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NETHERLANDS-FLEMISH INSTITUTE IN CAIRO



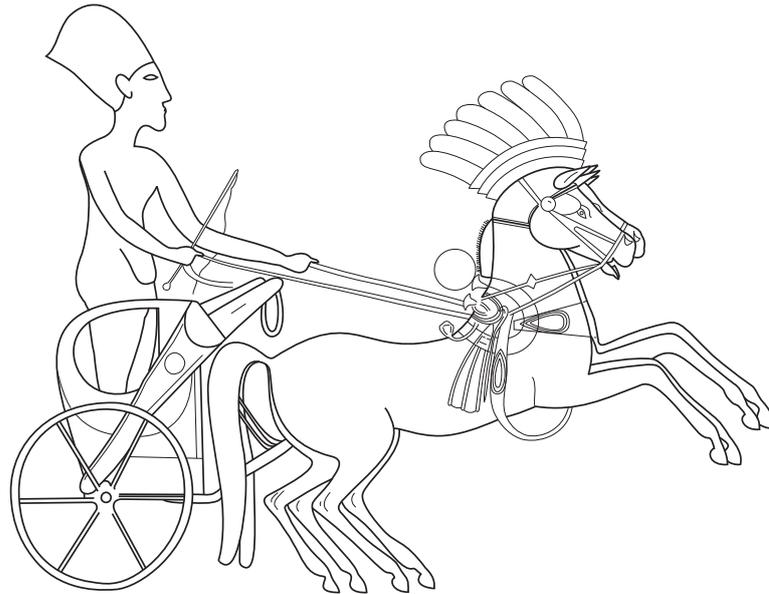
THE AMERICAN  
UNIVERSITY IN CAIRO



## FIRST INTERNATIONAL CHARIOT CONFERENCE

SCHEDULE AND ABSTRACTS

30 NOVEMBER, 1 & 2 DECEMBER 2012



Friday, 30 November	16.00 - 18.30	Registration at Netherlands-Flemish Institute in Cairo (NVIC) 1, Dr. Mahmoud Azmi Street, Zamalek.
	19.00	Key-note lecture by <i>Prof. Dr. Joost Crouwel</i> (Professor Emeritus of Aegean Archaeology at the University of Amsterdam): Studying the Six Chariots from the Tomb of Tutankhamun.
Saturday, 1 December	08.30	Registration
	09.00	Welcome
	09.30	<i>Salima Ikram</i> : The 'Tano' Chariot and the Egyptian Museum Chariot Project.
	10.00	<i>André J. Veldmeijer</i> : The 'Tano' Chariot: The Near Complete Leatherwork from an Ancient Egyptian Chariot.
	10.30	<i>Lucy Skinner</i> : Conservation of an Ancient Egyptian Chariot Cover: Its Secrets Revealed.
	11.00	Break
	11.30	<i>Edgar B. Pusch</i> : Qantir/Pi-Ramesse "... Headquarters of Thy Chariotry ...".
	12.00	<i>Silvia Prell</i> : The Workshops of the Chariotry of Qantir-Piramesse.
	12.30	<i>Bela Sandor</i> : Chariots' Inner Dynamics: Springs and Rotational Inertias.
	13.00	Lunch
	14.30	<i>Heidi Köpp</i> : The Chariot as a Mode of Locomotion in Civil Contexts.
	15.00	<i>Hermann Genz</i> : The Introduction of the Light, Horse-Drawn Chariot and the Role of Archery in the Near East. At the Transition from the Middle to the Late Bronze Ages: Is there a Connection?
	15.30	<i>Samantha L. Cook</i> : Cultural Implications of the Chariot and Composite Bow in New Kingdom Egypt.
	16.00	Break
	16.30	<i>Arianna Sacco</i> : The Depiction of Chariots on Wall Reliefs in New Kingdom Egypt and Neo-Assyrian Empire.
	17.00	<i>Lisa Sabbahy</i> : Gendering Chariot Use in New Kingdom Egypt.
	Sunday, 2 December	09.00
09.30		<i>Edwin C. Brock</i> : A Possible Chariot Canopy for Tutankhamun.
10.00		<i>Yukiko Sasada</i> : An Alternative Theory for 'Bit-Wear' found on the Second Premolar Teeth of the Buhen Horse.
10.30		<i>Fernando Quesada-Sanz</i> : Physical Limits of Horses and Men and the Military Employment of Light Chariots in the Near Eastern Late Bronze Age.
11.00		Break
11.30		<i>Roberto Díaz Hernández</i> : The Role of the War Chariot in the Formation of the Egyptian Empire in the Early 18th Dynasty.
12.00		<i>Colleen Manassa</i> : The Chariot that Plunders Foreign Lands: Paronomasia and Chariots in New Kingdom Literature.
12.30		<i>Ole Herslund</i> : Chariots in the Daily Life of New Kingdom Egypt.
13.00		<i>Mohamed Raafat Abbas</i> : The Diplomatic Role of the Charioteers in the Ramesside Period.

- 13.30 Lunch
- 15.00 *Anthony Spalinger*: Egyptian Chariots: Departing for War.
- 15.30 *Ian Shaw*: Ballistic Missiles and Electric Cars: The Differing Aims and Trajectories of Egyptian and Syro-Hittite Chariots.
- 16.00 Discussion
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- 18.30 Reception at the Netherlands-Flemish Institute in Cairo.

## Studying the Six Chariots from the Tomb of Tutankhamun

*Joost Crouwel*

It was only in 1985 that (the late) Mary Littauer and I published this unique group of actual vehicles from a single, well documented context: 'Chariots and Related Equipment from the Tomb of Tut'ankhamun' (Tut'ankhamun Tomb Series Vol. 9, Griffith Institute, Oxford).

In this lecture I will tell the story of our study of the chariots in the Egyptian Museum in Cairo in 1973. I will also review recent work on the chariots, their remarkably sophisticated construction and their use. In doing so, particular attention will be paid to the practical experiments that were conducted by (the late) Jean Spruytte. In addition, the question of the origin of such spoke-wheeled, horse-drawn vehicles in Egypt will be addressed, in the light of the discovery of an actual wheel at Lidar in south-eastern Turkey.

## The 'Tano' Chariot and the Egyptian Museum Chariot Project

*Salima Ikram*

The Egyptian Museum Chariot Project (EMCP) grew out of the Ancient Egyptian Leatherwork Project (EMCP) when Dr. Veldmeijer and the author of this paper found an assemblage of leather and horse harnessing that were all derived from a single chariot held in the collections of the Egyptian Museum in Cairo. They had entered the museum in 1932 and had been acquired from the well-known dealers, the Tano family. This assemblage, dating to the New Kingdom, has since been the focus of study for the EMCP. This paper will outline the methodology that the EMCP has followed and some of the results of our investigation.

## The 'Tano' Chariot: The Near Complete Leatherwork from an Ancient Egyptian Chariot

*André J. Veldmeijer*

The re-discovery in the storerooms of the Cairo Museum of the near-complete leatherwork of a chariot turned out to be an unprecedented find,

especially for a leather specialist. Purchased from the well-known antiquity dealer, Georges Tano, it entered the collections of the museum in 1932. Despite the good preservation for organic remains in Egypt, particularly from the south, finding the leatherwork from a chariot is extremely unusual. Only eight more or less complete examples of chariot are known, as well as several bits and pieces, distributed among several collections, but none with any substantial amount of leather.

Besides the importance for chariotry and related topics, the leather treasure trove offers enormous possibilities in studying the leather industry from various points of view, including technological developments in leather production and the organisation of the industry. But besides this, the leather shows clear evidence of been used (features that are apparently lacking in the known chariots, although it is somewhat debatable). The severe wear might offer an explanation, paradoxically, for finding the leather.

This paper will also presents the preliminary results of the comparison of the technology as well as decoration, leading to a possible date of the chariot.

## Conservation of an Ancient Egyptian Chariot Cover: Its Secrets Revealed

*Lucy Skinner*

During 2008 a collection of leather fragments were 'rediscovered' in a storeroom in the Egyptian Museum in Cairo, wrapped within a series of brown paper and cardboard folders. Numbering nearly three hundred pieces, varying in size from less than a centimetre, up to fifty centimetres, diagnostic sections have identified the leather as being from the dismantled covering and fittings of a chariot probably dating to the 18th or 19th Dynasty. The fragmentary and distorted appearance and great fragility of the leather precluded rapid or detailed study of the complete assemblage.

This paper will present the conservation and investigation which is being carried out on the chariot leather since October 2011 in the Egyptian Museum. Preliminary work has involved testing methodology and carrying out basic analysis to determine the level of the skin deterioration and establish a treatment protocol. Conservation is ongoing and thus far has en-

tailed rehousing the artefact in a more suitable environment; consolidation of pieces too fragile to handle; unfolding of some heavily distorted pieces; and rejoining and support of split and detached areas. Work is slow and the desiccated skin is proving to be extremely challenging material to conserve due to its inherent instability and the risk of causing irreversible damage through unsuitable treatment. The problems encountered in the conservation process will be discussed as well as solutions found.

In addition to stabilizing the skin fragments so that they are in a fit state to be drawn and studied, the conservation process in itself has revealed some interesting information about this particular chariot construction which will also be presented in this paper.

### **Qantir/Pi-Ramesse "... Headquarters of Thy Chariotry..."**

*Edgar B. Pusch*

Findings and finds made between 1980 and 1998 give sufficient evidence of chariotry and adjoined stables dating to the Ramesside Period, functioning through the reigns of Ramses II until Seth-nakht. Three major architectural entities are present: horse stables (site Q IV), training and exercising yard (site Q I) and an armoury with multifunctional workshops (site Q I, see contribution by Silvia Prell).

The architectural units and their content will be presented and set into the context of Egypt's international relationship to its northern neighbours. The finds – solely of non-organic raw materials namely stone, metal and bone – comprising yoke saddle- and yoke-finials, horse bits, linch pins, a unique bronze naval cap and other chariot and horse related objects are shown in their variety, context and function.

It is suggested that foreign and Egyptian 'specialists' covering different areas of knowledge were working side by side.

### **The Workshops of the Chariotry of Qantir-Piramesse**

*Silvia Prell*

The excavations carried out between 1980-1987 by the Hildesheim Mission in Site Q I allowed

a unique insight into the working life in the residence of Ramesses the Great at Qantir-Piramesse.

After the abandonment of an earlier foundry, a court of considerable size was established in its location. This court can be identified as belonging to the chariotry due to the presence of chariot pieces made of stone and bronze. Associated workshops, formerly connected to the foundry, remained in place and now supplied the garrison.

The majority of the tools found in the workshops are different implements made of stone. Four main groups stand out: crushing, abrading, smoothing and grinding tools. The above-mentioned groups frequently exhibit evidence of use as multi-purpose tools. This multifunctional character complicates the process of identifying the specific branch of production for which certain tools were used. Unlike the stone tools, only a few metal tools came to light, most of which are proportionally small and represent miscellaneous metal implements, styluses and punches.

With a few exceptions, the distribution of the tools displays no noteworthy concentrations that link certain tools to specific parts of the workshops. But after combining all the information available, including raw material, unfinished products and finished products, it becomes apparent that some parts of the workshop were associated with specific branches of production.

There is evidence for small-scale hot metal-working as well as the processing of cold metal. Scales of armour, lance and arrowheads point to the production of offensive and defensive armaments, and some bronze knobs suggest a connection to the manufacture of chariots. Scrapers made of pottery sherds can be connected to leather working and, together with the occurrence of numerous bronze scales, indicate the production of body armour.

A large amount of waste as well as roughly shaped products made of bone identify another part of the complex as a bone workshop, where mainly bone arrowheads were fabricated. Artefacts made from silex, especially sickle blades, indicate woodworking. All in all, the manufacture of whole arrows can be assumed. The manufacture of bows might have taken place in the same neighbourhood, but cannot be definitively localized. A shield mould for a Hittite

'Figure-Eight-Shield' found *in situ* reveals that the metal fittings for shields were also being manufactured, most probably alongside the production of the wooden shields.

The different specialized workshop areas function together as an assembly line. Scales of armour and yoke saddle knobs made of bone prove that the bone workshop interacted with other branches of production and was not confined to the manufacture of arrowheads only.

Based on the few chariot parts that were found in the workshops themselves, the fabrication and repair of complete chariots cannot be assumed within the excavated part of the originally much bigger complex, but took place in a nearby neighbourhood. In conclusion, the unearthed part of the workshops can be identified with the *hpš*, the armoury of the garrison, as displayed in New Kingdom tombs.

### **Chariots' Inner Dynamics: Springs and Rotational Inertias**

*Bela Sandor*

The safety, comfort and performance characteristics of a chariot depend on the vehicle's structural dynamics, which is a function of materials, geometry of components, and joint systems. Two areas are covered: spring systems and wheel structures.

It was well-sprung chariots, low-inertia wheels and daredevil driving techniques that enabled the warrior pharaohs to display their spectacular skills in the ultimate tests of high-speed war games. The discussion focuses on Egyptian and Roman chariots, with relevant finds from other vehicles.

Every chariot has many springs, with a wide range of elastic properties. Leather is found as a tension spring in the yoke traces and in floor mats. The pole acts as a bending-and-torsion spring. The front floor bar acts as a bow spring, and also as an elastic warping element involved in supporting the driver and in the torsion of the pole. The extensive subassembly comprising the axle, pole, yoke, pole-tail socket, and front floor bar has an additional important function as a shock-absorbing anti-roll mechanism, as long as the horses are running in reasonably level positions. The various spring actions are demonstrated with the aid of hand-held flexible models.

Most wheel structures represent extremely difficult design compromises in order to minimize the bone-jarring washboard effect, which is the result of cyclic bending of flexible wheel rims, provide spoke strength in compression, to resist bending in cornering maneuvers, and to minimize both the linear and rotational inertias if high acceleration is desired. These conflicting requirements are well addressed in the 'Tutankhamun-chariots' and in the 'Tiber model' of a Roman racing chariot. The opposite is exemplified by the 10-spoke Celtic wheels, the 30-spoke Chinese wheels, the heavy Assyrian wheel rims, and bronze wheels; all of these reduce the washboard effect at the cost of increased inertias.

Rotational inertia is an abstract concept, involving the integration of elemental rotational inertias. Newton, who formalized the notion of linear inertia, missed the basic idea and nonlinear calculation of rotational inertia. Remarkably, the developers of Egyptian chariots ca. 1500 BC, and later the Romans, had an understanding of this subtle issue (like dancers and figure skaters control their rotations without knowing the physics and mathematics), simply by spinning a variety of suspended wheels as demonstrated in the presentation. Thus, the ancients could produce shape-optimized wheels more than three millennia before our modern methods of analysis and design emerged.

A qualitative consideration of rotational inertias leads to a fresh assessment of the compelling advantages and disadvantages of using iron tires and nave hoops in racing. Applying this understanding, a detailed study of the crash scenes in the Lyon circus mosaic reveals the ancient factions' crucial dilemmas and risky decisions. In direct comparison, the Egyptians probably dealt with similar issues in drag racing and war games, employing leather tires successfully, long before the introduction of iron.

### **The Chariot as a Mode of Locomotion in Civil Contexts**

*Heidi Köpp*

In ancient Egypt, the chariot was used in warfare, hunting, and sports. Its use in warfare is well attested and often discussed, while several hunting scenes depict private individuals and even pharaohs on chariots. The sportive aspect

plays a secondary role and is rarely shown. In addition, the chariot was the supreme mode of locomotion for the elite (both men and women) for private and public purposes, and an important status symbol in the New Kingdom. It was used for visits and inspections by kings or high officials. In comparison to all other means of locomotion, the chariot was the fastest and also the most expensive.

The Egyptian chariot in the Museum of Florence weighs only 24 kg and its tread is 2 cm wide. This might imply that the chariot was suited for limited long-distance travel because of its light and fragile construction. Its spoked wheels especially required even and compact soil in order to function properly, therefore cross country driving was probably only possible in appropriate terrains. In Papyrus Anastasi I (25,8–26,1) a chariot accident is described after the horses bolted. Thus, one might suggest that the chariot is not capable of being driven at high speed on uneven, sandy, or rocky ground.

Still, chariots were used for long-distance travel even in the desert, given that the ground was prepared or geologically solid enough on its own. Once again, Papyrus Anastasi I (23,1; 23,3; 23,7; 24,2 and following) describes the crossing of a mountain pass leading from the coastal plain to Megiddo, where chariots were taken along. They could even be carried on the shoulders of a single man over uneven, rough, or hilly terrain as due to their low weight it was not necessary to dismantle them.

This lecture deals with the question whether the chariot was limitedly suited for long-distance travel because of its light and fragile construction. Moreover, the range of application of the Egyptian chariot in civil use will be discussed.

### **The Introduction of the Light, Horse-Drawn Chariot and the Role of Archery in the Near East. At the Transition from the Middle to the Late Bronze Ages: Is there a Connection?**

*Hermann Genz*

This contribution will review the role of bows and arrows at the beginning of the Late Bronze Age in the Levant, Anatolia and Egypt. While bows played an important role in warfare throughout the 3rd and 2nd millennia in Egypt,

one decisive change is noticeable at the beginning of the New Kingdom. While in the iconographic record from the Old and Middle Kingdoms the pharaoh smiting his enemies is always depicted with a mace or a dagger, in the New Kingdom an additional new image emerges: the pharaoh in his chariot using a bow. Equally in the iconographic record of Hittite Anatolia the bow is shown as a frequent weapon of the Hittite king.

The picture is most dramatic in the Levant. While for the Early and Middle Bronze Ages almost no evidence for the use of bows and arrows is attested in the archaeological record, in the Late Bronze Age arrowheads are among the most frequently encountered weapons. Moreover, arrowheads are widely found in royal and elite tombs, for instance in Qatna, Kamid el-Loz, and Dan (tomb 387).

It is suggested that the sudden rise in the social prestige of archery in warfare can be connected to the development of a new warrior ideology, linked to the introduction of the light, horse-drawn chariot.

### **Cultural Implications of the Chariot and Composite Bow in New Kingdom Egypt**

*Samantha L. Cook*

The impact of cultural contact between Egypt and the Near East is fundamental to understanding the introduction, development and combined use of the chariot and composite bow in Egypt. While there is evidence for innovation and experimentation with forms of chariots and the composite bow in parts of the Near East during the earlier second millennium, Egypt's entrenched conservatism has often been blamed for its late adoption of both technologies; many theories have pointed at the Hyksos 'invaders' as providing the impetus the Egyptians needed.

It is certain that neither the chariot nor the composite bow was commonplace. These were prestige items owned only by the king and the elite and, as such, their effectiveness in battle is perhaps limited. However, there is a direct correlation between the uses of both technologies; combined, the chariot and composite bow form a highly advanced and efficient fighting unit, offering solutions to both mobility and firepower in conflict. The cyclical nature of conflict and

technological advance is in evidence throughout the New Kingdom, in which instances of warfare with Near Eastern civilisations provide a catalyst for further refinements to these technologies. In addition, continuing contacts with the Near East in the New Kingdom would have been crucial to manufacturing the chariot and composite bow since many of the woods used in the construction of both would have been sourced from this area (most notably Common Ash, Elm and Silver Birch). This raises important questions concerning the nature and implications of Egypt's foreign relations at this point: can we identify whether these objects were the result of trade and exchange or spoils of war?

This paper consequently considers the role of conflict in triggering and sustaining the accelerated processes of technological change, and the role of trade and tribute in providing resources and craftsmanship for technological developments.

### **The Depiction of Chariots on Wall Reliefs in New Kingdom Egypt and Neo-Assyrian Empire**

*Arianna Sacco*

The aim of the present paper is to examine how chariots are represented in war scenes on wall reliefs both in New Kingdom Egypt and in the Neo-Assyrian Empire. Even though there are unquestionable differences between the two, apart from differences in time and space (with the former dated to the end of the Bronze Age and the latter dated to the full Iron Age), in both cases we are dealing with Near Eastern empires which made propagandistic use of war scenes, recalling recent military conquests. It is therefore interesting to examine how chariots are depicted in such scenes, and what they contribute to the figurative composition and overall meaning. Since these depictions cover a long period of history, it may be also possible to consider the diachronic evolution of the chariots' representation from the figurative point of view.

From Egypt, examples are examined from the Great Temple of Abu Simbel, from Ramesses II's temple and Sethi I's temple at Abydos, from the Beit el-Wali temple dedicated by Ramesses II, from the temple at Karnak (scenes dated to the reigns of Sethi I, Ramesses II

and Ramesses III), from the temple at Luxor (scenes dated to the reign of Ramesses II), and from the temple at Medinet Habu (scenes dated to the reign Ramesses III). From Assyria, examples are examined from the Nimrud Central Palace, dated to the reign of Tiglat-Pileser III, from the Nimrud Northwest Palace, dated to the reign of Ashur-Nasir-Apli II, from the Nimrud Southwest Palace, dated to the reigns of Tiglat-Pileser III and Esar-Haddon, and from the Nineveh Southwest Palace, dated to the reign of Ashur-Bani-Apli.

A study of the aforementioned scenes yields interesting results. First, the Egyptian war scenes with chariots are shown on temple walls, while the Assyrian ones are represented on palace walls. This suggests that these scenes targeted different audiences, namely clergy members in the first case and foreign visitors in the second, even though in both cases members of the royal court were also supposed to view them, no doubt. Secondly, chariots are represented much more frequently, both in terms of number of scenes and as number of items in each scene, in Egypt than in Assyria. Perhaps the Egyptians used chariots in battles more often than Assyrians did, even though it is clear that chariots were used in both empires to breach enemy lines, as well as to move quickly along the battlefield and to fire arrows.

### **Gendering Chariot Use in New Kingdom Egypt**

*Lisa Sabbahy*

The chariot is introduced into ancient Egypt from the Near East perhaps at the start of the Second Intermediate Period, but not adopted until the end of that time. Its use is at first limited to military purposes, but eventually spreads to professional use by high officials, and professional use by royalty both male and female. Female use of chariots, both as driver and occupant, is extremely restricted, however, and for the most part limited to the Amarna Period.

This paper looks at the use of chariots during the Egyptian New Kingdom, a period of approximately five hundred years. The study is based on depictions in temple relief scenes, private tomb paintings, stela, both royal and non-royal, and ostraca. The depictions will be divided by the context of use: transportation,

procession, warfare, hunting, work; as well as by whom the chariot is being used: driver and/or occupant/s; and are they: male/female, royal/non-royal/divine. When relevant, textual evidence will be brought in as well. The comprehensive view of chariot use over this extended period of time will allow for patterns to be observed not only in chariot use, but use of chariot depictions themselves.

### **The 3rd Millenium BC Chariots in Syria: A Study through the Documentation**

*Mattia Raccidi*

First attestations of wheeled-vehicles in the ancient Near East come from Uruk. The proto-cuneiform signs of the end of the 4th millennium BC represent a sledge sustained by four wheels or two rollers that could be considered as archetype of the 3rd millennium chariots. The evolution of the wheeled vehicles is confirmed by the finding of four-wheeled chariots in tombs at Ur and Kish, dated back to the first half of the 3rd millennium BC, in addition to the so-called 'Standard of Ur' that represents a procession of four-wheeled war chariots.

But it is during the second half of the 3rd millennium BC that in Syria a rapid increase of the documentation relating to chariots is attested. Terracotta models, seals or seal impressions and written sources from many Syrian sites (such as Ebla, Mari, Terqa, Hama, Tell Brak/Nagar, Tell Bi'a/Tuttul, Tell Beydar/Nabada, Tell Mozan/Urkeshe, Tell Barri/Kahat, Tell Arbid, Tell Selenkahiye, etc.) prove the use and diffusion of both two- and four-wheeled chariots. Although no full-size chariots have been found in Syria it is possible to reconstruct their morphology and their function based on the documentation mentioned above.

The present paper aims to create a morphological and functional reconstruction of the 3rd millennium BC Syrian chariots. The first step is represented by the identification of different types of chariots through the cross-study of the terracotta models and the glyptic representations. Six different types have been recognized based on their morphological features: number of wheels, body morphology, position and shape of the axles, specific features (shape of the frontal shield; decoration). The six types are: two-wheeled platform body, two-wheeled box body,

two-wheeled, platform body with footboard, four-wheeled platform body, four-wheeled box body and four-wheeled covered vehicle.

Glyptic representations also provide information about the function of the chariots, especially four-wheeled ones. They are involved usually in war or cultic scenes, and rarely in hunting scenes. In addition, the written sources provide valuable information, both morphologically and functionally. In the first case, different terms were used to identify different types of chariots according to the number of the wheels and to the vehicles' use. Finally, in the second case, texts confirm that 3rd millennium BC Syrian chariots were used in wars, cultic festivities, and for carrying loads.

### **A Possible Chariot Canopy for Tutankhamun**

*Edwin C. Brock*

Among the artifacts discovered in the tomb of Tutankhamun, the item number 123, described by Carter as a portable pavilion, lends itself to further study and a different interpretation. This item displayed in the Tutankhamun Gallery, on the first floor, with various groups of funerary furniture, may actually have been part of one of the six chariots (122) found in the king's tomb.

### **An Alternative Theory for 'Bit-Wear' found on the Second Premolar Teeth of the Buhen Horse**

*Yukiko Sasada*

In 1958, the remains of a 19 year old male horse were found in Buhen by Walter B. Emery. The fact that it was found on top of the Middle Kingdom rampart caused excitement among academics since it signified the possibility that the Buhen horse dated back to 1675 BCE, several decades earlier than previously found horse remains in Egypt. On closer examination of the skull, abnormal wear of the lower premolars was identified. There is controversy over whether this wear is evidence to suggest that the horse had been wearing a bit. This is an important concept since the use of a bit from this period would signify the first irrefutable evidence of domestication of horses in Egypt.

In this period, it is most likely that bits were used to control horses when using a chariot since without the direct contact of the legs (as is usual with horseback riding), a bit and reins would have been the only way for the driver to have communicated with the horse. Dorcas Brown and David Anthony write in 'Bit Wear, Horseback Riding and the Botai Site in Kazakhstan', that "[h]orses can use their tongues to lift the bit off their gums and push it back into the grip of their second premolars" and since the horses they studied have a habit of chewing the bit, they suggest that this caused the wear on the teeth. Although this may be true, there is an alternative explanation for the wear on the lower second premolars of the Buhen horse that may be equally plausible.

It is well described in the veterinary literature that older horses may develop an abnormal pattern of wear on their molars that is commonly known as a 'wave mouth'. When studying the images of the Buhen horse, focus has always been placed on the second lower premolars, rather than commenting on the entire set of molars as a functional unit. Considering the age of the Buhen horse at the time of his death and the wave-like appearance of the molar arcades, old age should be considered as an alternative cause for the apparent wear on the lower second premolars.

By studying anatomical specimens and the veterinary literature, I aim to provide evidence that the wear on the premolars of the Buhen horse was caused by normal dental attrition associated with old age, and if this is the case, it places into question previous theories about the presence of bits in Egypt in the Second Intermediate Period. Although this does not completely dismiss the possibility of the usage of bits at this time, further studies are necessary to confirm this theory.

### **Physical Limits of Horses and Men and the Military Employment of Light Chariots in the Near Eastern Late Bronze Age**

*Fernando Quesada-Sanz*

Battlefield tactics of the 'chariot armies' during the Late Bronze Age of the Near East have been the subject of considerable – and sometimes heated – debate. However, discussion has sel-

dom, if ever, taken *systematically* into account the physical limits of certain key variables that are essential to our understanding of chariot unit employment: horse-chariot sustained and maximum speed, turning radius of the vehicles, the practical combat range of composite bows and practical rate of fire. All these factors are governed by physical laws based on muscular strength that are applicable, within certain margins, to men and horses in both antiquity and the Middle Ages.

Systematic analysis of literary sources and of other serious experimental archaeology, from Spruytte to more recent work, can be used to reliably calculate, within fairly narrow margins, the actual capabilities of chariots and weapons. Admittedly, these cannot *prove* which tactics were actually used by Egyptian, Mitannian or Hittite chariot units, but they can show which tactics are physically impossible, and thus lead us in the right direction. We will apply our results to Robert Drews' influential work 'The End of the Bronze Age' to prove that his theory on how chariot forces deployed, manoeuvred and fought in the Late Bronze Age of the Near East is physically impossible, avoiding the usual 'woulds' and 'ifs', that plague most explanations.

### **The Role of the War Chariot in the Formation of the Egyptian Empire in the Early 18th Dynasty**

*Roberto Díaz Hernández*

It is well-known that the invention of the war chariot between the Middle and the New Kingdom was a major change in military technology. However, little attention has been paid to its importance in the formation of the Egyptian Empire at the beginning of the New Kingdom.

To fill this gap, I will first examine the role of the war chariot in Egyptian victories recorded in autobiographies such as that of Ahmose, son of Ibana, and in royal annals such as those of Thutmose III's inscriptions. I will then compare the Asiatic and the Egyptian chariots and their use in order to spot any relevant differences which could explain the Egyptians' victories over their Asiatic enemies.

Lastly I will argue that the Egyptians improved a decisive war machine (probably taken from the Asiatic peoples coming to Egypt in the

Second Intermediate Period), which they put to good use to expel the Hyksos and, above all, to set the basis of a great empire.

### **The Chariot that Plunders Foreign Lands: Paronomasia and Chariots in New Kingdom Literature**

*Colleen Manassa*

The 'Poem on the King's Chariot' is attested in two ostraca (Edinburgh O. 916 and Turin O. 9588), both of which contain only a portion of a longer text, paleographically datable to the 20th Dynasty, with particularly close parallels from the reign of Ramesses IV. The ancient title of the composition is unknown, and since the text incorporates weaponry as well as the chariot, a more apt name may be the 'Hymn to the Royal Panoply.' The poetic merit of the text was acknowledged in its initial publication, but the opaque lexicography and resulting difficulties in translation have led to a general neglect of the composition. Each verse on the Edinburgh ostrakon names a part of the chariot (*e.g.* yoke, body, spokes), followed by a statement about foreign conquest that creates a phonetic pun on the part's name; the 'Hymn to the Royal Panoply' is a sterling example of Egyptian use of paronomasia and the aesthetic use of technical terms in poetic compositions. Recent advances within the study of the physical aspects of the Egyptian chariot are particularly significant for solving the remaining lexicographic difficulties within the text.

The literary devices within the 'Hymn to the Royal Panoply' can also be placed within the larger context of New Kingdom literature, particularly works of 'historical fiction', such as the 'Capture of Joppa', which uses paronomasia in a way similar to the hymn. The use of loan words in both compositions evidence an intersection between imperial ideology and contact linguistics – foreign words are chosen intentionally to express domination over those very foreign territories. A re-examination of the 'Hymn to the Royal Panoply' also provides additional information concerning the theological associations of the chariot, and finds a strong parallel in the equation between parts of the solar bark and divinities in Book of the Dead Chapter 99. The 'Hymn to the Royal Panoply' thus provides an ancient Egyptian description of the divine ico-

nography known from actual Egyptian chariots as well as two-dimensional depictions, and despite its obscure language, binds together numerous threads of modern research on ancient chariots.

### **Chariots in the Daily Life of New Kingdom Egypt**

*Ole Herslund*

The light, two-horse drawn chariot stands among the most iconic weapon systems of ancient Egypt and features regularly in battle scenes and inscriptions. The chariot, remains, however, featured in a number of additional contexts, some of which are found in relatively fragmented textual evidence. This paper establishes a socio-historical framework for the everyday use and role of chariots in language, history, and production.

Firstly, the written record of the New Kingdom indicates that the material culture contained different kinds of chariots, distinguished by names and possible cultural origins. To this can be added a more technical terminology with words for chariot parts and equipment. Although the exact nature of these different chariots and associated terminology remains unclear, there is some evidence that allows us to pinpoint variations and developments in technology, materials and conceptualisation of chariots through time.

Secondly, the textual record allows us to glimpse into the many social contexts in which chariots are attested in everyday life. Throughout the New Kingdom, chariots were used for hunting by the kings and nobility, and are known from the popular and widespread motif of the royal sportsman in art and texts. Chariots are also known to have been part of other royal activities or simply served as personal transportation for kings in both urban and desert environments. Furthermore, the amalgamation of a number of sources draws a picture of the chariot as a way of everyday transportation for private people, whether on the job, going on house visits or simply in and around town.

Finally, the production of chariots and the people involved in it are brought into consideration. Although the historical evidence is relatively scarce, certain details and textual references offer insights into the workshop setting

and the types of specialised craft personnel involved in chariot production. Here we find a number of professional titles for the craftsmen who made a living by producing chariots as either specialised chariot makers, or leather and metal workers.

### **The Diplomatic Role of the Charioteers in the Ramesside Period**

*Mohamed Raafat Abbas*

Chariots were very significant in the Ramesside Period, a position mentioned frequently in texts dating to the reign of king Ramesses II. Charioteers also played an important role in diplomacy as many Ramesside charioteers held the title  $\text{𓆎𓅓𓏏𓏏} \textit{wpwty nsw r h3swt nb}$  'the Royal envoy to all the foreign lands'. This paper will focus on the different roles of charioteers in the Ramesside Period and their status in Egyptian society.

### **The Role of the Egyptian Chariot Warrior**

*Anthony Spalinger*

A discussion of the mustering arrangement of departing Egyptian armies in the New Kingdom. The issue of logistics will be covered, especially as the army would have had to be dispersed after leaving the northern capital, and then reassembled at Gaza. Hence, the well known scenes at Medinet Habu are useful only for the immediate tactical disposition of the various components of the New Kingdom army. This issue does not cover the actual tactical disposition which is the subject of a further study.

### **Ballistic Missiles and Electric Cars: The Differing Aims and Trajectories of Egyptian and Syro-Hittite Chariots**

*Ian Shaw*

An intriguing aspect of Egyptian chariotry – and one that is particularly evident in the Qadesh battle reliefs – is the number of ways in which Egyptian chariots appear to have differed from their Hittite and Syrian counterparts. Whereas the Egyptian chariots had a two-man crew and are shown with quivers attached for the archer,

the Hittite and Syrian chariots are shown with three occupants, comprising a shield-bearer in front of the driver and a spearman behind him, and apparently no quivers for arrows or javelins. A less obvious difference between Egyptian and Hittite chariots is in the technology used to produce the 'snaffle bits'.

In the case of both modern and ancient divergences in the use of technology, there are clear indications that even cultures or ethnic groups sharing a common paradigm will find that their individual technological trajectories can vary considerably as a result of social, political and strategic factors. This paper compares the Syro-Hittite weaponry and tactics with those that appear to have been employed by the Egyptians, in order to try to gain some sense of what might be described as the 'knowledge network' of warfare in the Late Bronze Age. To what extent did two of the great empires of the Late Bronze Age differ from one another in their attitudes and approaches to chariot warfare, and to what extent can we see their approaches converging or diverging during this period as people, ideas and artefacts flowed back and forth in the form of booty, prisoners of war and élite diplomatic exchange.

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One additional talk (the conference schedule will be updated in due course), added 14 June 2012:

### **Earliest Archaeological Testimony for Metal Horse Bit and Donkey Saddlebag**

*Eliezer D. Oren*

Ben-Gurion University expedition to Tel Haror, Israel, unearthed in the Middle Bronze Age III (1700/1650 – 1530 BC) sacred precinct a ritually deposited, fully articulated, donkey skeleton bridled with a bronze horse bit and equipped with a model (leather?) saddlebag. Evidently, the donkey was symbolically bridled and saddled for the occasion of the sacrifice and ritual interment following a ceremonial procession in the temple courtyard.

This outstanding discovery is significant on two counts: thus far, the Tel Haror bridle bit is the earliest known metal horse bit from a securely dated archaeological context and the only specimen of the second millennium BCE actually to have been recorded in the mouth of an equid. Such standardly manufactured metal bits – the primary implements for controlling and steering effectively a horse team traveling at speed, bear directly on the early history of the light chariot in the Levant and Egypt and its eventual incorporation into the military organization. Equally important, the set of bronze fittings recorded on the back of the donkey is the first archaeological attestation for a (leather?) saddlebag during the Bronze and Iron Ages.

This paper will present the contextual evidence of the Tel Haror finds and address their cultural-historical implications on the intriguing issue of the introduction and standardization of the light, horse-drawn chariot in the Levant and Egypt in the second millennium BCE. The unique remains of the saddlebag most likely reflect on the complex network of donkey trading caravans that operated in the Middle Bronze Age across the Levant and Anatolia as well as the large scale Egyptian expeditions, including hundreds of donkeys, destined to the mining centers in the eastern desert and Sinai.