LINEAR B LEXICON FOR THE CONSTRUCTION OF MYCENAEAN CHARIOT

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LINEAR B LEXICON FOR THE CONSTRUCTION OF MYCENAEAN CHARIOTS

Richard Vallance JANKE and Spyros BAKAS

РЕЧНИК НА ЛИНЕАР Б ЗА КОНСТРУКЦИЯТА НА МИКЕНСКИТЕ КОЛЕСНИЦИ

Ричърд Валънс ЯНКЕ и Спирос БАКАС

Abstract: Ever since humankind first settled down in permanent settlements as the direct consequence of farming of grains and other crops and the raising of livestock in the Late Neolithic era, the territorial imperative has consistently dictated real or imagined threats from outsiders. Consequently, people always struggled to improve means of self defence, leading to the introduction of missiles such as sling stones, spears and arrows. In the Late Neolithic, humankind built enormous fortresses. This was soon followed by the emergence of the first chariots in Sumeria ca. 2,500 BCE. Cumbersome as they were, they represented a significant step forward in the early technology of warfare. The next millennium was to bring about the perfection of the chariot as a vehicle enabling much more efficient warfare. Chariots had become far lighter, more mobile and more battle-worthy than their much more ponderous Sumerian predecessors. All late Bronze Age chariots, including Egyptian and Mycenaean, had reached the zenith of perfection attainable for that era. The Linear B Lexicon for the Construction of Mycenaean Chariots, the only one of its kind, has been produced in partnership with Koryvantes, the Association of Historical Studies (Athens).

Keywords: Late Neolithic, farming, defence, fortifications, Sumer, Egypt, Mycenae, chariots, Bronze Age.

Резюме: От момента, когато човечеството се установява за пръв път в постоянни селища като пряка последица от отглеждането на зърно и други култури, а също на добитък през късния неолит, териториалната необходимост последователно налага реални или въображаеми заплахи от чужденци. Следователно, хората винаги са се борили да подобрят средствата за самозащита, водещи до въвеждането на метателни оръжия като камъни за прашки, копия и стрели. През късния неолит човечеството строи огромни крепости. Това скоро е последвано от появата на първите колесници в Шумер около 2500 г. пр. н. е. Характерни със своята тромавост, те представят значителна стъпка напред в ранната технология на войната. Следващото хилядолетие щяло да предизвика усъвършенстване на колесницата като превозно средство, което дава възможност за по-ефективни военни действия. Колесниците стават по-леки, по-мобилни и по-полезни в боя от техните по-тежки шумерски предшественици. Всички колесници от бронзовата епоха, включващи египетските и микенските, достигат върха на усъвършенстването си, постижим за тази ера. Речникът на Линеар Б за конструкцията на микенските колесници, единствен по рода си, е създаден с партньорството на Асоциацията за исторически изследвания Koryvantes (Атина).

Ключови думи: Късен неолит, земеделие, защита, фортификация, Шумер, Египет, Микена, колесници, Бронзова епоха.

Mycenaean Chariotry in Warfare History of the Old World

Ever since humankind first settled down in permanent settlements in the Late Neolithic era, the territorial imperative has consistently dictated real or imagined threats from “them” (other settlements) to “us” (our own). Farming grains and other crops and the raising of livestock necessitated the establishment of sedentary communities. And the direct consequence of

sedentism in the wake of the Neolithic Revolution was systemic warfare. The gradual but steady spread of fortifications in the Late Neolithic meant that settlers became more and more inclined to wage war on their own or on contiguous or neighbouring enemy territories. This development lead to the introduction of missiles such as sling stones, spears and arrows. As a consequence of farming of grain crops and the raising of livestock settlers soon learned to defend themselves with artificial barriers in the guise of fortifications. Feelings of insecurity meant that Neolithic fortifications were often immense[1]. For instance, the famed walls of Jericho were massive, with lookout towers 9 metres in diameter[2]. But fortifications such as this soon proved to be insufficient for secure defense.

The Sumerian chariot:

In spite of these provisions for territorial defence of newly emerging settlements, novel tactics were soon devised in the Near East. Territorial imperatives, leading to restive political manoeuvring necessitated the inception of transit corridors in the Levant in Palestine's MB IIB. At this juncture in prehistory the horse was introduced, and soon after the chariot. Thus, for the first time ever, mobile warfare became the norm. This was perhaps the first great historical revolution in war tactics [**Morritt, B.** 2017, pass.]. The chariot appears to have originated in Sumeria ca. 2,500 BCE. There is some speculation whether or not the Sumerian chariot actually entered combat. Many researchers are of the opinion that the ponderous and cumbersome Sumerian chariot was merely used to ferry noblemen charioteers to a strategic area of the battlefield, where they subsequently dismounted to fight hand to hand. The Standard of Ur depicts a column of four wheeled battle carts deployed alongside infantry wielding spears. For each chariot there is a driver and a warrior to toss axes, javelins and spears at the enemy. These heavy chariots were pulled by the Mesopotamian wild asses, known as onagers, to pull them into battle. The Standard of Ur is one of the first depictions of the use of the chariot in prehistory. It appears to dispel any notion that the cumbrous Sumerian chariots were directly engaged in combat. As heavy as they ostensibly were, they must have been terribly difficult to set in motion, however intimidating they may have been to the enemy in head-on battle. Hence, it is unlikely they could have dispersed enemy lines.

Figure 1

the Standard of Ur, depiction of a Sumerian chariot

The Egyptian chariot:

By the Middle to Late Bronze Age in Egyptian history there was a significant transformation of the military. Much more mobile and faster chariots were designed and manufactured. With substantive improvements in armament, by the New Kingdom in Egypt (XVIIth. Dynasty, ca. 1580-1550 BCE), the Egyptians had come to rely on the new military technology of the horse and chariot. By the end of Dynasty XVII the Thebans were

[1] On the warfare in Neolithic see **Marler, J. Neolithic Warfare…**; **Rowthorne, R. Neolithic Warfare…**; **Ferrill, A. Neolithic Warfare…**; **Pleslovatiková, E.** 1980, pp. 61-74; **Runnels, C. N.** 2009; **Shennan, S.** 2009; **Rollefson, G.** 2012;
Renfrew, C. 2013; **Shennan, S.** 2013; **Clare, L.** 2016; **Medrano, E. V.** 2017; **Basco, K.** 2017.

[2] **Bible: Joshua 6:1** "Now the gates of Jericho were securely barred because of the Israelites. No one went out and no one came in".

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confident enough to regularly engage in warfare against their foes on the north and south Nile. Under Thutmose I, grandson of Pharaoh Ahmose, the land-based army served as the core of the Egyptian military, with the chariot at its core [**Smock, P.** 2017]. As can be seen in the depiction of the in the Battle of Kadesh (ca. 1274 BCE) , alongside a monochrome plate of a typical Egyptian chariot in Figure 2, contemporaneous with the late Mycenaean Empire, their chariots were already lightly constructed, yet durable, highly mobile and swift, ideally suited to massive head-on confrontation in battle. And these very characteristics can be attributed to Mycenaean chariots in the field in the very same era.

Figure 2

New Kingdom chariot at the Battle of Kadesh (ca. 1274 BCE)

The Mycenaean chariot:

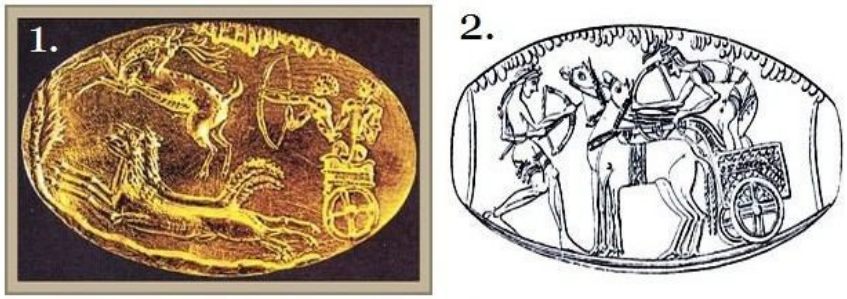
And now we turn to the Mycenaean chariot[3]. As archaeological evidence from various Mycenaean sites suggests, Mycenaean military chariotry[4] plays a prominent role in late Bronze Age Aegean warfare right up until the turning point of the apparently sudden, catastrophic fall of the palatial states of Mycenae, Pylos, Tiryns, Sparta and Thebes ca. 1200 BCE. The first evidence of the use of chariots in the Aegean surfaces no earlier than LM I or LH I (1550-1450 BCE) , and is probably linked with of the arrival of the Achaeans and the influence they exerted on Mycenaean culture and its military [**D'Amato, R., Salimbetti, A.** 2013, p. 14].

As Littauer notes, a chariot mural has been discovered at Pylos, while the fragments of another from Knossos have been recognized and joined together [**Littauer, M. A.** 1972, p. 145]. Apart from these, the Linear B 'chariot' tablets from Knossos describe about 550 chariot bodies and equivalent numbers of pairs of wheels. Additionally, Pylos tablets list about 200 pairs of wheels, as well as various types of wood for the construction of 150 axles. Two of the Pylos findings specifically mention chariot makers [**Fields, N.** 2006, pp. 22 – 23].

The continental landscape of Aegean basin displays fundamental differences from that of the Near East or Egypt. The rockier, rougher, harsher plains of the Mycenaean palatial centres would require heavier and more robust chariots. The typical Mycenaean box chariot [**Steel, L. 1994, pp. 201 – 211**] was buttressed with the four spoke wheel pattern.

[3] On the Mycenaean warfare see **Niemeier, W.-D.** 1999; **Harrell, Katherine M.** 2009; **Kirkpatrick S.** 2009; **Molloy, B.** 2010; **Molloy, B.** 2012; **Kelder, J.** 2012; **Deligianis, P.** 2013; **Smith, A. J. C. IV,** 2013; **Senn, H.** 2013; **O'Brien, S.** 2013; **Bakas, S.** 2013; **Montecchi, B.** 2014; **Bakas, S.** 2014; **Bakas, S., and Kambouris, M.** 2015; **Miller, J.** 2017; **Bakas, S. Military Traumas...**; **Koutoupis, P. Mycenaean Greeks as Egyptian Soldiers...**. On Mycenae and his role in the Bronze Age history see **Rutter, J.** 1993; **Edder, B.** 2005; **Kelder, J.** 2010; **Kelder, J.** 2016; **Kelder, J.** 2016 a; **Thaler, U.** 2016; **Sarri, K.** 2017; **Schultz, W.** 2017; **Soultanian, G.** 2017; **Jacobsen, B. C. Heroes...**; **Nikoloudis, S. The ra-wa-ke-ta...**; [4] On Mycenaean military chariotry see **Chondros, Milidonis et al. Chariots...**; **Salimbeti, A. Chariots...**

Figure 3



four-spoke chariots

1. gold signet ring from shaft grave IV, Mycenae LH II
2. wicker box chariot LH II a ca. 1500 BCE

These spokes were distinctively larger than those of their contemporary enemies (most notably the Egyptians). The Mycenaean draught pole was strengthened by a wooden support with cross bracing [**Grguric, N.** 2005, p. 42]. Fields points out that the axle was positioned near the centre of the cab, while a shaft running horizontally from the yoke to the front of the cab further strengthened the vehicle. Moreover a wooden support joined this shaft to a curved draught pole that continued to the rear of the cab for greater tensile strength in its construction. The wood that was used was probably of elm, willow, yew, boxwood and/or cypress [**Fields, N.** 2006, p. 23], and possibly also ash.

Mycenaean chariots were designed to be drawn not by one, but two horses attached to a central pole. If two additional horses were required, they were attached on either side of the main team by a single bar fastened to the front of the chariot. The chariot itself consisted of a (wicker) basket with a rail on each side and a foot board for the driver to stand on. The body of the chariot rested directly on the axle connecting the two wheels. The harness of each horse consisted of a bridle and reins, usually made of leather, and ornamented with studs of ivory or horn. The reins were passed through collar bands or yoke, and were long enough to be tied around the waist of the charioteer, allowing him to defend himself when necessary.

The wheels and basket of the chariot were usually of wood, strengthened in places with bronze, the basket sometimes covered with wicker wood. The wheels had four to eight spokes.

Figure 4

Chariot, Cyprus, with bows and arrows, ca 1300 BCE

These warriors could have fought as cavalry or a force of mounted infantry particularly suited to responding to the kind of raids that seem to have occurred with some frequency towards the end of the suzerainty of the Mycenaean Empire (ca. 1250 BCE).

There can be little doubt that Mycenaean chariots were as battle-worthy as those of the great contemporaneous Bronze Age civilizations of Egypt and the Hittite Empire, though perhaps a little less so than the iron-clad chariots of Iron Age Sparta and Athens. Since the Mycenaeans were after all a warlike nation, they would have surely have gone to great lengths to ensure that all chariot components were battle-worthy, with great tensile resistance to wear and tear, meeting the highest standards of construction within the limits of Bronze Age technology. The primary difference between Mycenaean chariots and those of other Bronze Age nations appears to have been in the mountings.

The Mycenaeans seem to have adopted the chariot for warfare in the late 16th. century BCE, as evidenced by findings of gravestones, seals and rings. Apparently, the Mycenaean chariot design did not originate in Crete, but was exported from the mainland to the island where it appears the first time ca. the mid 15th. century BCE, as attested by a number of Linear B Tablets, and on some sealings.

Mycenaean chariots can be classified in five main design categories: the box, quadrant, rail, dual and four wheel chariot. While no archaeological findings have unearthed any complete chariot, metallic components and horse bits have been found in some graves and settlements, numerous Linear A tablets inventory chariot bodies, wheels and horses. The rail chariot was a light vehicle with an open cab, and appears to have been used as a means of conveyance for equipment and accoutrements rather than as a mobile military armoured vehicle. The rail and four- wheeled chariot subsisted beyond the Bronze Age into the Iron Age.

The small box chariot, which differed somewhat in its design from other Near Eastern chariots of the period (ca. 1600 – 1200 BCE), had a cab framed in steam treated bent wood, covered with leather or ox-hide or wicker work. The floor of the box chariot appears to have been interwoven with raw-hide thongs. These chariots were harnessed either by one or two charioteers and/or warriors.

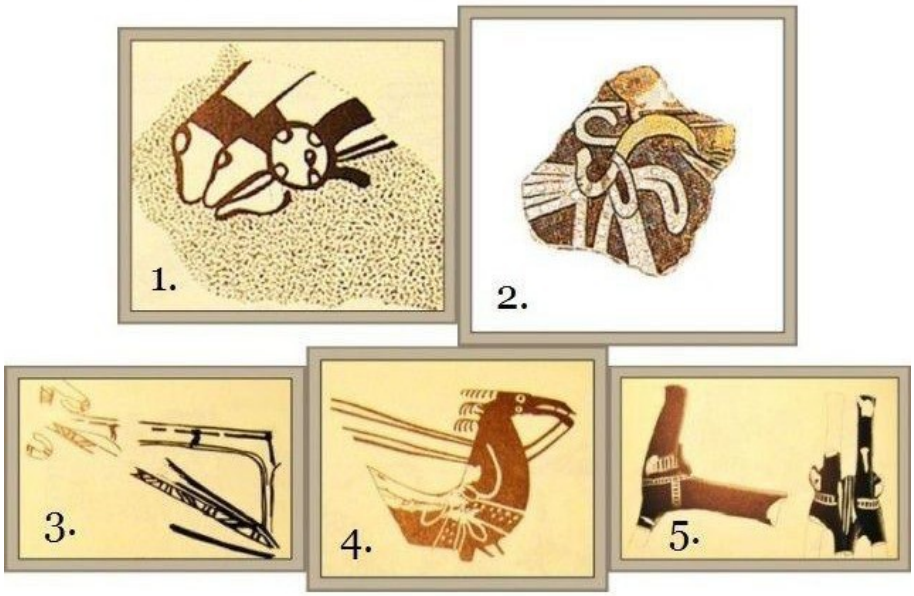
Mycenaean chariots were always drawn by two horses yoked to a fore-and-aft pole fronting the lateral pole. The chariot body was of basketry design, generally of wicker, with a rail on each side and a foot board for the driver. The body of the chariot was set directly on top of the axle bridging two wheels of four spokes. Each of the two horses wore a leather harness with bridle and reins, often ornamented with ivory or horn studs. Reins, which passed through the collar band or yoke, were of sufficient length to be tied around the charioteer's waist in such a manner that he was able to defend himself as called upon to do so. The wheels, which consisted almost always of four spokes (rarely of 8), were constructed of various hard woods, buttressed with with bronze studs and fixings.

