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A NEW FIND OF LEAD MIRROR FRAMES FROM RIT (VIMINACIUM)

ABSTRACT

Eleven miniature lead mirror frames were discovered during the protective archaeological excavations of Viminacium in 2015, at the Rit site. The frames were found in a ditch probably used at first as a canal for drainage and was filled with waste material during the cleaning of the necropolis afterwards. Some of the mirrors represent a unique find, since few of these types have been found on the territory of Viminacium so far, and the only analogies are the ones from the Hungarian National Museum in Budapest. These finds confirm the widespread opinion about these mirrors not having been used as cosmetic or toilet articles, but as cult/apotropaic objects.

KEYWORDS: LEAD, MINIATURE MIRROR FRAMES, RIT, VIMINACIUM, APOTROPAIC OBJECTS.

INTRODUCTION[1]

During the protective archaeological excavations of *Viminacium* in 2015, at the Rit site, eleven lead miniature mirror frames were found. This site was endangered by the expansion of the strip coal mine, Drmno. Rit is located north-east of the city of *Viminacium*. At this site, four villas and several parts of a necropolis (possibly more than one) have been excavated so far. The necropolis is located in a west-east directon, along the road which led from *Viminacium* to *Lederata* (Danković, Petaković 2013, 60–63; Mikić et al. 2006, 21–26; Milovanović et al. in print; Redžić et al. 2012, 66–70; Redžić et al. in print). Many pits were found at the necropolis, and some of them were used first for the extraction of clay, and later as waste pits, but some of them were probably primarily used as waste pits for the clean-up of the cemetery. A few ditches for the accumulation of water from this area were also investigated and, after losing their primary role, they were filled with the discarded material from the cemetery or from the residential objects nearby. Recent archaeological excavations have shown that these residential objects were erected during the III century, and they were followed by the necropolis spreading towards the north-east, probably along the road to *Lederata*.

1 This article resulted from the project: *IRS – Viminacium, Roman city and military legionary camp – research of the material and non-material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalisation and 3D visualisation* (*no. 47018*), funded by the Ministry of Education, Science and Technological Development of the Republic of Serbia.

Settling in this area stopped during the IV century, when the drainage system had also obviously stopped functioning, flooding the area and turning it into a reed-patch with swamps (Danković, Petaković 2013, 63).

During 2015, besides the investigated part of the necropolis, a section of a ditch was discovered and excavated. The ditch extended in an east-west direction, and the graves of the cremated and inhumed deceased are located south of the ditch. The primary function of this ditch and its definite dimensions could not be determined. The ditch was investigated through five trenches in which it could be followed diagonally, and it has been investigated to a length of 25.65 m and a maximum width of 2.20 m. At a depth of between 0.35 and 0.5 m in this ditch, eleven miniature lead mirrors were found, all of them located in an area of approximately 1 m^2. Besides pottery sherds, animal bones, brick and schist fragments, there have been found: a bronze needle with a head in the form of an axe, the bottom of a pottery lamp with a *NERI* stamp and a bronze coin from the middle of the III century (*Valerianus*, *Provincia Dacia*).

It is obvious that the ditch is connected to the cemetery, especially because of the position of the graves following the direction of the ditch. The ditch could have been the border of the necropolis, but also a canal for drainage. Over the course of time, the ditch was filled with the waste material during the cleaning of the cemetery. The finds of coins from the necropolis layer, as well as from the graves, suggest that the necropolis was used in the period of the second half of the II century and in the III century, the latest coins being from the time of *Maximianus* and *Diocletianus*.

LEAD MIRROR FRAMES FROM RIT

Eleven mirrors found in a ditch at the site of Rit belong to the miniature-mirror type, with a reflecting surface made of glass. The mirror frames are made of lead, cast in a bipartite mould. All of them are circular in shape, with leaves on top, while some specimens have a vertical handle, which can have a triangular widening or side strengthening in the lower part of the frame, preserved. This triangular widening could also be the scraps left from the casting process. The Rit specimens do not have preserved glass in the centre; on the back they have a circular relief around the opening for the mirror hole.

These mirrors can be divided into five groups, based on the frame decoration.

Five mirror frames (*Cat. Nos. 1–5*) have a surface divided into three concentric circular sections, two inner sections filled with radial lines, and the external one decorated with a wavy (stylised zigzag) line. Analogous to these frames are the specimens from the collection of the Hungarian National Museum. These three frames have the identical decoration as the Rit finds but, due to their unknown provenance, we remain deprived of information regarding their dating (Bózsa, Szabó, 2013: 67, II.3.16, Cat. No. 108–110). This type of mirror can be connected with the mirrors from *Pincum* (Спасић 1996, 54, кат. бр. 35) and Sucidava (Tudor 1959, 417, type VI, Fig. 1/7, Fig. 2/9–11), which have sharper zig-zag lines; these specimens were dated from the second half of the II to the III century.

One mirror frame (*Cat. No. 6*) is divided into three annular sections with sloping radial lines pointing in alternating directions. Analogies can be found in the collection of the Hungarian National Museum, but unfortunately they do not contain any additional information (Bózsa, Szabó, 2013: 64, II.3.9a. Cat. No. 85–95, II.3.9b. Cat. No. 90–94). The frame decorated with a fish-bone motif in the middle and radial lines around the outer edge (*Cat. No. 7*) can be classified as the same type. The closest analogy for this specimen is the mirror from Sucidava (Tudor 1959, 427, Fig. 1/5, Cat. No. 6).

One mirror specimen (*Cat. No. 8*) has a simply decorated frame with relief radial lines. Analogies

can be found at the Čair site, *Viminacium*, (Спасић 1996, 55, кат. бр. 37, second half of the II and the III century), as well as in the collection of the Hungarian National Museum (Bózsa, Szabó, 2013: 61, II.3.1. Cat. No. 53–57; 64, II.3.4 Cat. No. 60–68).

Two mirror frames are decorated with floral motifs (*Cat. Nos. 9–10*), namely spiral vines and granules. Analogies for these samples are numerous, due to the spread of the vine motif in the Roman period. A direct analogy is an example from the Hungarian National Museum, of unknown origin (Bózsa, Szabó, 2013: 81, II.3.69. Cat. No. 504).

An interesting and unique find is the mirror frame decorated with alternately distributed relief circles and rhomboids, which contain granules in the middle (*Cat. No. 11*); the space between the rhomboids and circles is also filled with single granules. The bottom of the frame and the handle are also decorated with a combination of geometric motifs and granules. This specimen has no direct analogies, but there is a certain similarity with the mirror from *Viminacium* (Спасић 1996, 33–34, 50–51, кат. бр. 19).

DISCUSSION

A cheap and simple technological process of lead production was crucial for its widespread use in the ancient period, and its specific features, such as its colour, weight and poisonous properties, gave certain lead objects magical and, above all, cult status. The curse tables, Danubian horsemen icons, deity figurines, but also miniature mirror frames, all belong to the category of cult objects made mostly, or exclusively, of lead, and rarely of any other material (Milovanović 2008, 5–8).

There are many different opinions concerning the usage of miniature lead mirrors in the Roman period. The ones of a rectangular shape might have been attached to the inner part of the lid of boxes for storing medical and cosmetic instruments (Kouzov 2002, 97) or they could have simply been kept in leather cases (Крунић 2000, 11). Also, there are opinions that miniature lead mirrors were some sort of souvenir, or that they were used as fetishes in cults and rituals (Kouzov 2002, 97). These miniature mirrors were often found in shrines dedicated to female deities, probably as votive gifts (Barrata 2009a, 67–74), or they were objects used in funerary cults (Bózsa 2012, 39) etc.

The miniature dimensions of the reflecting surface on these lead mirrors (the glass itself is usually not bigger than 2 cm in diameter) diminish their practical function. The greatest attention is paid to the richly decorated frame, so we could rather assume their cult use, especially considering the various symbolic motifs on them. The examples of mirrors with the inscriptions related to good luck (Спасић 1996, 59; Величковић 1959, 59–60; Косановић 2015, 224–225), erotic or love messages (Nemeth, Szabo 2010; Спасић 1996, 59) or containing dedications to the goddesses and women in general (Nemeth, Szabo 2010, 101–113; Barrata 2009a, 67–74; Barrata 2009b, 432–454; Sobin 2000, 175) confirm the apotropaic character of these items.

Mirrors were attested as objects of divination and magical rituals in the written sources of the classical period. For example, in the temple of Demeter in Patras, the future was foreseen by dipping a mirror into water. Large mirrors fixed at the entrance of the Despoina sanctuary in Lycosura gave interesting visions. In ancient Greek, divination with reflective surfaces was called catoptromancy. Mirrors were also connected with various dyonisiac-orphic rituals. The mirror was carried in front of the cult statue of Isis in processions, so that she could see her followers (Bósza 2009, 38–39).

Based on the finds, the lead mirror frames were discovered mostly in shrines: Sucidava, Orochak, Copilovtsi and Dulévo (Tudor 1959, 415–432), and in the necropolises: *Intercisa*, the West Cemetery of *Aquincum*, *Viminacium*, the necropolis near Mitrovačka petlja, *Burgenae* and *Naissus* (Дрча, Јеремић, Црноглавац 2012, 114, кат. бр. 99; Fitz 1957, 385–395; Крунић 2000, 17; Милошевић

1979, 117–118, сл. 9; Милошевић 1995, 202, T. VII, 1). The presence of lead mirrors in the graves in the Upper Moesia region is scarce. Based on the anthropological analysis of the inhumed skeletons, these were women or children, while the goods are usually chronologically insensitive. Individual finds of mirrors from the layers of the *Viminacium* necropolises prove that there were probably more mirrors inside the graves, but due to damage to the graves they ended up in the layer (Milovanović 2008, 121).

The presence of mirrors in the graves could be connected with their ability to reflect the sunlight, thus representing the materialisation of Sol, lighting the transition of the deceased to the afterlife (Јовановић 2000, 18). According to the old-German word *scukar,* a mirror is an object which retains shadow (von Franz 1995, 182). Their presence in graves could also be explained by the belief that a mirror holds the reflection of a human soul, and to free itself from the material remains, the mirror serves to keep the image, that is, the soul of the departed individual. The fact that a mirror is *Venus*'s asset should not be forgotten. In funeral cult, *Venus Funeraria* secured the return for the prematurely deceased and is often identified with the old Roman goddess *Venus Libitina* (Јовановић 2000, 18).

The finds originating from the objects of public and private character are less numerous (forts, amphitheatres and villas; Milovanović 2008, 145–146, kat. 117; Tomović 2001, 169, Fig. 32; Величковић 1959, 55–72).

* * *

The most numerous are those mirrors accidentally discovered and acquired through a buy-out or given as a gift to a museum collection, while their circumstances and the contexts are often unknown. As far as we know, the greatest collection of Roman lead mirrors belongs to the Hungarian National Museum, in Budapest. It consists of 720 lead mirrors from the Roman period, only 26 being from the territory of *Pannonia*, and 694 from the territory of the Middle Danube region and the Carpathian basin. The accidental finds of these mirrors comprise the greatest part of the collection, as well as the ones from private collections, therefore, the precise location of where these objects were found remains unknown (Bózsa, Szabó 2014, 195). The biggest collection of lead mirrors from the territory of the Roman provinces of Serbia belongs to the National Museum in Požarevac. The collection holds 130 lead mirrors, mostly from the site of *Viminacium* (site Čair; Спасић 1996, 29–68). It should be noted that this collection has grown in time, especially thanks to the addition of the newly discovered mirrors from the systematic excavations of *Viminacium,* which have been carried out continuously for years. The Vojvodina Museum in Novi Sad also has a significant collection of these objects. The most numerous are the findings from the area of Srem, especially from the sites of Hrtkovci and Gomolava (Даутова Рушевљан 2006, 336–340; Dautova Ruševljan i Brukner 1992, 60–61; 63, T. 2, 3).

A big concentration of lead objects has been noticed at the Čair site (*Viminacium*), which could suggest the existence of a workshop near the settlement beside the military camp, but the types of objects (mirror frames, pendants, amulets, miniature axes, statuettes of deities and icons of Danubian horsemen) suggest another possibility – a cult place or a sanctuary (Поповић 1992a, 30, 46). It is possible that every province had its own production centre. The workshops probably accepted one particular shape with standard or almost standard dimensions, but the possibility of the travelling *plumbarii* shouldn't be excluded (Крунић 2000, 13). If the decoration and style of these frames are analysed and compared to the same objects from *Dacia*, *Thracia* and *Pannonia*, a certain resemblance can be noted. However, the examples from *Viminacium* should probably form a separate group (Спасић 1996, 41–42).

* * *

Representations of mirrors are found on many reliefs, wall-paintings and mosaics from the Roman time. On these, mirrors are usually represented as attributes of deities (Venus, Cupid or Hermaphroditos), being the symbol of beauty and femininity, as well as objects for everyday cosmetic/toilet use (Bózsa 2012, 38).

Round mirrors with one handle often appear on Roman tombstones. The mirror was often shown below the epigraphic field or in the gable of the *stelae* with various objects (a comb, a rosette, a writing tablet, shoes; Vulić, 1931, 27–28, kat. 53; 213–214, kat. 569–570). On the pediment of a stela from *Singidunum*, a mirror is depicted together with a pair of shoes, a writing tablet and two rosettes. The tombstone belonged to a girl only two years and eight months old (IMS I 42). On *stelae* and *sarcophagi* in *Pannonia* and *Noricum,* a special type of depictions appears – standing girls, holding mirrors above their heads or on their chests (Bózsa 2012, 38; Garbsch 1965, Tafel 1–4; 12–15). Depictions of mirrors on tombstones can be linked to a funerary cult and they can also have the role of a mediator between two worlds – the profane and the afterlife (Bósza 2012, 39; Milovanović 2008, 122).

* * *

Decoration of miniature lead mirror frames is often lavish and very diverse; they are mainly adorned with geometric and floral, rarely figural motifs. The most numerous are the mirrors with a circular frame and a vertical handle. These lead mirrors are primarily typical of *Pannonia* and the Balkan provinces, while they are very rare in the western and northern provinces of the Roman Empire (Bózsa, Szabó 2014, 198, 204).

The Rit find mirror frames have rich decoration that can be associated with certain symbolic meanings. Geometrical motifs, such as radial lines on the lead mirror frames, could be connected with the Sun rays and solar mysticism in general, which dominated the II and the III century through the widely spread cult of the god Mithras (Спасић 1996, 37, 44–45). The motif of a rhomboid with the granule could be linked to the so-called "evil eye", against which various talismans of prophylactic character were worn (Спасић-Ђурић 2008, 158–159).

The vine motif was depicted very often in the Roman period – on tombstones, utilitarian and religious objects, mosaics, frescoes, etc. (Korać 2007, 19–22; Спасић 1996, 32). On the territory of *Pannonia* and *Moesia Superior,* this motif occurs from the II century onwards. Floral motifs, such as tendrils, grapevines and grape clusters, are shown on numerous lead mirror frames from the territory of Serbia (Даутова Рушевљан 2006; 336, тип II, сл. 2/9–11; Косановић 2015, 221–222; Крунић 2000, 6–13; Milovanović 2008, 127–133, тип II, III, кат. бр. 19–59; Спасић 1996, 31–34, типови I–VI, кат. бр. 1–23). A stylised depiction of a vine on the mirror frames could be connected with the grapevine, while the granules would represent the grapes. The periodic death and rebirth of the plant symbolically represent the waking of nature, but also life itself. In this case, the grapevine could be associated with the resurrection, not only that of nature, but also of the people who strive towards immortality. With the symbolic interpretation of the grapevine, it is inevitable to mention Dionysus. The deity is born again after death, resurrects, becomes the protector of the vegetation that dies and is reborn year after year, just like the deity itself. The motif of the grapevine is present mostly on gravestones (*stelae*, *sarcophagi*), independently or in combination with other ornaments, originally as a symbol of immortality, which, over the course of time, lost that function and became a decoration of those parts of the monuments suitable to be filled with vine motifs (the frieze or the frame of the writing field; Крунић 2011, 375; Миловановић 2001, 110–111). Wall painting of late ancient and early Christian tombs also contains the motif of the vine, which has, besides symbolising immortality, become a constituent part of the heaven representations for Christians

(Anđelković Grašar, Nikolić, Rogić 2013, 89–90; Korać 2007, 43–48; 73–74; Marijanski-Manojlović 1987, 17–32; Мирковић 1956, 53–71). The grapevine is often shown on the discs of pottery lamps, which, apart from their practical use, had a symbolic meaning in the funeral context – lighting the way to the afterlife for the deceased (Korać 1995, 151, kat. 1697; 172, kat. 2073; Крунић 2011, 374–375). The grapevine motif also occurs on pottery and toreutic vessels, and is particularly frequent in the period of the II to III century (Крунић 2011, 375).

CONCLUSION

New finds of lead mirror frames from Rit complement and confirm the already well-known and accepted opinion of scholars and experts on the cult-apotropaic character of these types of items. One cannot say with certainty that these finds form a hoard, but it is unlikely that the higher concentration of these types of items is found in one place by accident. The find location at the necropolis, as well as the frame decoration with specific symbolic motifs, indicates the funerary cult or apotropaic function of the mirrors.

The frames (*Cat. Nos. 1–5*) are identical in size and in all the details, so it can be suggested that they might have been made in the same workshop or even in the same mould. There are already assumptions about the existence of workshops for production of lead objects in *Viminacium*, so this information would stand in favour of that theory. Some of the types of these lead mirror frames have not been found in *Viminacium* so far. For most of the mirrors, analogies can be found in the Hungarian National Museum in Budapest.

The findings, mainly according to the finds from the nearby necropolis and from the ditch, are dated in the period of the II to III century, the period of the highest frequency of this type of finds in Roman provinces.

Fig. 1

Fig. 2

CATALOGUE

***Miniature mirror frame*, T. I/1, fig. 1**
Documentation centre Viminacium, inv. nr. 1601.
Lead, casting, bipartite mould.
Dimensions: length – 10.3 cm; frame diameter – 5.2 cm.
The frame is divided into three uneven concentric circle sections. Two inner circles are filled with straight radial lines, while the external section is decorated with wavy (stylised zigzag) lines. On top of the frame there are the remains of leaves. The handle is strengthened with two side bars and filled with horizontal lines.

Fig. 3

***Miniature mirror frame*, T. I/2, fig. 2**
Documentation centre Viminacium, inv. nr. 1602.
Lead, casting, bipartite mould.
Dimensions: length – 9.9 cm; frame diameter – 5.2 cm.
Frame decoration is identical to that of the previous specimen. The top of the frame has the remains of leaves. The handle has a triangular widening at its juncture with the frame. The lower part of the handle is filled with horizontal lines.

Fig. 4

***Miniature mirror frame*, T. I/3, fig. 3**
Documentation centre Viminacium, inv. nr. 1607.
Lead, casting, bipartite mould.
Dimensions: length – 7.2 cm; frame diameter – 5.3 cm
Frame decoration is identical to that of the previous example. The upper part of the triangular-widened handle is preserved.

***Miniature mirror frame*, T. I/4, fig. 4**
Documentation centre Viminacium, inv. nr. 1605.
Lead, casting, bipartite mould.
Dimensions: frame diameter – 3.9 cm
Frame decoration is identical to that of the previous specimen. The top of the frame is decorated with two leaves. The handle is not preserved.

Fig. 5

Fig. 6

Fig. 7

Fig. 8

***Miniature lead-mirror frame*, T. I/5, fig. 5**
Documentation centre Viminacium, inv. nr. 1611a.
Lead, casting, bipartite mould.
Dimensions: frame diameter – 5.2 cm.
Frame decoration is identical to that of the previous example. The top of the frame is decorated with two leaves. The handle is not preserved.

***Miniature lead-mirror frame*, T. I/6, fig. 6**
Documentation centre Viminacium, inv. nr. 1611b.
Lead, casting, bipartite mould.
Dimensions: length – 6.5 cm; frame diameter – 4.4 cm.
The frame is divided into four unequal concentric circular sections. An empty inner circle is by the glass hole and three panels with alternately directed, angled radial lines are next to it. At the top of the frame, in the direction of the handle, there are the remains of leaves. The fragmented vertical handle is decorated with a fish-bone pattern.

***Miniature lead-mirror frame*, T. I/7, fig. 7**
Documentation centre Viminacium, inv. nr. 1612.
Lead, casting, bipartite mould.
Dimensions: length – 5.8 cm; frame diameter – 4.3 cm
The fragmented frame is decorated with radial lines around the outer edge and a fish-bone motif in the middle section; the empty inner circle is by the glass hole. On the top of the frame there are the remains of leaves. Only the upper part of the handle with two side bars is preserved.

***Miniature lead-mirror frame*, T. I/8, fig. 8**
Documentation centre Viminacium, inv. nr. 1606.
Lead, casting, bipartite mould.
Dimensions: length – 6.0 cm; frame diameter – 3.8 cm.
The frame is decorated with straight radial lines. On the top of the frame there are two leaves. The upper part of the handle with two side bars is preserved.

***Miniature lead-mirror frame*, T. I/9, fig. 9**
Documentation centre Viminacium, inv. nr. 1603.
Lead, casting, bipartite mould.
Dimensions: frame diameter – 3.8 cm.
The frame is decorated with floral motifs. Relief granules are arranged around the glass hole and along the outer edge of the frame, while the middle section is filled with a spiral vine with leaves and granules. The handle is not preserved.

Fig. 9

***Miniature lead-mirror frame*, T. I/10, fig. 10**
Documentation centre Viminacium, inv. nr. 1608.
Lead, casting, bipartite mould.
Dimensions: frame diameter – 3.8 cm
Frame decoration is identical to that of the previous specimen. The top of the frame has the remains of leaves. The handle is not preserved.

Fig. 10

***Miniature lead-mirror frame*, T. I/11, fig. 11**
Documentation centre Viminacium, inv. nr. 1604.
Lead, casting, bipartite mould.
Dimensions: length – 7.7 cm; frame diameter – 3.9 cm.
The frame is decorated with a combination of geometrical motifs and granules. The adornment consists of alternately distributed relief circles with granules (two) and rhomboids (three) that contain granules in the middle; the space between the rhomboids and circles is also filled with single granules. The bottom of the frame is separated from the rest by a semi-circular relief line, along which two ornaments consisting of three semi-circles with granules are arranged. The handle has horizontal and zigzag relief lines with granules between them; two symmetrical volute-like widening with a circle and granules are set half way along the handle. There are two leaves with a small circle between them in the direction of the handle, on the top of the frame.

Fig. 11

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REZIME
NOVI NALAZ OKVIRA OGLEDALA OD OLOVA IZ VIMINACIJUMA (LOKACIJA RIT)

KLJUČNE REČI: OLOVO, MINIJATURNI OKVIRI OGLEDALA, RIT, VIMINACIUM, PREDMETI APOTROPEJSKE NAMENE.

Tokom zaštitnih arheoloških iskopavanja u Viminacijumu (lokacija Rit) tokom 2015. godine otkriveno je jedanaest okvira ogledala od olova. Lokalitet je bio ugrožen širenjem površinskog kopa Drmno, a nalazi se severoistočno od užeg gradskog jezgra Viminacijuma. Do sada su na ovoj lokaciji istražene četiri vile, kao i delovi nekropola. Skorašnjim arheološkim istraživanjima je utvrđeno da su ovi rezidencijalni objekti podignuti tokom III veka, i da su praćeni nekropolom koja se širi ka severoistoku, verovatno duž puta od Viminacijuma ka Lederati.

Okviri su pronađeni u rovu za koji se pretpostavlja da je prvobitno služio pri drenaži terena, a kasnije za odbacivanje materijala prilikom čišćenja nekropole, a mogao je predstavljati i granicu nekropole. Pored okvira ogledala, ulomaka različitih keramičkih posuda i životinjskih kostiju, u rovu je pronađena i bronzana igla sa glavom u vidu sekire, dno keramičkog žiška sa pečatom *NERI* i novac od bronze iz sredine III veka (*Valerianus*, *Provincia Dacia*).

Svih jedanaest primeraka minijaturnih ogledala od olova liveno je u dvodelnom kalupu. Svi primerci imaju kružni okvir sa listićima na vrhu. Pojedini primerci imaju u donjem delu očuvanu vertikalnu dršku, koja može biti trouglasto proširena ili ojačana bočnim krakovima. Staklo nije očuvano ni kod jednog primerka, a na njihovoj poleđini, oko otvora za staklo, nalazi se reljefna kružnica.

Prema dekoraciji, ova ogledala se mogu svrstati u pet grupa. Prvoj grupi pripadaju ogledala čiji su okviri podeljeni na tri koncentrična kružna polja, od kojih su dva ispunjena radijalnim linijama, a jedno, spoljno polje, ukrašeno je talasastom (stilizovanom cik-cak) linijom (kat. br. 1–5). Jedan okvir ogledala (kat. br. 6) je kružnicama podeljen na tri prstenaste zone sa kosim radijalima usmerenim u suprotnom smeru. U isti tip bi se mogao svrstati i okvir ukrašen motivom riblje kosti u sredini i radijalnim linijama oko spoljne ivice (kat. br. 7). Ogledala (kat. br. 8) ima jednostavno ukrašen okvir izveden reljefnim radijalnim linijama. Dva okvira ogledala su ukrašena vegetabilnim motivima (kat. br. 9–10), odnosno spiralnom lozom i granulama. Posebno je zanimljiv nalaz okvira koji je ukrašen naizmenično raspoređenim reljefnim krugovima i rombovima u kojima su kružnice sa granulom u sredini (kat. br. 11). Prostor između rombova i krugova je ispunjen pojedinačnim granulama. Donji deo okvira i drška, takođe su ukrašeni kombinacijom geometrijskih motiva i granula.

***

Pojedini primerci opisani u radu (kat. 1–5; 11) do sada nisu pronalaženi na teritoriji Viminacijuma i jedine zasada poznate analogije potiču iz Nacionalnog muzeja u Budimpešti. Nalazi su datovani u period II–III veka. Moguće je da nekoliko ogledala identičnih u dimenzijama i svim detaljima (kat. 1–5) potiče iz iste radionice (ili čak iz istog kalupa), koja se na osnovu brojnih nalaza minijaturnih ogledala od olova može locirati u Viminacijumu.

Novi nalazi olovnih ogledala iz Rita upotpunjuju i potvrđuju već dobro poznato i prihvaćeno mišljenje stručne javnosti o kultno-apotropejskom karakteru ove vrste predmeta. Moguće je da nalazi opisani u radu potiču iz grobova i da su u rov dospeli čišćenjem nekropole koja je locirana u neposrednoj blizini. Ne treba isključiti ni mogućnost da se radi o ostavi, s obzirom na to da su svi okviri pronađeni na površini od 1 m^2. Na kultno-apotropejsku funkciju ovih primeraka mogu ukazivati i dekorativni motivi njihovih okvira.

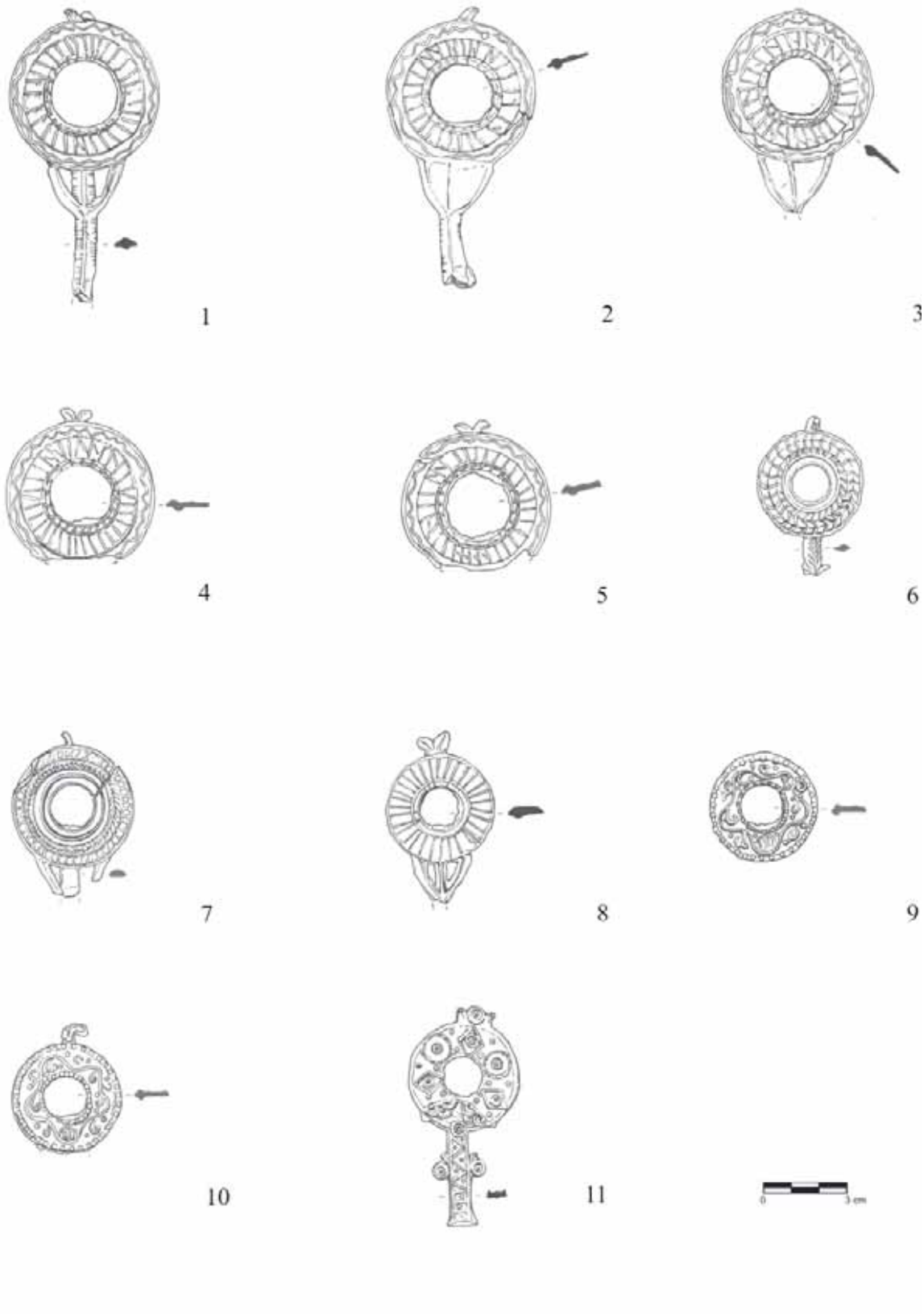

Table I. Lead mirror frames from Viminacium (the Rit site) (drawings by E. Dobrić and M. Ranisavljev)

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904:255.26"652"(497.11)
930.2:003.341(=124'02)(497.11)"01/02"
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JUPITER'S CULT AT THE TERRITORY OF VIMINACIUM

ABSTRACT

From the total of nine monuments dedicated to the cult of Jupiter, six of them are dedicated to Jupiter alone, as Capitoline Jupiter. Among the three others, one is dedicated to the Capitoline Triad, to Jupiter, Juno and Minerva, as well as other deities of the Roman pantheon and the Imperial cult. Among the remaining two monuments, one is dedicated to Jupiter and the ruling emperor, while the second one is dedicated to Jupiter, other deities of the Roman pantheon and the Lares. Dedicants of the votive monuments dedicated to Jupiter are mostly members of higher and high social strata.

KEYWORDS: ROMAN ERA, VIMINACIUM, JUPITER, CULT.

So far, at the territory of Viminacium,[1] there are nine votive monuments dedicated to Jupiter, both as a single deity or in groups with other deities. Among the votive monuments dedicated to Jupiter and other deities, one monument is dedicated to the Capitoline Triad, other Roman deities and emperor, one to Jupiter and the ruling emperor and one to Jupiter, other Roman deities and the Lares.

The earliest monuments dedicated to Jupiter were already collected by Vulić (cat. nr. 2, 3, 4, 7), while the remaining monuments were noted during the eighties of the last century (cat. nr. 1, 5, 6, 8, 9).

Originally, Jupiter was a heavenly deity and he ruled the weather conditions (Замуровић 1936: 220; Срејовић и Цермановић-Кузмановић 1979: 183). In time, he turned into the supreme deity of the Roman Pantheon. Since he was the god of heaven and light, all the annual days of the full moon (*idae*) were dedicated to him. Every month, on this very day, the supreme priest would sacrifice a white sheep, while at the beginning of vintage, he would sacrifice a lamb. Jupiter was the protector of winegrowers and grapevine, since this fruit depends on weather conditions most. As the deity who rules weather conditions, he was also connected to land fertility. In times of drought, prayers for rain were sent to Jupiter. Through wine, he was most likely also connected to libation and the cult of the dead. He was often connected with Mars and Liber, as well as with Terminus, since as the god who throws lightnings, he also ruled borders.

The dedication to Jupiter as Capitoline, *O(ptimus) et M(aximus)*, made a powerful protection of the empire. In all of the provinces and cities,

1 This article resulted from the project funded by the Ministry of Science of the Republic Serbia: *Romanization, urbanization and transformation of urban centres of civil, military and residential character in Roman provinces on territory of Serbia*, No 177007 funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.

including Viminacium, such dedication belongs to the most numerous ones (cat. nr. 1–5, 8, 9). After establishing a provincial city or town, one of the initial tasks of builders and architects was to erect a temple resembling the one in Rome and dedicate it to Capitoline Jupiter (Срејовић и Цермановић-Кузмановић 1979: 184). In the Capitoline temple in Rome, Sibylline Books were kept, all of the important documents and laws. There was no doubt that in the Capitoline temples in variuos provincial towns, all of the important documents and laws were kept, too. Certainly, Viminacium also possessed such a temple. Dedication to the Capitoline Triad, Jupiter, Juno and Minerva (cat. nr. 9), refered to a complete protection of the empire and the society. This indicates a good relationship between the Roman state and its society, confirming that in Viminacium also, the society and its organization were based on the standards of the Roman socio – political system. In the Capitoline temple, while entering adult age, young men offered sacrifices to the Capitoline Jupiter, while consuls and most likely magistrates in provinces, took their oaths.

We tend to think that dedication to Jupiter as the supreme and the most powerful one (*Optimus et Maximus),* actually the biggest and the best, contained all of the features of Jupiter as a deity, while by adding certain attributes, his specific features were highlighted. His most common attributes are *Fulgator*, the one that gets angry, i.e. Jupiter the Thunderer, further on *Cohortalis*, the protector of cohortes, and finally *Sacrum*, the sacred one. The attribute *Conservator*, found in Viminacium, was not so common. The attribute *Conservator* is encountered on two inscriptions from Viminacium (cat. nr. 6 and 7). It marks Jupiter as a guardian deity, a savior, who rescues people from trouble.

Juno represented one of the most important deities of the Roman Pantheon. She was respected from the very beginning, originally as a protectress of women, the goddess of the Moon and of the women in labour, the protectress of marriage. Her image is later gradually formed by divinisation of all of the female genii (Junos) into one divine woman. (Perhaps one should here pay attention to the so-called psycho-factor, i. e. "mental association" of why Jupiter is also quite often associated with Genii, although at least so far, not found as such at the territory of Viminacium). In time, from a protectress of women, Juno grew into the protectress of primarily married women, family, birth and therefore also the entire Roman society and also of the Empire. As such, she was celebrated as a queen (*Regina*), the wife of Jupiter. She was also respected as a goddess that multiplies people, but also protects cities in times of war and even as a protectress of the army. In Viminacium, there is a monument dedicated to Jupiter, Juno and Minerva, but also to other deities (cat. nr. 9). Here, Juno is described as *Regina*, the queen, indicating that she was respected as the wife of *Iupiter Rex*, the king, protecting the state and the people. In this case and as such, it is possible that she alsoprotected the army, especially since the monument is dedicated to other deities, too. Such a dedication to Jupiter, Juno and Minerva belongs to the odd ones, since there is also a dedication to other deities. Nevertheless, apart from his independant cult, Jupiter is most commonly associated with either Juno or Juno and Minerva (See: Imamović 1977: 132–135; Zotović 2016: 18–19, n. 1–3). Another question is whether other deities include the ones with whom, apart from Juno and Minerva, Jupiter is most commonly associated with (Mars, Liber, Genii, see Zotović 2016: 18, 19-20), or this generally refers to all of the deities of the Roman pantheon. Such a dedication could be regarded as rather rare. It is also possible that the dedication is related to all of the deities, especially because of the Capitoline Triad. Due to the original importance of Jupiter within the dedication, it could also refer to other deities with whom Jupiter was associated with. For the time being, the question remains open, the same as the question of how many temples, apart from the Capitoline one, were there in Viminacium?

Minerva was the goddess originally celebrat-

ed as the protectress of all of the handicrafts and craftsmen, as well as schools, teachers and pupils. In Rome, Minerva's cult was introduced due to a prompt development of handicraft. She was often associated with the god Mars, as well as with Jupiter, although most commonly with Jupiter. She was also connected to music, since very often worshiped by flute and trompet players. Later on, she was associated with the Greek goddess Athena. In all of these aspects, it is possible that she was connected to the army, since trompet players were very much appreciated in the army. There was also a special school for trompet players.

Besides, dedication to an emperor indicates socio-political spheres that influenced Roman social system. It also indicates that dedications to Capitoline Jupiter and the Capitoline Triad were of the utmost political and state importance. This is why dedications to emperors are often encountered together with dedications to Jupiter or the Capitoline Triad. So far, at the territory of Viminacium, only one dedication to Jupiter and to an emperor (cat. nr. 6) has been discovered, but also one dedication to the Capitoline Triad, Jupiter, Juno and Minerva, along with other deities and with the imperial cult (cat. nr. 9). Such dedications contributed to the even greater protection and security of the state. Dedications to Capitoline Jupiter and the imperial cult are not so rare. They are also encountered in Singidunum (Mirković 1976, n. 3, n. 4; Dušanić 1976, n. 101) and Naissus (Petrović 1979, n. 7, n 8, n. 9, n. 11, n. 14). A special question is if, due to a dedication to the imperial cult, one is allowed to think of eurgetism.

One of the very interesting dedications includes the one to Jupiter, other deities and Lares. Such a dedication is rare, actually the only one so far from Roman times at the territories of urban centers in Serbia. Lares were good spirits, living in the upper world and protecting their heirs and their home (Замуровић 1936: 259). The domestic Lares were especially respected and sacrifices have been made to them on every home festive occasion. Busts and images of Lares were kept near fireplaces, in special caskets (*lararium),* opene during every home festival. Offerings have been brought to them on special plates, containing different food. Just like all of the previously mentioned dedications, this one also indicates the state and political importance of Jupiter's cult. Along with other deities, he did not only represent a powerful protection of the state, but also of the entire society, empire and family.

If we look upon tectonic and morphologic features of the Viminacium monuments, we are likely to notice a rare appearance of monuments in the shape of cylinder. Before going further into detail, it is important to say that every votive monument represents a simplified temple entrance (Zotović 2016: 6). Basically, every votive monument consists of a pedestal, monument›s body, containing the engraved inscription and monument›s roof. Pedestals and roofs are separated from the body with a more or less highlighted profilation, the lower one, actually the pedestal, remaining undecorated, while the upper one, the roof, usually bore decoration (Imamović 1977: 126–127). The field with inscrptions was never positioned so low as with tomb monuments, confirming once more that votive monuments represent simplified temple entrances. In this case, the form of a cylinder (cat. nr. 7) literally imitates a temple column. The inscription field and its rectangular shape also represent a simplified temple column.

Although all of the monuments are rather damaged, two of them still bear visible ornaments (cat. nr. 6 and 8). There is an engraved triangular tymphanon with a rosette in the middle (cat. nr. 6), as well as leaf-shaped signs used to separate words (cat. nr. 8). Engraved triangular tymphana are also encountered on tomb monuments, resembling entrances to a deceased's home.With votive monuments, there is once more the case that they represent temple entrances. Since in Viminacium, all of the votive monuments to Jupiter are quite damaged, one cannot speak about favored ornaments. Palmettes are represented in angles of different tomb monuments and it can be presumed

that they were reduced to a simple decorative element, without a deeper symbolic meaning, the same as rosettes.

Due to the small number of finds, the frequence of monuments on different sites can be described as sporadic. The only site with a different picture is Kostolac, actually the site Viminacium, revealing the greatest number of the monuments discovered so far. Once again, this indicates the existance of a temple dedicated to Jupiter in Viminacium, but also to the Capitoline Triad. A separate question includes the monument finds from Smederevo, since it is not known whether they were brought there or that Viminacium possessed a special organization as a municipality. It would be a bold presumption that the territory of modern Smederevo was organized as a group of Roman citizens from the great Roman center in Viminacium, actually as a *concilliabulum*.

Another interesting fact is that on votive monuments from Viminacium dedicated to Jupiter, no dedicant names remained preserved or they were simply not stated. For the areas that possess cult analyses, including the cult of Jupiter, like the inland of the province of Dalmatia (Imamović 1977) and its eastern part (Zotović 2016), one can speak about the socio – economic status of dedicants. They were either Roman citizens, romanized inhabitants, Orientals, free citizens, former slaves or still enslaved (Imamović 1977: 129), but also members of the middle or higher social strata (Zotović 2016: 9). In this case, parallels cannot be drawn, except maybe for the eastern part of the Roman province of Dalmatia. According to the art of making monuments or according to dedication on them, one can tell whether dedicants of the votive monuments dedicated to Jupiter at the territory of Viminacium belong to the members of higher or high social stratum.

All of the monuments dedicated either to Jupiter alone or also to other deities can be dated into a broad chronological span, from the middle of the 2nd to the middle of the 3rd century.

Fig. 1

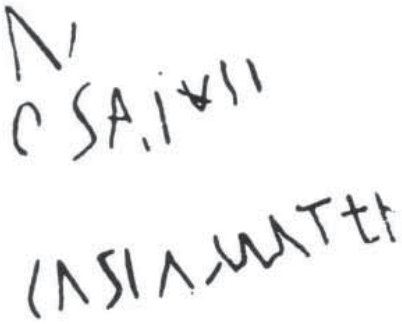

Fig. 2

Fig. 4

Fig. 3

Fig. 5

CATALOGUE

1. Altar, lime, dimensions 86 x 40 x 50 cm. Damaged in the lower right angle.
Site: Smederevo
Bibliography: Mirković 1986, 69, n. 17.
Dedication: *I(ovi) O(ptimo) M(aximo).* (Fig.1)

2. Altar, lime, dimensions 28 x 26 x 16,5 cm. Rather damaged.
Site: Kostolac
Bibliography: Вулић 1909, 121, nr. 31; Mirković 1986, 69–70, n. 18.
Dedication: [*I(ovi) O(ptimo)*] *M(aximo).* (Fig. 2)

3. Altar, lime, dimensions 80 x 34 x 48,5 cm. Rather damaged.
Site: Viminacium
Bibliography: Вулић 1909, 119, nr. 126; Mirković 1986, 70, n. 19.
Dedication: *I(ovi) O(ptimo) M(aximo).* (Fig.3)

4. Altar, lime, dimensions 36 x 36 x 25 cm.
Site: Čair
Bibliography: Вулић 1905, 84, nr. 15a; Mirković 1986, 70, n. 20.
Dedication: *I(ovi) O(ptimo) M(aximo).* (Fig.4)

5. Altar, lime, dimensions 170 x 47 cm. Rather damaged due to weather conditions and its lower left corner missing.
Site: Smederevo
Bibliography: CIL III 8106; Mirković 1986, 70–71, n. 21.
Dedication: *I(ovi) O(ptimo) M(aximo).* (Fig. 5)

6. Altar, lime, dimensions 45 x 24 x 18 cm. At the top, there is a carved triangular tympanum, in the middle, there is a rosette. In the outer corners, there are palmettes.
Site: Kostolac
Bibliography: Mirković1986, 71, n. 22.
Dedication: *I(ovi) O(ptimo) M(aximo) Cons(ervatori) Imp(eratoris) Caes(aris) L. Sept(imii)*

Sever[i] Pert(inacis) Aug(usti). (Fig. 6)

7. Altar, lime, cylinder shaped, dimensions 60 x 26 cm.
Site: Kostolac
Bibliography: Вулић 1931, 127, nr. 310; Mirković 1986, 71–72, n. 23.
Dedication: *I(ovi) O(ptimo) M(aximo) Cons(ervatori)*. (Fig. 7)

8. Altar, lime, dimensions 49 x 48 x 15 cm. The lower monument part is missing. On the upper part, there are acroterii. In the first inscription row, the words are separated with carved leaves.
Site: Čair
Bibliography: Mirković 1986, 72, n. 24.
Dedication: *I(ovi) O(ptimo) M(aximo) Dis Deabusq(ue) et Larib(us) domest(icis)*. (Fig. 8)

9. Altar, lime, dimensions 80 x 35 x 37 cm. The upper monument part, down to the beginning of the inscription, is missing.
Site: Kostolac
Bibliography: Вулић–Премерштајн 1900, 15, nr. 3; Mirković1986, 72–73, n. 25.
Dedication: *I(ovi) O(ptimo) m(aximo) Iunoni Reg[i]nae Minervae ceterisque Dis Deabusq(ue) pro salute domino[r(um)]n(ostrorum duorum) Severi et An[toni]ni Aug(ustorumduorum)*. (Fig. 9)

Fig. 6

Fig. 7

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Fig. 8

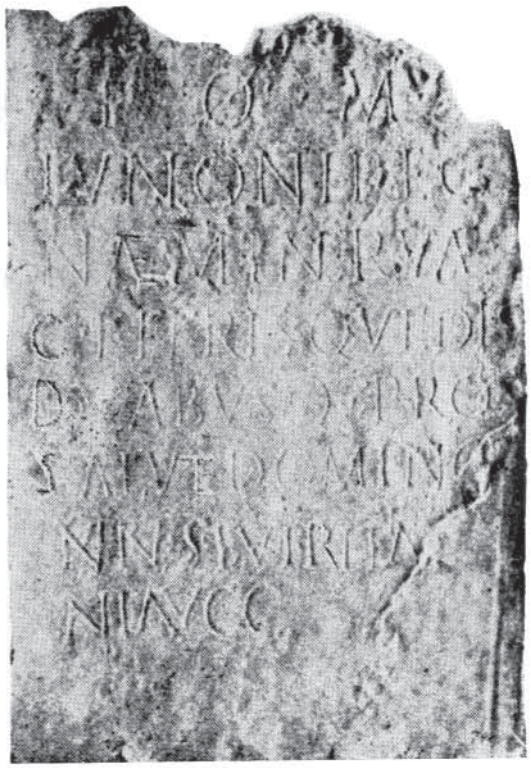

Fig. 9

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REZIME
JUPITEROV KULT NA PODRUČJU VIMINACIJUMA

KLJUČNE REČI: RIMSKI PERIOD, VIMINACIUM, JUPITER, KULT.

Na području Viminacijuma konstatovano je do sada ukupno devet votivnih spomenika posvećenih bogu Jupiteru, samostalno i u kultnim zajednicama sa drugim božanstvima. Od votivnih spomenika posvećenih Jupiteru i drugim božanstvima mogu se konstatovati jedan spomenik Kapitolinskoj trijadi, drugim bogovima i boginjama rimskog panteona i caru, jedan Jupiteru i vladajućem caru, i jedan Jupiteru i drugim bogovima i boginjama rimskog panteona i domaćim Larima. Sve ove posvete govore o tome od kolikog je značaja bio Jupiterov kult za zaštitu, ne samo države, već celokupnog društva i porodice. Dedikanti su pripadnici višeg ili visokog društvenog sloja. Svi spomenici se mogu datovati u širi hronološki period od sredine II do sredine III veka.

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FINDS OF ROMAN AGRICULTURAL TOOLS ON THE DANUBIAN LIMES IN UPPER MOESIA AS INDICATORS OF AGRICULTURAL DEVELOPMENT IN THE AREA OF MILITARY CAMPS

ABSTRACT

This paper discusses the Roman agricultural tools on the fortresses along the Danubian limes in Upper Moesia. The agriculture played an important role among Roman soldiers. The development and improvement of tools used for cultivating grain, which can be established after analyses of archaeological material, influenced the intensity of agricultural production and increased quantities. At the same time, this indicates the importance of the Danubian limes in the production of grain as the basic food intended for the military stationed in numerous castella along the Danube.

KEYWORDS: AGRICULTURAL TOOLS, FORTRESSES ALONG THE DANUBIAN LIMES, LATE ROMAN PERIOD.

Agriculture was a basic activity of the Balkan inhabitants even before these territories were occupied and became part of the Roman Empire[1]. However, the new Roman reign brought new organisation methods, more or less successfully including the local population, which again depended on the Romanisation level of the newly established Roman provinces.

Due to the lack of historic data, the role of the autochthonous elements can only be assumed, but not completely determined. At the same time, the organisation of agricultural estates remains insufficiently defined, since the data given by Roman agronomists is mostly related to other parts of the Roman Empire.[2] For example, in Apennine Peninsula, due to different socio-economic relationships, but also due to the climate and other natural circumstances, the organisation of agriculture must have been different from that in the Balkan provinces. As a result of this, archaeological finds, primarily agricultural tools, remain the best indicator of the agricultural activities in this area during Roman times.

According to their context, the agricultural tools excavated at the fortifications along the Danubian limes can mostly be dated into the Late Roman era. One can presume that the same, or very similar, types were used during the Principate, since these items belong to a group that rarely changes. In addition, the methods of agriculture remained somewhat unchanged during the entire Roman period. Much later, during the Middle Ages and through the entire 19th century, Serbian farmers used wooden ploughs, sickles and scythes, similar to those from the Roman period.

Scarce data from Roman authors reveals that the greatest part of Upper Moesia was covered with woods, including the area of the Danubian

1 The article results from the project: *Viminacium, Roman city and military camp – research of the material and non material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalization and 3D visualization* (no 47018), funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.

2 The most data about Roman agriculture can be found in works of Roman agronomists: Cato et Varro*, De agricultura*; Plinius, *Naturalis historia;* Columella, *De re rustica.*

limes. Priscus writes about thick woods to the north of Niš (Priscus, Frg. 8, p.291, 23-26). The forest was thick and impenetrable from the Danube at Branicevo to Trajan table. This appearance was retained for a long time. It could assume that the Byzantine Empire in the Middle Ages, better protected from the enemy by the impassability of roads than the troops. In a much later period, in 19th century travel writers spoke about thick oak forests in the territory of today's Serbia (Opra 1998: 169-170). It was well justified that the natural features of Serbia remained unchanged since the Roman times. Extensive changes of the natural surroundings occurred later, with the greater influences of the industrial revolution reaching our territory somewhat later than Western Europe.

A very important process in agricultural development is clearing forests and obtaining cultivable soil. Although there is no data preserved regarding organised clearing of great forest areas, it is certain that, during Antiquity, these activities took place on a large scale, especially in those areas suitable for farming. As a consequence of this, in areas of Roman provinces in the territory of modern Serbia, and along the Danubian limes, a great number of tools have been discovered, which were used for clearing, mostly forest vegetation, in order to obtain cultivable soil (И. Поповић 1988).

In fortifications, mostly of the Late Roman times, tools used for tilling soil were discovered in large quantities, indicating the changes that took place in this period, related to supplying troops. Most of the agricultural tools coming from military camps represent single finds, although hoards were also discovered, like those from the *castra* of Boljetin or Saldum. Among the finds of Roman tools, special attention will be paid to those intended for ploughing and sowing grain.

Ploughshare

At the sites along the Danubian limes in Upper Moesia, there were numerous ploughshare finds, representing parts of ploughs (Fig. 1). According to the typology by I. Popović, they are divided into several types and variants (И. Поповић 1988: 98-104). The majority belong to symmetrical forms, while a single non-symmetrical example comes from the *castrum* of Karataš (*Diana*). The symmetrical ploughshare type was discovered in layers or hoards and is mostly dated into Late antiquity, actually the second half of the 4th century. The find of a non-symmetrical example reveals that during Late antiquity, beside ploughshares, also contemporary ploughing devices, ploughs, were used.

Type Aa is a symmetrical ploughshare with a triangular blade and a very sharp point, spear-shaped, discovered on the following sites:

Karataš (*Diana*)
Excavation in 1983, C/923
End of the 4th and the beginning of the 5th century
Length: 32 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIII Aa, 100, cat. 1.

Kostol (*Pontes*)
Excavation in 1982, C/212
4th century
Length: 34.5 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIII Aa, 101, cat. 2.

Saldum
Excavation in 1968, field inv. 266
Tool hoard, 4th century
Length: 40 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIII Aa, 101, cat. 3; G. Jeremić, *Saldvm*, 164, cat. 484.

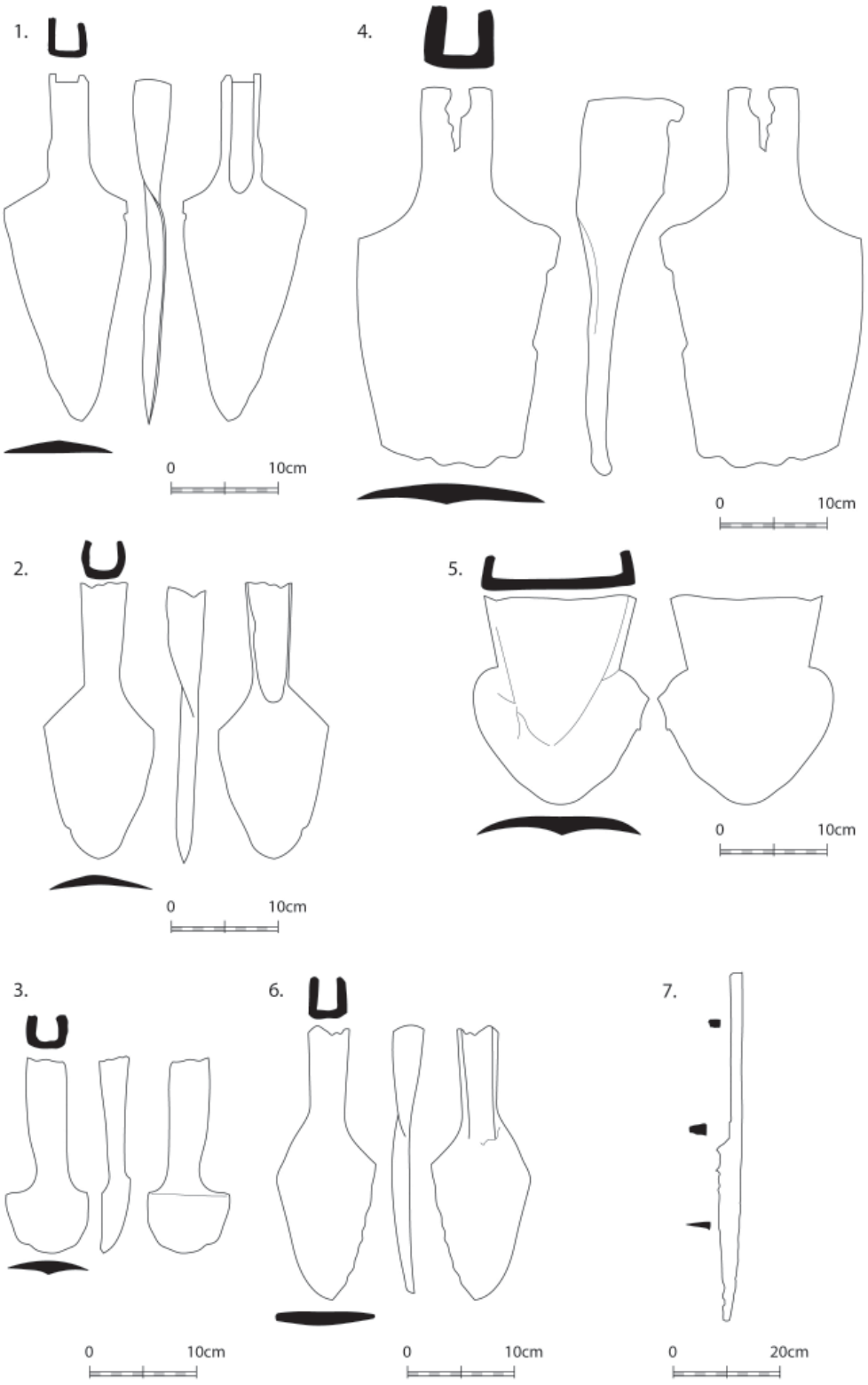

Fig. 1 Different types of ploughshares and coulter from the sites at the Danubian limes: 1, 6. ploughshares Karataš/ Diana; 2-3. ploughshares, Boljetin/Smorna (tool hoard); 4. ploughshare Kostol/Pontes; 5. ploughshare, Dražaj near Grocka (tool hoard); 7. coulter Boljetin/Smorna.

Boljetin (*Smorna*)
Excavation in 1965, field inv. 81
4th century
Length: 31 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIII Aa, 101, cat. 4.

Boljetin (*Smorna*)
Excavation in 1968, field inv. 864
Tool hoard discovered in an amphora, 4th century
Length: 42 cm.
Bibliography: Lj. Zotović, *Starinar* XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type XXIII Aa, 101, cat. 5.

Boljetin (*Smorna***)**
Excavation in 1968, field inv. 864
Tool hoard discovered in an amphora, 4th century
Length: 35 cm.
Bibliography: Lj. Zotović, *Starinar* XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type XXIII Aa, 101, cat. 6.

Type Ab is a ploughshare with a triangular blade and a rounded point:

Boljetin (*Smorna*)
Excavation in 1966, field inv. 405
4th century
Length: 28 cm.
Bibliography: Lj. Zotović, *Starinar* XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type XXIII Ab, 101, cat. 2.

Boljetin (*Smorna*)
Excavation in 1967, field inv. 760
Tool hoard, 4th century
Length: 22 cm.
Bibliography: Љ. Зотовић, Старинар XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type XXIII Ab, 101, cat. 3.

Boljetin (*Smorna*)
Excavation in 1967, field inv. 760
Tool hoard, 4th century
Length: 28 cm.
Bibliography: Љ. Зотовић, Старинар XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type XXIII Ab, 101, cat. 4.

Type Ad has a trapezoid shaped blade with rounded angles:

Kostol (*Pontes*)
Excavation in 1983, C/158
4th century
Length: 35.5 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIII Ad, 102, cat. 1.

Type B possesses a symmetrical ploughshare with a triangular blade, with a more or less rounded point. On the Danubian limes, only two examples have been discovered so far:

Kostol (*Pontes*)
Excavation in 1932, C/271
4th to 6th century
Length: 15.5 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIII B, 102, cat. 2.

Saldum
Excavation in 1968, field inv. 226
Tool hoard, 4th century
Length: 20.5 cm
Bibliography: И. Поповић, Античко оруђе, type XXIII B, 102, cat. 3; G. Jeremić, *Saldvm*, 164, cat. 486.

Type E is the last variant of symmetrical ploughshares from the Danubian limes fortifications. Such a ploughshare is arrow-shaped, with a triangular blade:

Ravna (*Campsa*)
Excavation in 1966, field inv. 96
4th century
Length: 73 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIII E, 103, cat. 1.

Saldum
Excavation in 1969, field inv. 559
4th century
Length: 64 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIII E, 103, cat. 2; G. Jeremić, *Saldvm*, 164, cat. 487.

Kostol (*Pontes*)
Excavation in 1980, C/102
4th to 6th century
Length: 25 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIII E, 103, cat. 3.

Type C, according to typology by I. Popović, is described as a non-symmetrical ploughshare with a long, opened socket with a rectangular cross-section and a deltoid shaped blade. The only example was discovered at the site Karataš.

Karataš (*Diana*)
Excavation in 1981, C/384
4th century
Length: 26 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIII C, 102, cat. 1.

The ploughshare types found at the Danubian limes fortifications were also discovered in the neighbouring territories of the Morava valley, Pannonia, Bulgaria, Hungary and Romania (Popović 1988: 103-104). We can say that the types named above represent typical features of the entire Balkans throughout the Roman era.

Coulter

A coulter is a heavy blade in the shape of a knife, fixed upon a joist, cutting vertically in front of the ploughshare, thus making ploughing easier. The majority of Roman coulters possessed a flat, dull side and were fixed onto the ploughshare joist. In the 3rd and 4th centuries, coulters were introduced with a loop on the dull side, used for fixing chains that were again used for fixing the coulters onto joists. According to the typology given by I. Popović, it is possible to distinguish two types of such a tool (И. Поповић 1988: 104-106). On the Danubian limes in Upper Moesia, both types were discovered in a hoard from Boljetin, dating from the 3rd to the middle of the 5th century.

Type A possesses a massive handle with a rectangular cross-section and a big flat or slightly bent, triangular blade. The dull side is flat, without a perforation or a loop used for fastening. Both types of this tool come from the *castrum* of Boljetin.

Boljetin (*Smorna*)
Excavation in 1967, field inv. 771
4th century
Length: 60 cm.
Bibliography: И. Поповић, Античко оруђе, type XXIV A, 105, cat. 1.

Boljetin (*Smorna*)
Excavation in 1967, field inv. 760
Tool hoard, 4th century
Length: 76.5 cm.
Bibliography: Љ. Зотовић, Старинар XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type XXIV A, 105, cat. 2.

Boljetin (*Smorna*)
Excavation in 1967, field inv. 760
Tool hoard, 4th century
Length: 57 cm.
Bibliography: Љ. Зотовић, Старинар XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type XXIV A, 105, cat. 3.

Type *B* is a coulter which possesses a massive handle with a rectangular cross-section and a big, flat, triangular blade. On its dull side, at the point where the handle becomes the blade, there is a perforation or a loop, used for fastening.

Boljetin (*Smorna*)
Excavation in 1967, field inv. 76
Tool hoard, 4th century
Length: 67.5 cm.
Bibliography: Љ. Зотовић, Старинар XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type XXIV B, 106, cat. 4.

Cleaner hoe

A cleaner hoe is a small shovel used for cleaning ploughshares. It consists of an oval or fan-shaped blade. From Late Antiquity, there is a single find from the site of Kostol (*Pontes*). According to the typology by I. Popović, this find possesses features of type A, with an oval blade (Поповић 1988, 108). So far, this is the only find from the limes in Upper Moesia.

Kostol (*Pontes*)
Excavation in 1983, C/172
4th century
Length: 11 cm.
Bibliography: И. Поповић, Античко оруђе, type XXVI A, 108, cat. 3.

Hoe

Throughout the entire Roman era, the hoe was a tool with a wide range of uses in agriculture. Apart from being used in gardens and vegetable gardens, this tool was used for cultivating grain. The lighter hoe type was used during grain and vegetable growth, in order to remove weeds and prevent soil from cracking. Light hoes were also used for digging up, manuring and covering seeds with soil. The basic type has not changed from Antiquity to modern times.

In the Danube valley, hoe finds are numerous. According to I. Popović, it is possible to distinguish several basic hoe types, with sub-variants within each type (Поповић 1988: 39-44). Depending on the structure of the tilled soil, there are types with triangular, trapezoid or fan-shaped blades.

Hoe type *Aa* was discovered at several sites from the Danubian limes: in Čezava (*Novae*), Saldum and Karataš (*Diana*). This hoe type possesses a trapezoid shaped blade, with a round socket (Fig. 2).

Saldum
Excavation in 1968, field inv. 270
Tool hoard, 4th century
Length: 24 cm.
Bibliography: И. Поповић, Античко оруђе, type IV Aa, 40, cat. 11; G. Jeremić, *Saldvm*, 165, cat. 489.

Saldum
Excavation in 1968, field inv. 268
Tool hoard, 4th century
Length: 30 cm.
Bibliography: И. Поповић, Античко оруђе, type IV Aa, 40, cat. 12; G. Jeremić, *Saldvm*, 165, cat. 488.

Čezava (*Novae*)
Excavation in 1968, T/1119
4th century
Length: 15.6 cm.
Bibliography: И. Поповић, Античко оруђе , type IV Aa, 40, cat. 16.

Variant *Ab* is distinguished by a trapezoid blade with rounded corners. Such examples were discovered within a tool hoard from the Boljetin *castrum*.

Boljetin (*Smorna*)
Tool hoard, 4th century
Length: 11 cm.
Bibliography: Љ. Зотовић, СтаринарXXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type IV Ab, 40, cat. 1.

Fig. 2 Different types of hoes from Saldum
(After: G. Jeremić, Saldvm: Roman and Early Byzantine Fortification, Belgrade 2009, fig. 80).

Boljetin (*Smorna*)
Tool hoard, 4th century
Length: 25.5 cm.
Bibliography: Љ. Зотовић, СтаринарXXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type IV Ab, 41, cat. 2.

Boljetin (*Smorna*)
Tool hoard, 4th century
Length: 29 cm.
Bibliography: Љ. Зотовић, СтаринарXXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type IV Ab, 41, cat. 3.

From the Danube limes fortifications, there are isolated hoe finds, but also those from hoards. According to the typology by I. Popović, they can be classified as hoe type *B*. Such hoes possess a trapezoid shaped blade, with huge shoulders and a rounded lower blade part. The socket is massive with a hammer-shaped ending.

Variant *Ba* of this hoe type is characterised with an approximately equal blade length and width. Such a type was discovered at the sites of Čezava (*Novae*), