grave culture brought a new type of pottery to the region, a grey ware, of which a large percentage

[119] Mallory, 1989, p. 47
[120] Parpola, 2004, p.4

(approximately 50%) was decorated with incisions[121]. This type of ceramic is reminiscent of late-BMAC pottery, more specifically, late Dzharkutan phase, between 2034 and 1684 BC[122], itself linked to steppe ICW ceramic. There might be a relation between Gandhara Grave culture gray wares and the Indian Gray Ware culture, but no consensus has been reached regarding the subject.

Despite its strong indicators, this hypothesis presents one debatable point, namely chronological discrepancies regarding the arrival of the first nomadic peoples of south Asia to the Swat region. The hypothesis requires the existence of an Indo-Aryan element in BMAC cultures. Some even suggest the existence of an Indo-Aryan superstrate:

"The BMAC pottery is the source of the ceramics of the Gandhāra Grave culture of Swat, which is the first culture of northern Pakistan to have the domesticated horse. This suggests that Proto-Indo-Aryan speakers had become the elite layer of the BMAC culture in southern Central Asia before spreading to the Indian subcontinent"[123]

Regardless of being an elite or not, the existence of an Indo-Aryan element in BMAC sites has been demonstrated. According to Mallory, the first traces of the emergence of Swat culture are dated c. 1800 BC[124]. This, however, poses a significant problem, considering that at the time, the first populations of Andronovo pastoralists were starting to settle in the Zeravshan region. That makes an Indo-Aryan presence in Swat region highly unlikely. Therefore, a later date must be found. Parpola places the beginning of the Ghandara Grave culture at c. 1600 BC, corresponding to the arrival of the Kânvas, with a second phase of occupation dated c. 1300 BC, corresponding to the arrival of the Atris[125]. Even though Parpola dates the extensive spread of ICW in BMAC sites after 1600 BC[126], he admits its presence in BMAC architectural contexts at

[121] Mallory, 1989, p. 47
[122] Parpola, 2004, p. 4
[123] Parpola, 2004, p. 4
[124] Mallory, 1989, p. 47
[125] Parpola, 2005
[126] Parpola dates the spread of ICW in BMAC sites through the dates of findings at major BMAC sites: Auchi, Taip, Togolok-1, Togolok-21 and Gonur. This could explain the late date. As D. Anthony points out "*Fred Hiebert termed this the post-BMAC period* [after 1800 BC] *to emphasize the scale of the change, although occupation continued at many BMAC strongholds and Namazga VI – style pottery still was made inside them. But Andronovo-Tazabagyab coarse incised pottery occurred both within post-BMAC fortifications and in occasional pastoral camps located outside the mudbrick walls."* Anthony, 2007, p.452

a prior date[127]. Furthermore, the Swat region maintains a cultural continuum since c.1600 BC[128] to c. 400 BC (long after an established Indic element in India), thus allowing for slight chronological discrepancy. Therefore, in light of current evidence, Parpola's date seems to be appropriate in relation to the beginning of the Indo-Aryan occupation of the Swat region.

In conclusion, despite some blurry details, it is possible to identify a direct link between steppe cultures and the Indus region, through the archaeological record. However, this connection, by itself, is not enough to identify the beginning of the Indian chariot tradition. Because the exact parameters of the interaction between Indo-Aryan steppe populations and Middle Eastern populations remain unknown, a direct link between either steppe or Middle Eastern chariots and Indian chariots cannot be established by archaeology alone. One must resort to other sources of information.

The *Rig Veda* is filled with allusions to sacrificial and ritual practices. For the most part, such allusions cannot be traced back to earlier cultures. However, there is a small number of practices that can be seen elsewhere, in Sintashta.

Great importance was attributed to the horse in Vedic society. The *aśvamedhá*, the horse-sacrifice, related to strength and kingship, was one of the most important (ŚBM XIII 4.2.22) and complex (TS 7.1-5, VSM 22–25) rituals performed by a king (ŚBM XII 1.6.3). However, in the *Rig Veda* only two hymns pertain to the horse-sacrifice, RV I 162 and RV I 163. Of these, the first is especially relevant, as it details the preparations for the sacrifice:

"Cut ye with skill, so that the parts be flawless, and piece by piece declaring them dissect them." (RV I 162.18

"Let not a greedy clumsy immolator, missing the joints, mangle thy limbs unduly." (RV I 162.20)

In both passages the importance of not damaging the limbs is underlined. Such practice is seen in Sintashta, Potapovka and Filatovka graves. Other aspects of horse-

[127] Parpola 2004, p.4
[128] 1800 BC according to Mallory, 1989, p.47

sacrifice ritual, as seen in Sintasha/Andronovo graves, might be mentioned in the *Rig Veda*[129], although not as clearly as the previously mentioned one.

That which might be the best indicator present in the *Rig Veda* of a connection to Sintashta can be found in RV X.18:

"1. Go hence, O Death, pursue thy special pathway apart from that which Gods are wont to travel.

(...)

4 Here I erect this rampart for the living; let none of these, none other, reach this limit.

May they survive a hundred lengthened autumns, and may they bury Death beneath this mountain.

(...)

11 Heave thyself, Earth, nor press thee downward heavily: afford him easy access, gently tending him.

Cover him, as a mother wraps her skirt about her child, O Earth.

12 Now let the heaving earth be free from motion: yea,—let a thousand clods remain above him.

Be they to him a home distilling fatness, here let them ever be his place of refuge.

13 I stay the earth from thee, while over thee I place this piece of earth. May I be free from injury.

Here let the Fathers keep this pillar firm for thee, and there let Yama make thee an abiding-place." (RV X 18.1-13)

This is a description of a *kurgan* burial, typical of Sintashta culture pit graves, but absent from India. There is a reference to the *kurgan* itself (*bury Death beneath this mountain*), as well as to the subterranean chambers (*let a thousand clods remain above him*), with their support poles (*keep this pillar firm for thee*), shored walls (*I stay the earth from thee*) and timber roof (*Heave thyself, Earth, nor press thee downward heavily: afford him easy access, gently tending him*) (fig.17).

[129] Anthony, 2007, p.409

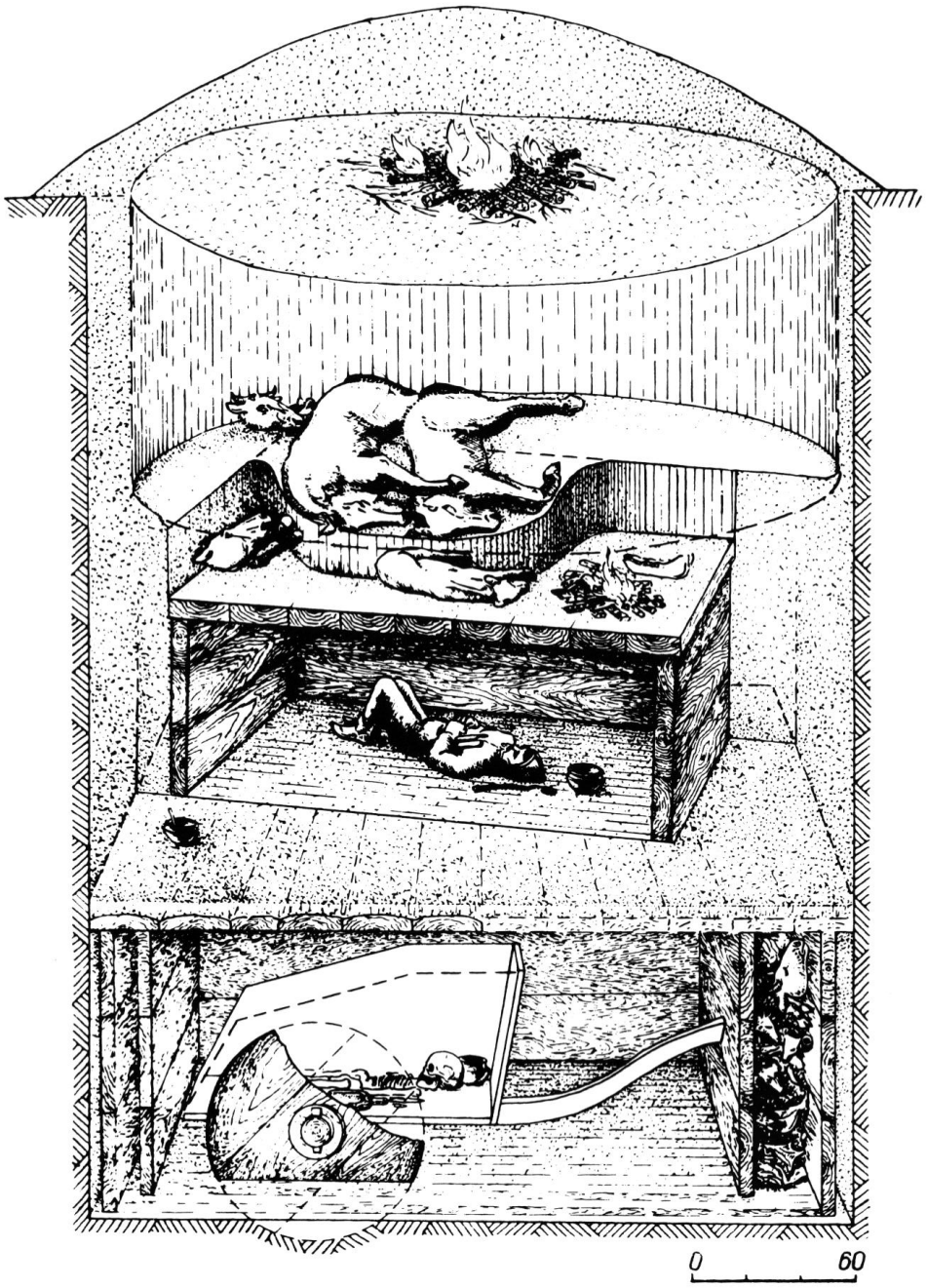


Fig. 17 Reconstruction of the burials 10 and 16 in the area SM south of the Great Kurgan at Sintashta. After Gening et al. 1992: I, 154 fig. 72

However, that which is the best link between the Indo-Aryan cultures of India and the Sintashta steppes is the cult of the Nasatya, also called Asvins. These were twin deities, related to horses, chariotry, healing and the burial of the dead. In the Epic Period, the cult of the Asvins had dwelled until it became part of the cult of Indra. However, traces of their former importance can still be found. The *gharma*, a minor

offering of milk, part of the Soma ritual, was dedicated to these twins. The vessel used in this offering has been connected to the face-urn of Gandhara graves[130].

The Indic Asvins can be related to the Greek *Dioskouroi*, and the Baltic *Dieva deli/Dievo sunaliai*. Furthermore, similar rituals associated with their cult, all of them involving horses and/or chariots can be found in the previous branches. Parpola convincingly argues that these deities represent the deified chariot team[131]. This allows dating the emergence of the chariot related mythos to a time when proto-Aryan speakers, proto-Greek speakers and Proto-Baltic speakers (these to a lesser extent) had regular contact among them. Furthermore, Parpola is able to identify early Aryan loanwords, related to the Asvins cult, in Finno-Ugrian languages[132]. The split between proto-Aryan and proto-Greek occurred c.2800 BC, after the Yamna culture had been replaced west of the Volga by the Catacomb Grave culture (proto-Greek), and east towards the Urals by the Poltavka and Abashevo cultures (proto-Aryan). However, this date is far too early for the initial spread of the Asvins cult in both cultures. Nevertheless, late Catacomb Grave culture is contemporaneous with Abashevo culture until c. 2200 BC., which in turn extended farther north, into central Russia, where it might have had contact with the late proto-Finno-Ugrian Volosovo culture, which would explain the loan words identified by Parpola. So, proto-Greek, proto-Aryan and proto-Finno-Ugrian shared common mythological elements, regarding the Asvins cult, approximately 100 years before the emergence of Sintashta-Arkaim culture further south[133]. Not only is this significant regarding the date and place of origin of the chariot, pointing towards the steppe, it also marks the origin of the Indian chariotry tradition.

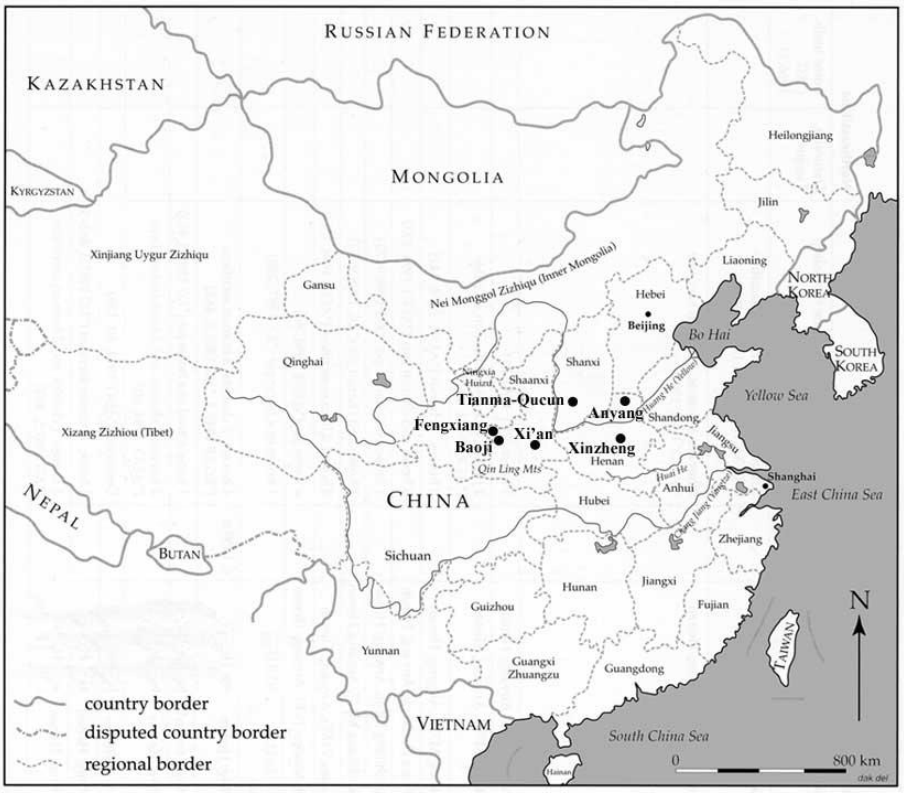
All these evidence together allows us to draw conclusions regarding the arrival of the war chariot in India. The Asvins cult clearly shows a direct link between the earliest Indo-European chariot tradition and that of India. This allows the identification of the Sintashta steppes as the origin of the Indian chariot, which agrees with the conclusions of the previous chapter. Furthermore, such a connection is backed up by archaeological and literary sources. The *Rig Veda* evokes rituals that can be seen in Sintashta graves, and archaeology has shown a possible route linking the southern

[130] Parpola, 2004, p. 4 (note)
[131] Parpola, 2004, p.6
[132] Parpola, 2004, p.38
[133] Parpola, 2004, p.3

Uralian steppes to the Indus region. Therefore, there is no reason to assume that the chariot might have arrived in the Indian Subcontinent by any other means. The information we have regarding the early Indian chariots, taken from the *Rig Veda*, does not suggest otherwise, albeit being somewhat fragmented and lacking in detail.

III. China

The oldest war-chariots found in China date back to the late Shang dynasty, c.1200 – 1045 BC, found at the capital city of Anyang. The earliest examples of chariot burials do not allow for significant conclusions regarding their basic design, since all that remained of the actual chariots was the bronze fitting, with mud imprints, made by the rotting wood (in similar fashion to the Sintashta wheel imprints), showing its basic form. However, unlike elsewhere, chariot burials are common in China (map.3).



Map. 5 Chariot Burials in China after Levine, M. A., *Chinese Chariot Horses and the Evolution of Horse Husbandry*
http://www.arch.cam.ac.uk/~ml12/ChinPalaeoWebsite/examples.htm (September 2010)

Furthermore, Chinese chariot design has maintained a remarkable stability over time. There were no significant changes since its first appearance and the 3rd century BC[134]. This means that it is possible to analyse the earliest types of Chinese chariot by later examples. So, it is possible to have a considerably detailed idea of the structure of a Shang Chinese chariot.

[134] Lu Liancheng, 1993

Chinese chariots were significantly larger than Middle Eastern ones. The wheels averaged 124 to 140 cm in diameter, with the felloes made by multiple sections of bent wood, united by bronze clasps. These clasps show that the outer surface of the rim of the wheel was narrower than the inner one, thus making the mortising of the spokes more robust. These were mortised into an inner nave, which, in a similar fashion to the rim, had an enlarged section, 20-30 cm, where the spokes were mortised, thus providing added reliability to the wheel. Early wheels usually had 18 spokes, but in later times (Zhou and Spring and Autumn period) this number varied between 18 and 28. Gauge distance varied between 215 and 240 cm, and the wheels were held in place through the use of lynchpins.

The axle average was 300 cm long, and remained fixed beneath the box. Perpendicular to the axle was the draught pole, extending all the way to the rear of the cab. The draught pole average was 300 cm, with the front end curved upward. Attached to it by means of a leather thong is a 110 cm to 140 cm long yoke

Usually, the box of the car had a rectangular shape (although oval and circular boxes have been found), with a height of 35 cm, and had either an open railing or was covered with wooden boards. It rested on a frame made by four pieces of wood, fixed on the draught pole and on axle-pads. The boxes had a small opening in the back, c. 30 - 40 cm wide, for access.

The entire structure was reinforced with bronze at critical points[135].

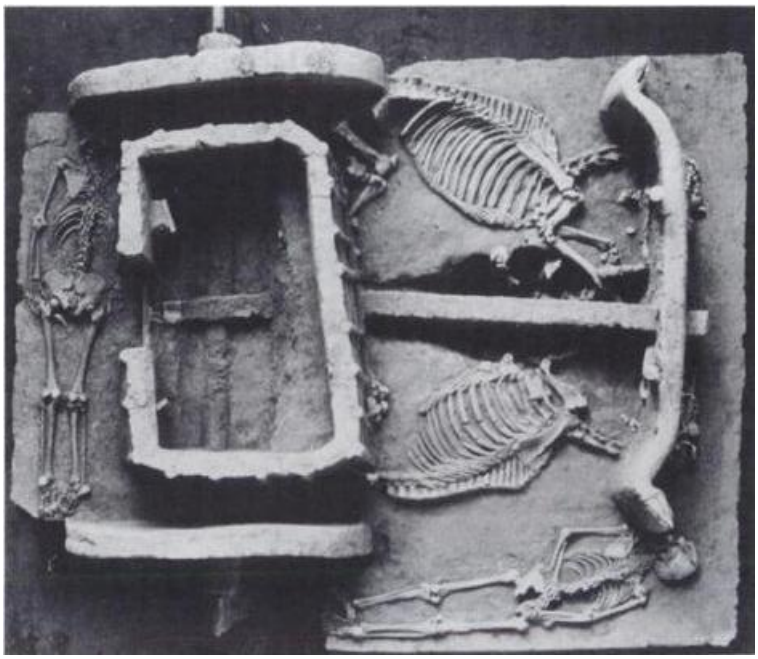


Fig. 18 Chariot burial Guojiazhuang M52, Anyang. Yinxu 4, 11th century BC after Loewe et al., 1999, fig. 3.26

[135] Lu Liancheng, 1993

As it can be seen from the above description, the Chinese chariot is similar to the Eurasian ones. The absence of any sort of previous-wheeled vehicle suggests that the chariot appeared in China in its final form. The only way that could have happen is if it was introduced by a foreign element. That seemed to have been the case. Pulleybank[136] identifies two key foreign elements that can be identified in China prior to the first known chariots, and clearly demonstrate western[137] influence.

Shang bronzes are famous for their complexity and artistic value. Erlitou ones, although much simpler, are of no less importance. The significant aspect of the Erlitou bronzes is the absence of any evidence regarding experimentation. Although somewhat crude, they are "deliberate copper alloys"[138], which is atypical. Experimentation with copper, arsenic bronze (as in the Eurasian steppes), and copper ore with a natural high rate of tin were to be expected. This suggests that metallurgy was introduced in China in an already-advanced state, rather than being a local development, as it might have been suggested by a serious of particulars of Chinese bronze casting methods (absence of forging and lost-wax casting).

Therefore, it is necessary to identify potential cultures, with advanced metallurgical techniques, that might have had either direct or indirect contact with the Chinese periphery, while simultaneously displaying indicators of western connection.

A culture showing both western elements and a close proximity to Erlitou is the Longshan-Era Kexingzhuang II culture[139], located around Xi'an. The presence of domesticated cattle, an element to some extent alien in Chinese contexts[140], suggests nomadic, and therefore western, influence. However, the most important element in Kexingzhuang II culture is its overlapping with Qijia culture in east Gansu. Qijia, despite being fundamentally agricultural, had a significant pastoralist component, with domesticated sheep, cattle, but more importantly, horses[141]. Furthermore, it produced small copper and bronze objects of local origin. This could be one possible source for the introduction of advanced metallurgical techniques in China. Despite being impossible to unequivocally link this culture to the Eurasian steppes, the presence of

[136] Pulleybank, 1998
[137] "Western" should be understood as pertaining to a cardinal direction, rather than synonymous with "European" or "Eurasian". In this context, it refers to any region west of Shang.
[138] Pulleybank, 1998, p.23
[139] Fizgerald-Huber, 1996, p.17-67
[140] Pulleybank, 1998, p.31
[141] Rowan K. Flad, Yuan Jing, and Li Shuicheng, 2007, p. 181

domesticated horses suggests a connection. The existence of far-reaching Eurasian steppe cultures makes this a strong possibility. The graves of the Afanasievo culture, east of the Urals, show great similarities with the successive Sredny Stog, Yamna and both Catacomb and Poltavka cultures' graves, and extends east as far as northern Xinjiang[142]. There is no reason to assume that contact between both regions would not have occurred.

It should be noted that the beginning of the Bronze Age in China brought with it drastic changes. The relatively harmonious Neolithic populations soon began to bid for territorial dominion. The introduction of metallurgy could have been one of the motives that triggered such reaction.

Alongside metallurgy, Pulleybank identifies wheat as a key factor proving the presence of western influence in the formative stages of the Chinese Bronze Age civilization. Wheat was first cultivated in West Asia, where it originated. In China, different varieties of millet seemed to have been the most important cereal production.

No evidence of wheat was found at Shang or Zhou sites. However, it is mentioned in the oracular bone inscriptions, showing that it was known at the time. So far, it is impossible to advance any date regarding the introduction of wheat in China. Nevertheless, Pulleybank, through graphic analysis of the relevant graph, has convincingly demonstrated that knowledge of wheat pre dates the invention of the Chinese script, and therefore, clearly demonstrates foreign elements at the early stages of Chinese civilization.

The pictogram for "wheat" contains the pictogram for "come", because of the phonetic similarities between the two. Because the original pictogram clearly resembles a cereal crop, the graph for "wheat" was later attributed to "come". This can be explained by the abstract nature of "come". Wheat is a tangible concept, and therefore easier to represent with a pictogram. "Come", on the other hand, is an abstract concept, making it harder to represent. Considering the original phonetic similarities, demonstrated by Pulleybank[143], between the two, the tangible pictogram was attributed to both concepts. A semantic determinative was attributed to the pictogram to allow distinction between the two. Being "come" a much more common word, the pictogram "wheat" became slightly more complex. This process shows that when the script was

[142] *EIEC s.v* Afanasevo Culture
[143] Pulleybank, 1998, p. 26

being developed, there was knowledge of wheat in China, thus proving the existence of a western element.

This influx of new products and new technology gave western states significant advantages over their easternmost neighbours. The introduction of bronze working technology from the northwest into Shang led to the development of more advanced weapons, such as the characteristic bronze axes, which in turn led to the overpowering of the Xia. This process repeated itself throughout early Chinese history, and probably occurred with the war chariot. While the Shang had chariots, their armies' elite troops remained the infantry. The Zhou, however, made ample use of the new vehicle, which in turn greatly facilitated the Shang's downfall. Shang's western frontier was regularly raided by nomadic peoples to whom the Chinese called the *ma* "horse"[144]. It is possible that these peoples were responsible for the introduction of the chariot into Shang China, in a similar fashion as the Xiongnu, who later became responsible for the introduction of cavalry in Han China. It is relevant that every new dynasty originated west of the previous one, clearly illustrating the afore mentioned process.

Both wheat and bronze can be seen as proof of western influence in ancient China. However, neither proves a connection between the Eurasian steppes and China. Metallurgy could have been independently developed by any of the numerous central Asian steppe populations, and while wheat cultivation certainly had its origin in West Asia, it is impossible to know how it reached China. However, in the case of the war chariot, that connection can be established.

Considering the similarity between Chinese chariots and West Asian ones, particularly those found at Lchashen, modern day Armenia, dated c. 1500 BC, it is difficult not to consider a possible connection (fig.19). That such a complex device could be independently developed in identical fashion in such distant locations is highly improbable. However, this alone is not enough to prove a connection. Further evidence is required.

[144] Shaughnessy, 1988

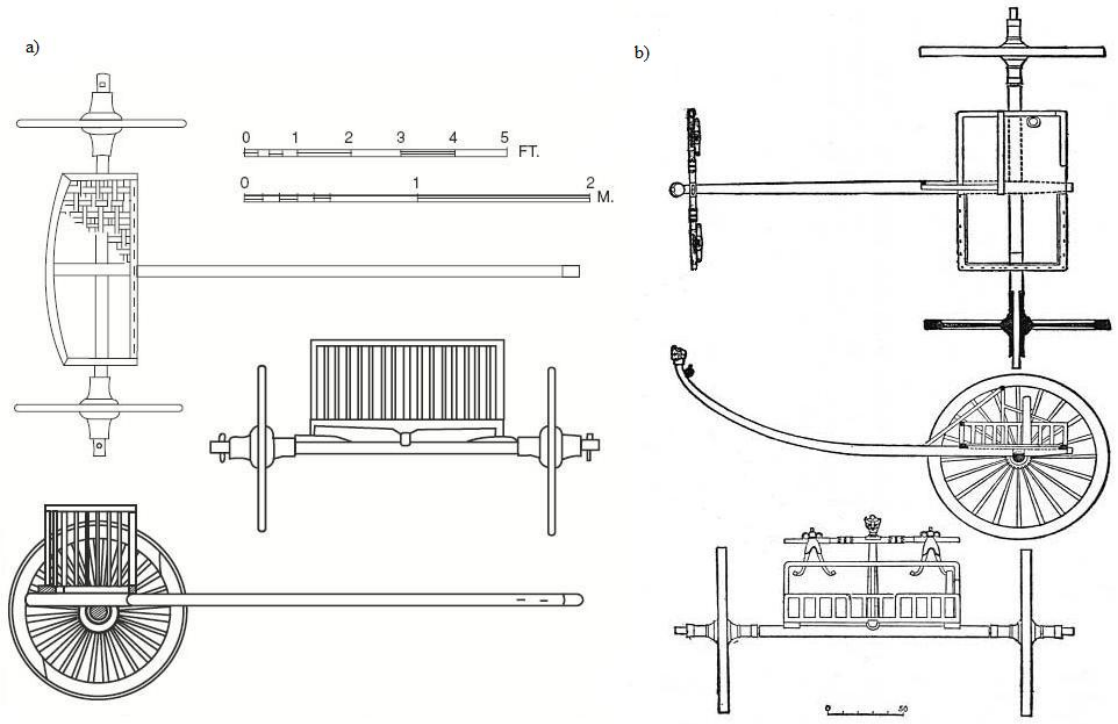


Fig. 19 a) Chariot from barrow 11, Lchashen c. 1500BC. Courtesy of History Museum of Armenia, after Piggott, 1974, fig. 1
b) Chariot from Rujiazhuang Western Zhou c. 1045 - 771 BC, after Lu Liancheng, 1993, fig.5 (adapted)

Rock carvings depicting chariots can be found throughout all of Asia, from Transcaucasia to the Southern Gobi. These petroglyphs show the eastward advancement of the light chariot.

A great number of rock carvings depicting both men and animals were found in modern day Armenia. Of these, there is a small number portraying vehicles, mainly four-wheel cars, but also two-wheel chariots. Although the carvings, as a whole, range from the 5th to the 2nd millennium BC, all of the chariot petroglyphs were dated to the end of the period.

Another region where chariot rock carvings were found is Kojbagar, in Kazakhstan. There, again amongst representations of men and animals, chariot petroglyphs were found and dated from the end of the 2nd millennium to the start of the 1st millennium BC.

Perhaps less significantly, rock carvings, amongst which chariot petroglyphs, were discovered in Alichur range in Tadzhikistan, dating from the 2nd to the 1st millennium BC. However, the chariot carvings themselves were never dated.

In Outer Mongolia several sites containing relevant rock carvings were found, with the better studied ones being Jamani Us and Kobdo Somon. At the Jamani Us gorge, four chariot petroglyphs were dated to the early 1st millennium BC (and were accompanied by two more, dated to the 2nd century BC to the 2nd century AD). At Kobdo Somon, amongst other rock carvings, one that might depict two chariots was found. However, the petroglyph is ambiguous, and whether it represents a four-wheel car or two two-wheel chariots depends mainly on personal interpretation[145].

In the face of such evidence, one might be tempted to highlight the apparent west to east diffusion perceptible in the findings' chronological sequence. However, rock art is impossible to date accurately, and so far, it has not been possible to link any of these findings to an archaeological context. Furthermore, the crude and schematic nature of the rock carvings does not allow for any conclusions based on their design. However, it is possible to draw conclusions based on the remarkable stability of the stylistic conventions of these representations (fig. 20a).

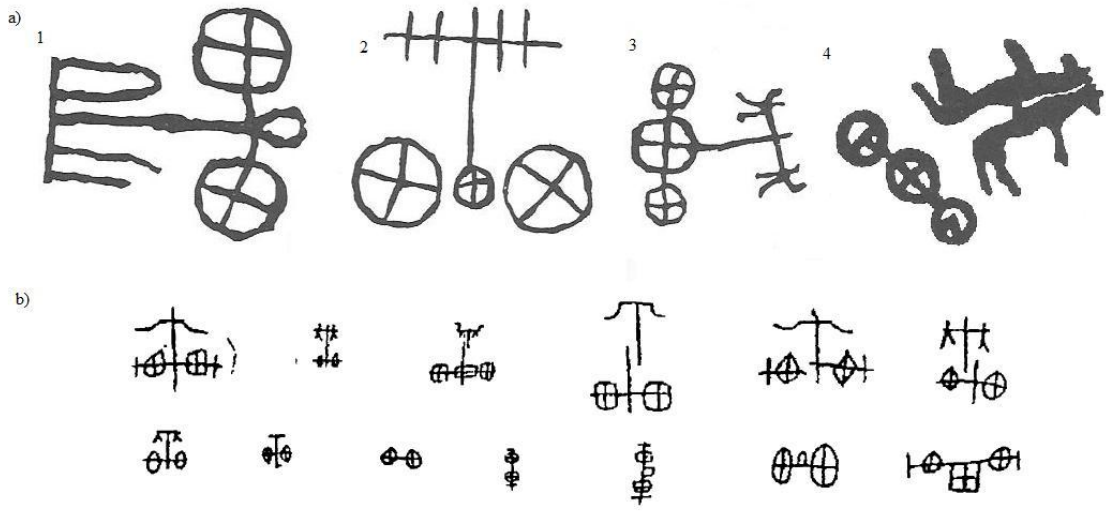


Fig. 20 a) Chariot petroglyphs 1 & 2 - Syunik, Armenia; 3 - Karatau, Kazakhstan; 4 - Jamani Us, Mongolia; after Littauer, 1977, fig 2, 3, 10, 19 (adapted)
b) Variations on the oracle-bone form of the graph *che,* after Shaughnessy, 1988, fig. 4

This similarity between chariot petroglyphs from different locations is particularly relevant when compared with the oracular-bone form of the graph for chariot (fig.20b). The Chinese continued a long tradition of depicting chariots, a tradition that originated in Eurasia. The best explanation for the phenomenon is that when the Shang adopted the technology, they adopted the traditional representation

[145] Littauer, 1977, p.243

conventions that came with it. While this proves a connection between West Asia and China, it does not provide any insight on how that exchange happened.

Everywhere else the introduction of the war chariot seemed to be linked, whether directly or indirectly, with Indo-European populations. Therefore, there is the temptation to make a similar assumption in the case of China. However, caution is advised.

The conventional wisdom states that the war-chariot was introduced in China by Indo-European speaking Tocharians. The discovery of "europoid" mummies as far east as the Tarim Basin, in Xinjiang, led most scholars to the conclusion that these were the remains of Indo-European speakers. Since the Tocharian is the only Indo-European language attested in the region, albeit at a much later date, it became natural that these mummies became associated with it, and therefore be considered early speakers of proto-Tocharian. Furthermore, the mummies can be dated back to the beginning of the 2nd millennium BC, thus placing them in the appropriate time frame for the introduction of the chariot in China. That could be the case, but critical analysis is required before drawing any conclusions.

When considering the Bronze Age archaeology of the Tarim Basin, two particular cultures stand out, the Gumugou culture (c.2000 – 1500 BC) and the Xintala culture. The first shows similarities with Afanasievo culture, mainly in its distinctive graves. However, the presence of bactrian camels (*Camelus bactrianus*) instead of horses and the lack of pottery make this connection thin at best. The second shows remarkable similarities with Andronovo type cultures, mainly in regard to metallurgical practices. Xintala metal artefacts reveal an unprecedented mastery of metal work in the region, and are similar in form to the ones found in Andronovo culture sites, itself notable for its metallurgical practices[146]. While these similarities certainly raise the possibility of a connection between the region and the Eurasian steppes, they alone cannot prove it.

However, there is at least one generally accepted proof of Indo-European influence on the Chinese language, the word for honey:[147]

Chin. *mì* "honey" < EC *mjit* < OC **mɟɪt/* mɪt*
Toch. B *mit* "honey" < PToch. **m'ət* < PIE **med^{h}u-*.

[146] Thorton et al, 2004, p. 85-86
[147] Lubotsky, 1998, p. 379

It is possible to identify a linguistic connection between Tocharian and Chinese. A. Lubotsky has identified several Indo-European loanwords in Old Chinese pertaining to chariots and chariotry, and raises the possibility of several others[148]. Despite most experts[149] being considerably more conservative in their estimate of possible loan words, there is a strong indication to the existence of a cluster of Tocharian loanwords in Old Chinese pertaining to chariot technology.

It must be noted that this does not automatically translate as a direct connection between both populations. In fact, the best explanation for these exchanges is the existence of intermediary peoples. It is reasonable to accept that the chariot was introduced in central Asia by populations who had significant contact with the Eurasian steppes or the BMAC region[150]. However, the technology could have travelled east until it reached China through cultural diffusion, rather than through an actual movement of peoples. There is no evidence that supports such a notion. The possibility of cultural diffusion is significantly more probable. A similar process can explain the eventual Tocharian loanwords found in Old Chinese. As the new technology is adopted by different populations, its particular vocabulary is adopted as well. Metallurgy offers a precedent for such process, backed up by archaeological evidence.

[148] Lubotsky, 1998, p. 382 - 385
[149] Pulleybank, 1998; Thorton et al., 2004
[150] Thorton, 2004, p.84

Conclusion

The subject of the origin of the war chariot is generally approached in a regional basis. Depending on the thesis, efforts are made to prove that its origins lie in a specific location, while discarding all others. While this has produced ample and in-depth evidence regarding the subject, the lack of a trans-regional approach has hampered the efforts to build a more encompassing understanding of said evidence.

The earliest indicator of the existence of the war chariot was found in the steppes of southern Urals and northern Kazakhstan, in the Sintashta region. These consist in imprints left in the soil while the spoked wheels rot away. Found in burial contexts, the graves also contained horse remains and weapons, a clear indicator of martial significance. This is of significance because spoked wheels are a fundamental element of the war chariot, along with the horse. However, the lack of detailed information on the superstructure of said chariots coupled with design limitations that could jeopardize its effectiveness as a war machine, do not allow for any conclusions.

Unlike the steppe, ample evidence regarding the designs of war chariots can be found in West Asia, from large numbers of depictions to some well preserved exemplars from Egypt, dated after c. 1500 BC. This allows for a much more detailed knowledge of the design and building methods of the chariots used in Egypt and the Near East. Therefore, it is possible to identify two different types of chariots in West Asia. The first one, the light rail chariot, used mainly in Egypt and Near East, is a fast moving vehicle, whose focus is on speed and manoeuvrability rather than strength. Because it was used as a firing platform, it displayed specific adaptations for that purpose, designed to increase its stability, and, as far as it is possible to ascertain, found nowhere else. Made of bentwood, this car seems to have its origins in previous near eastern designs. The first stages of its development can be found in northern Iran, c. 2100 BC, in the cross-bar wheel car. However, this particular wheel type was later replaced by spoked wheels, a foreign design. Despite being impossible to draw any conclusion regarding how the Sintashta wheels were made, slightly later models were found in Slovakia and Anatolia showing a design similar to the Egyptian one. Because the Sintashta wheels are much older than the known Egyptian one, it stands to reason that this design originated in the steppe. Therefore, it is possible to conclude that the

light rail west Asian chariot results from the application of steppe technology to an independent near Eastern design.

The second type of war chariot found in West Asia, more specifically in Anatolia, is the so called Hittite Chariot (or the Anatolian Type Chariot). Unlike its Egyptian and near Eastern counterpart, this chariot was not used as a firing platform, but as a close-quarter combat vehicle. Therefore, it was focused on strength rather than manoeuvrability. Weapons found at Sintashta chariot burials, as well as its wheel and axle designs, suggest that these vehicles were used in similar fashion as the Anatolian ones. Not only does this explain the perceived design flaws found in steppe chariot that would render them improper to be used as firing platforms, it also raises the possibility that these two vehicles either share a common origin or that one originated in the other.

While charioty flourished in West Asia, the conditions for its development in the Eurasian steppes are often questioned. However, climate changes in the Uralian steppes after c. 2500 BC led groups of nomadic peoples to settle near critical resources, in order to secure them for themselves. In turn, this restriction led to a state of endemic warfare, with a proliferation of fortified settlements. Furthermore, contact with South Central Asia urban complexes opened the southern steppes to long-range metal trade, thus generating a steady influx of wealth to the region. The combination of these two factors, endemic warfare and abundance of wealth, led to the appearance of a military elite that could afford to maintain the expensive draught teams, the chariots, and its respective crews. Therefore, military, economic and social conditions for the development of the war chariot were gathered at the Sintashta steppes c. 2000 BC.

The earliest case study for large-scale horse domestication is the Botai settlement, located in the northern Kazakhstan steppes, dating after c.3800 BC. However, there are indicators that suggest that large scale horse domestication existed earlier. On the other hand, the horse was introduced in the Middle East much earlier than previously thought, maybe as early as 2700 BC. However, it only became common in the region after c. 2000 BC, and by all accounts, while widespread by the 18th century BC, it had not yet been used in military contexts. Considering that the war chariot was developed to harness the horse's full potential, it stands to reason that the earliest the domestication, the earliest the beginning of the development of the new vehicle, as long as all conditions are gathered.

In conclusion, the conditions required for the development of the war chariot were gathered in the Sintashta steppes earlier than in West Asia. Considering the lack of

detailed information regarding the early steppe chariots, it is not possible to claim that the origin of the chariot lies in southern Uralian steppes. However, considering all evidence, it can be said with a considerable degree of certainty that the earliest key developments, and therefore the origin, of the light chariot took place in the Eurasian steppes, even if it later received considerable modifications originated in other regions.

Considering India, the greatest obstacle to the study of the war chariot is the lack of archaeological evidence. Therefore, one must resort to indirect sources, namely the Rig Veda, in order to build an image of how an early Indian chariot would be. This means that the information in vague, indirect, and often fragmented, meaning that a direct comparison between these vehicles and previous types is impossible. While the information given in the Rig Veda does allow for the conclusion that the Indian chariot was fundamentally similar to its previous designs, it is impossible to ascertain whether its affinity lies closer to its west Asian counterpart, or with its steppe counterpart. Whatever the case might be, religious traditions associated with chariotry can be traced back to the Sintashta steppes, proving a connection between both regions. Nevertheless, the presence of a strong Indic element in 15th century BC Mitanni proves the existence of close connections between Indic speaking peoples and middle and near Eastern ones. The importance given to archery, often in close relation to chariots, in India's epics, Mahabharata and Ramayana, suggests that Indic peoples adopted some of the west Asian chariotry practices. In that sense, India's chariot tradition can be understood as a combination between near Eastern and Eurasian chariotry traditions.

Unlike India, China has produced ample archaeological evidence of war chariots, which in turn allowed for a detailed comparison between these vehicles and the ones found in Eurasia. With the exception of the upward bent draught pole, the Shang chariots are in every way similar the 15th century BC Armenian chariots found at Lchashen. The close similarity between the two suggests a common origin. The influence of western cultures in the formative stages of the Chinese civilization can be seen in the introduction of new technology (i.e. bronze working) and of new products (i.e. wheat). Therefore, it is safe to assume that a similar process has occurred with the war chariot. In fact, the adoption of western military technology is a constant practice in China's early history, from the Shang to the Han. The stylistic consistency of rock carvings depicting light chariots found throughout all of Asia, from Armenia and Kazakhstan to the borders of China, and the similarity between these petroglyphs and the oracle-bone form of the Chinese graph for chariot "*che*", suggest the existence of a

unified chariotry tradition, from Eurasia, through Central Asia, and into China. Indo-European loan words concerning chariots and chariotry can be found in early Chinese, which in turn suggest that to an extent, Indo-European speakers were responsible for the diffusion of the war chariot into Central Asia. However, direct contact between Chinese and Indo-European peoples is highly unlikely. A simpler and more probable explanation is that the technology, as well as its specific vocabulary, was adopted by central Asian peoples, until it eventually reached China.

In conclusion, while the origins of the war chariot can be traced back to a limited geographical area, its effectiveness as a war machine led to an unprecedented spread throughout all of Asia, whether through migration or cultural diffusion. Instrumental to its success was the high mobility of steppe peoples. While at first sight the extent of the Asian steppes seems an overwhelming obstacle, it was in fact a privileged channel for cultural diffusion. However, the success of the light war chariot meant that it overcame the steppe frontier, being adopted, and later adapted, by the urban civilizations of West Asia, India and China. It is truly remarkable that an object so closely associated with steppe culture and nomadism became the prime symbol of the might of the greatest urban empires of the Bronze Age.

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