Armed chariots and hunting scenes featured on vases, pottery and shards as well as on Linear B tablets confirm that Mycenaean war chariots had a platform for tossing javelins or, if not them, long spears, that the lighter rail chariots apparently conveyed warriors and their equipment to and from the scene of battle. It would also appear that occasionally the lighter chariot could have served as a platform for bow-arms.

The primary components of the Mycenaean chariot (*iqiyo/iqiya*) are: *amota* = wheels; *temidweta* = wheel rims; rivets; studs; *akosone* = axles; spokes; transverse or lateral pole; front-to-rear pole; *peqato* = foot board; various types of hard wood for tensile strength, such as *erika* = willow; *pterewa* = elm; and *kidapa* = ash wood?; metallic fittings made of *kako* = bronze (rarely translatable as copper); *kuruso* = gold & *akuro* = silver; *aniya* = reins, usually made of *wirino* = leather; plus ivory (*erepato*) and horn (*kera*) trappings.

Figure 5

composite of parts of the Mycenaean chariot



1. cheek pieces, LH IIB2, Tiryns
2. yoke Knossos
3. yoke and upper junction, LH IIIB2, Mycenae
4. harness and junctions, with reins, LH IIIA, unknown provenance
5. harness and junctions, LH III Mycenae

Compliments: Andrea Salimbeti. The Greek Age of Bronze: Chariots

Lexicon of Chariot Construction in Mycenaean Linear B

II. 1. KEY to the Lexicon[5]:

1. All entries are alphabetical, by the key term, first in English, next in Linear B, then in Linear B Latinized and finally in (archaic) ancient Greek.

2. The syllabogram series usually rendered as "ja je jo", is represented here as "ya ye yo" for the simple reason that the letter "j" is interpreted in English as being pronounced as in "jet". Since the vast majority of readers of the Mycenaean Linear B syllabary are English, this is extremely misleading, as it is virtually impossible for Mycenaean "j" to have been pronounced as in English. It is far more likely that the "j" was pronounced as the French "j", as in *"Oui, je sais*." or "*jamais*", as this sound eventually glided to the Homeric "y", as in polemoi/o. For this very reason, I always render the so-called "ja je jo" series as "ya ye yo", with the understanding that the reader is to pronounce the "j" as in French.

3. Digamma *ϝ* is very common in Mycenaean Greek.

[5] On Mycenaean Greek Writing and Languages see **Evans, A. J.** 1952; **Buck, C. D.** 1955; **Chadwick. J.** 1987; **Firth, R. R., and Melena, J. L.** 1999; **Poelina-Hunter, E.** 2009; **Tselentis, C.** 2011; **Riunione Scientifica IIPP** 2017.

II. 2. Lexicon of Chariot Construction / κατάλογος ἁρμα′τειος

A

ancillaries *pawoke* πάρϝοργες
archer *tokosota* τοξότας
armour *toraka* θώραξ
arrow(s) *pataya* παλταιά παλτόν
arrow head (pointed head of...) *aikasama* αἰξμάνς
ash (wood) *kidapa* σχιδάπας
(fully) assembled *araromotemena araromotemeno* ἀραρομοτημένα νος
not assembled *anamota anamoton* ἀναρμοστεμένα ἀναρμοστέμενω
axles *akosone* ἄξονες

B

because of *eneka* ἕνεκα
(equipped with) binding straps *opidesomo* ὀπιδέσμοις
binder(s) *adete(re)* ἀνδετήρ ἀνδετήρες
black, dark *kerano* κελαινός
blinkers/blinders *opoqo* ὀπώπω
both/bi- api ἀμφὶ
on both sides *apoterote* ἀμφοτέρωθεν
bound, equipped with *araruya araruwoa* ἀραρύια ἀραρύϝοα
bridle (chain) *pasaro* ψάλλον
bronze, copper *kako* χαλκός χαλκόν
bronze/copper worker *kakeu* χαλκεύς
made of bronze/copper *kakiya kakiyo* χαλκία χαλκίος
without bronze/copper [2] *atarasiyo* ἀταλάνσιος
box-wood *pukoso* πύξος
builders *tokodomo* τοιχοδόμοι

C

carpenters *tekotone* τέκτονες
with chains *omopi* ὅρμοφι
chariot *iqiya* ἱππία
chariot, description of... *worawesa* ϝολλά ϝεσσα
charioteer *amaterate* ἁρματεηλάτης
chariot wheel (*see also* undercarriage) *amo* ἅρμον
copper (not talent *) *kako* χαλκός χαλκόν
made of copper *kakiyo kakiya* χαλκίος χαλκία
copper smith *kakeu* χαλκεύς
crimson *ponikeya* φοινίκια (fem.)
to be covered all over *apieke* ἀμφιέχει

D

debt, liability *opero* ὄφελας
decorated, inscribed *ayamena ayameno* αἰασμένα αἰασμένος

not decorated *anaita anaito* ἀναιτα ἀναιτος ἀναιτον
just delivered *amoiyeto* ἅρμοίεντοι
to deliver *apudoke* ἀπύδωκε
delivery *apudosi* ἀπύδοσις
distributed *epididato* ἐπιδίδαστοι

E

made of ebony *kuteseyo* κυτεσείοις
edges, without *outemi* ὐτέρμις
made of elm wood πτελέ ϝας

F

foal *poro* πῶλος πῶλοι πῶλω
follower, professional foot soldier, military attendant *eqeta* ἑπέτας
foot, border, edge, rim *temidwe* τέρμιδϝε
foot boards peqato πέκϝατοι
fragment, part *karamato* κλάσματος
from, with ἀπὺ

G

to give *dose* δώσει
gold *kuruso* χρυσός
goldsmith *kurusowoko* χρυσοϝοργός
grooves, with *See also* with studs *οδατωετα* ὀδατϝέντα

H

halters *poqewiya* φορβεϝιαί
head-band (*see also* reins) *apuka apuke* ἄμπυξ ἄμπυκες
head-bands, without *anapuke* ἀνάμπυκες
helmet *koru* κόρυς
horn (material) *kera* κέρας
horn worker *karewe* καραέϝεις
horse *iqo* ἵππος ἵππω ἵπποι
horse groom(er)s *ipopoqoi* ἱπποπόποι
hunter *kunaketa* κυναγέτας

I

with implements/paraphernalia *teukepi* τεύχεσφι
(from) inside *ete* ἔνθὲν
ivory *erepa* ἐλέφας
ivory worker *pirisate pirisatere pirietesi* πριέτερ πριέτερες πριέτεσι

K

king *ωανακα* ϝάναξ

L

leather *wirino* ϝρινός
leather hide *diptera* διφθέρα
made of leather *wirineyo* ϝρίνειος
lion (decorative) *rewo* λέ ϝων

M

well-made, well-worked *wozomeno wozomena* ϝορζομένος ϝορζομένα

N

new *newo newa* νέ ϝος νέ ϝα
not, on the other side *de* δὲ

O

other *hatero* ἄτερος
on the other side, not *de* δὲ
with one *eme* ἐμὲ
on top (of) *epi opi* ἐπὶ ὀπὶ
overseer (of weapons) *opiteukeu* ὀπιτευχεύς

P

(with) a pair of/set of (dat., instr. pl.) *zeuko zeukesi* ζευγός ζευγέσι
parts to be returned *ewepesesomena* ἐ ϝεπεψεσόμενα
purple, violet *popureya* ποφυρεία

R

ready, well-prepared *tetukowoa* τετυχυϝόα
red *erutaro erutara* ἐρυθρός ἐρυθρά
reins/head band? *aniya* ἀνία
with reins *aniyapi* ἀνίαφι
part(s) of the reins/bridle? *opiiyapi* ὀπίαφι
rims with spokes *temidweta* τερμίδϝεντα
rims (dual) with spokes *temidwete* τερμίδϝεντε
without rims or edges *outemi* ὀυ τέρμις

S

saddles? saddle pads *iqoeqe* ἴπποεπε
saddle-bags *katuro2 katurewiya* κανθύληϝιαι
sandals *pedira* πέδιλα
shell-shaped, spiral *kokireya* κολχιρεία
single, one, spare (wheel) *mono mona* μόνος μόνα
silver *akuro* ἄργυρος
spear *eko* ἔγγος
spiral *kokireya* κολχιρεία
spirals, in spirals, with spirals *toqide* τορπίδει
with straps, chains *omopi* ὄρμοφι

studs, with (of wheels) *odatuweta* ὀδατϝέντα
small sword(s), knives *pakana* φάσγανα
swords (with) *kipisi* ξίφεσι

T

thin, fine (craftsmanship) *pteno* φτενοί
tied on top of *epizota* ἐπίζωστα
two *dwo* δϝό
consisting of two parts *duwoopi* δυϝούπι

U

under/below *upo* ὑπὸ
undercarriage *amo amota amotasi* ἄρμον ἄρμοτα ἄμοτασι

V

vehicle *woka* ϝόχα

W

weapon, a type of *zowa* ζό ϝα
with/after *meta* μετὰ
wheel, chariot *amo amota amotasi* ἄρμον ἄρμοτα ἄμοτασι
wheel(s) *amota* ἄρμοτα
with wheels (on axle) (instr. pl.) *amotasi* ἄρμοτασι
with (a set of) wheels (on axle) *amotasi* ἄρμοτασι
without wheels *anamota* ἀνάρμοτα
willow *erika* ἐλίκας
workshop *opa* ὄπα
to the workshop of *amoteyonade* ἀραρμοτεώνανδε

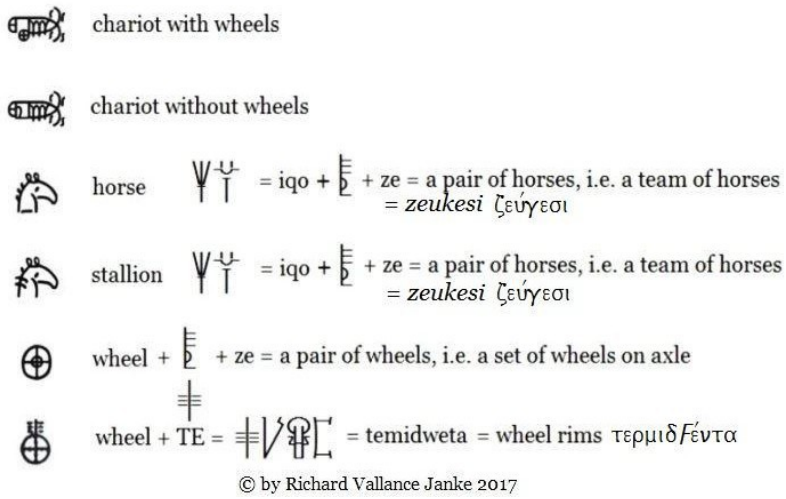
II. 3. Ideograms, supersyllabograms and Decipherment of Knossos tablet KN

894 Nv 01: The supersyllabograms

From Figure 6, Ideograms in the Military sector, we glean supersyllabograms. This article is not the place to discuss supersyllabograms in any detail, except to assert that *a supersyllabogram is the first syllabogram, i.e. the first syllable of any major Mycenaean term paired with an ideogram in any of the key sectors of the Mycenaean economy, including of course the military*. I have fully discussed in great depth the role of supersyllabograms in the military sector in my article, "The Decipherment of Supersyllabograms in Linear A" [**Janke, R. V.** 2015 , pp. 83 – 90]. It is absolutely essential that you read this section of the article with the closest attention and in depth. Otherwise, the supersyllabograms in Figure 6 above will bear no significant meaning.

Figure 6

ideograms related to chariot construction



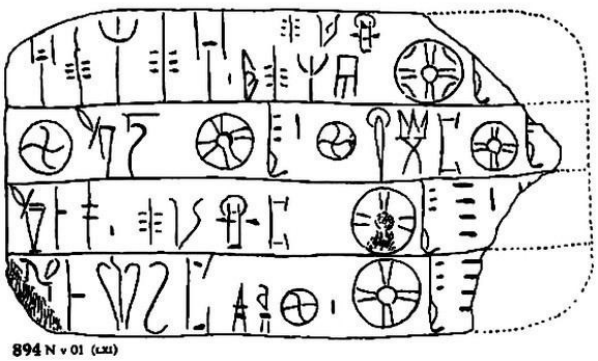
Supersyllabograms, once they are associated with ideograms, are clearly defined. Thus, the ideogram for *iqo* (horse), conjoined with the syllabogram *ze* = "with a pair of horses", in other words "with a team of horses" (instrumental plural), while the ideogram for wheel, paired with the syllabogram ze, signifies "with a pair of wheels", i.e. "with (a set of wheels) on axle", whereas the ideogram for wheel, with the syllabogram TE set directly on top of it references "wheel rims".

Decipherment of Knossos tablet KN 894 Nv 01:

Of all the surviving tablets from the Ashmolean Museum (British Museum) and Knossos dealing with chariot construction (some 120), Knossos KN 894 Nv 01 is definitely the most informative. Not only does it inventory chariot wheels 5 times on 4 lines, but also it details the types of pliant (hard) wood out of which Mycenaean chariots were constructed. The tablet is translated as follows:

Figure 7

Knossos tablet KN 894 N v 01 in the Ashmolean Museum, British Museum



Line 1. ateretea peterewa *temidwe* +ideogram for wheel, supersyllabogram + ZE for set or pair – tablet broken off (i.e. right truncated)

Line 2. *kakiya* +ideogram for wheel = "made of bronze" + *kakodeta* + ideogram for wheel, SSYL ZE for pair or set – tablet right truncated

Line 3. *kidapa temidweta* + ideogram for wheel, SSYL ZE for set or pair 41 – tablet right truncated line 4. *odatuweta erika* + ideogram for wheel, SSYL ZE for set or pair 40 to 89 – tablet right truncated

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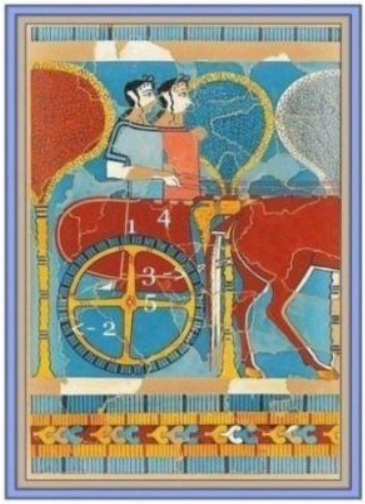
Line 3. *kidapa temidweta* + ideogram for wheel, SSYL ZE for set or pair 41 — tablet right truncated
line 4. *odatuweta erika* + ideogram for wheel, SSYL ZE for set or pair 40 to 89 — tablet right truncated
Decipherment:
Line 1. Pair/set of inlaid/unfinished? elmwood chariot wheel rims
the word *ateretea* is translated as "inlaid" from the Greek ἀιτῆρες,while the words ατελείωτος , ἀτελείς, mean "unfinished". Either way *ateretea* is an adjective that describes the wheel rims.
ἀτερεδέά ἀτελείωτος πτελεϝάς τερμιδϝέντα ζευγέσι ἄρμοτα
Line 2. 1 Bronze (copper) or pair of wheel fasteners , bronze set or pair of wheel rim fasteners
Since the *deta* on *kakodeta* refers to bindings, perhaps this line is refering to sets of types of fasteners of either copper and bronze for wheels (hubs, linch pins, nails, etc...). However, since copper is not as strong and tensile as bronze, it is more likely that the fasteners are of bronze.
χαλκίος ζευγέσι ἄρμοτα, χαλκοδέτα ζευγέσι ἄρμοτα
Line 3. 41 Sets or pairs of "kidapa" (ash wood) chariot wheel rims. We can take *kidap*a to mean ash wood, as it is a tough wood. It is also probably Minoan, since it begins with *ki*, a common Minoan prefix: *kida/kidi.* Although it may be a Minoan word*, kidapa a*ppears only on Linear B tablet KN 894 N v 01.
κιδάπα τερμιδϝέντα ζευγέσι ἄρμοτα
Line 4. 40 to 89 ? sets of grooved willow-wood chariot wheels
ὀδατϝέντα ἐλικα ζευγάρι ἄρμοτα 40 -89 ?
Specific notes:
[1] It is *not* really possible to write out Greek sentences in Mycenaean Greek, in view of the fact that sentences are almost never used on Linear B tablets, given that these are inventories. Grammar is not characteristic of inventories, ancient or modern. So it is up to us as decipherers to reconstruct the putative "sentences" which might be derived from each of the tabular lines in an inventory. So long as the sentences and the ultimate paragraph(s) make sense, all is well.
[2] "wheel rims" is an acceptable reading.
[3] Mycenaean Greek is in fact an archaic Greek dialect, and archaic Greek is absolutely appropriate in the context.
[4] In Line 2, *kakiya (*genitive singular of *kako*) might mean copper, but is much more likely to mean "(made *of*) bronze" (gen. sing.), given that copper is a brittle metal, more likely to shatter under stress than is bronze. Copper tires would simply not hold up. Neither would pure bronze ones. Either would have to be re-inforced, and in this case by *kidapa* = ash? wood. That is the clincher, and that is why the word *kidapa* appears on this tablet.
[5] In Line 5, *odatwenta* does *not* mean "with teeth", but the exact opposite, "with grooves" or "with notches". After all, if we *invert* teeth in 3 dimensions, so that they are inside out, we end up with grooves. This can be seen in the following illustration of a Mycenaean chariot in the Tiryns fresco of women (warrior) charioteers:

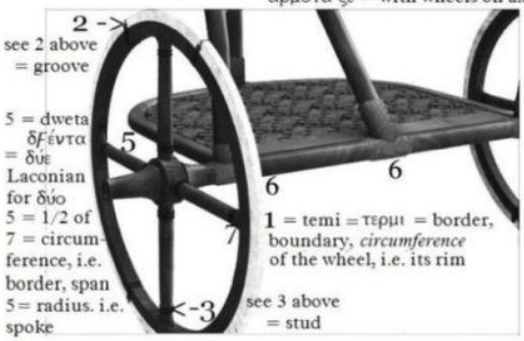
[1]

Figure 8



Fresco of a chariot with two women drivers at Tiryns

Fresco of a chariot wih two women drivers at Tiryns
illustrating enumerated chariot parts
1 = temidweta = temi + 5 dweta = τερμιδϝέντα = rim
2 = odatuweta = ὀδατϝέντα = groove + 3 = stud
4 = chariot (ideogram) 6 = supersyllabogram for - amota + ze
ἅρμοτα ζε = with wheels on axle



On the other hand, scythes, which are after all similar to teeth, were commonplace on ancient chariots, including Egyptian, a nice little clever addition to help cut or chop up your enemies. Still, it is unlikely that Mycenaean chariots would be reinforced by scythes, in view of the fact that there are far too many of them even on the fresco above. That is why we take *odatwenta* to mean "indentations" or "notches". But *odatwenta* could refer to "studs", which like notches, are small, even though they stick out.

[2] Finally, we are confronted with the strange archaic Greek Mycenaean word, *temidweta*. What can it possibly signify? It is actually not so arcane as one might think. Taking the first two syllables, *temi*, we discover that they are equivalent to ancient Greek te/rmi, which generally signifies "end, boundary". Now this is a decidedly odd translation for something dealing with wheels. But if we stop for just a moment and think about it, it turns out that there is a translation which exactly suits the context, and it is "circumference". In other words, *temi* is the circumference of a wheel, and the circumference of a wheel is its *rim*. Taking then the last two syllables, we have *dweta*. This is archaic Mycenaean Greek for δϝίντα. It is clear that this has something to do with the number two. But what? Examing the word more closely, we find that it is in the neuter plural. So it actually means 4 and not 2. But again, 4 what? The answer is staring us in the face. It is four spokes. After all, Mycenaean chariot wheels were four-spoked and the 4 spokes axles reached to the circumference,
i.e. the rim. *Voilà*! The word *temidweta* is translated. It signifies a wheel with 4 spokes reaching to the rim. And that is the quintessential Mycenaean chariot wheel. This translation is buttressed by the alternate *temidwete* (τερμιδϝέντε), as attested by L. R. Palmer [**Palmer, L. R.** 1963 [1998], p. 456]. In the latter, the last two syllables (δϝέντε) are in the dual. And the dual implies 2 times. So once again, we hve 2 x 2 = 4 = four spokes reaching to the rim.

All in all, there are 107 Linear B tablets from Knossos dealing directly or indirectly with chariot construction. These are in 3 series, 11 intact tablets in the . (dot) series, from KN 04.02 – 04.41; 39 intact tablets and fragments in the – (series); 48 tablets and fragments in the KN 200s (KN 217 Nj 31 – KN 255 N l 11); plus 9 tablets and fragments from the Ashmolean Museum, British Museum. All of these tablets are illustrative of chariot construction or military paraphernalia related to chariots, charioteers and teams of horses. Here we have two such tablets, which exemplify various aspects of chariot construction. As can be seen in the first (Figure 9), the chariot has been decorated but the wheels have not yet been mounted. This would imply that the chariot builders routinely decorated the chariots themselves, or that they hired decorators for this purpose. In the second example (correction: "anamota" should read "anamoto" in Figure 9.

Figure 9

Tablets from the excavations of 1904 at Knossos

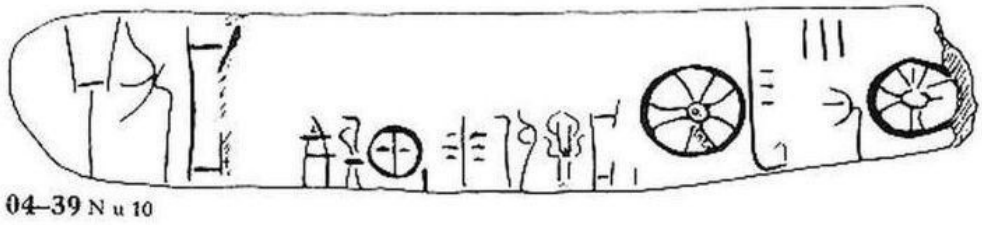
Linear B Latinized:
(i)qiya anamota ayamena + ideogram for "chariot with no wheels"
ie. a chariot body

Decipherment:
a decorated chariot (body) without wheels

(Figure 10), there are 3 chariots with wheels made of willow on axle, along with 3 spare wheels, which presumably were bound to the inside of the front or on one of the sides of the wicker cab. With tablets like these running to over 100, examples like these abound, accounting for all of the vocabulary in this lexicon.

Figure 10

Tablets from the excavations of 1904 at Knossos



04–39 N u 10

Linear B Latinized:
amota erika temidweta + ideogram for "wheels" + supersyllabogram ZE = zeukesi 3 + supersyllabogram MO + ideogram for "wheels"

Decipherment:
wheels, 3 sets of wheel rims on axle made of willow + 3 spare weels

Unless we take both the Linear B Lexicon for the Construction of Mycenaean Chariots and concomitantly Linear B supersyllabograms in the military sector of the Mycenaean economy firmly into account, no amount of effort on the part of any would-be decipherer of Linear B will result in the satisfactory decipherment of Linear B tablets in this sector.

Conclusions:

While humankind took its first real steps in self-defence in the Late Neolithic, when people established their first settlements as the direct result of the need for growing grains and other crops and raising livestock, and eventually constructed massive fortifications, it was not until the early Bronze Age in Sumeria (ca. 2,500 BCE) that the first chariots appeared. These vehicles were ponderous and cumbersome, ill-suited for hand-to- hand battle. However, by the end of the next millennium (ca. 1,400 – 1,200 BCE), the Egyptians and Mycenaeans, along with their contemporaries, had developed light, extremely mobile battle-worthy chariots, attaining the acme of perfection for technology available to them in the Late Bronze Age.

So over period of some 1,300 years, from the time of ancient Sumeria ca. 2,500 BCE to the twilight days of the Mycenaean Empire ca. 1,200 BCE, the chariot evolved into one of the most innovative implementa in the weapons arsenal in Bronze Age warfare. The critical innovation was was the spoked wheel, which allowed Bronze Age engineers to construct light, swift and yet sturdy horse-drawn chariots for use in battle. Yoked horses apparently wore saddle-pads. This is a point of contention in the design of Bronze Age chariots. The consensus among historians is that horses had no saddles. In our Linear B lexicon of Mycenaean chariot construction the term *iqoeqe* appears. There is no consensus that this word, in the dual, actually means saddles. So the translation "saddle" must be considered as arbitrary. It is much more likely to mean "saddle- pads", which would have been comfortable and practical enough to serve the purpose for which they were

intended. In other words, there were probably no saddles in the late Bronze Age. On the other hand, the term
= *katuro2 katurewiya,* probably does refer to saddle-bags. Moreover, what is really astonishing about Mycenaean chariot wheels is that, what with only 4 spokes, they had the tensile strength not to buckle under the intense pressures brought to bear on them by the harsh Mycenaean terrain they had to navigate. And what is true of Mycenaean chariot wheels is true of Mycenaean chariots *per se*. They were fast paced, highly mobile vehicles epitomizing the zenith of Bronze Age technology.

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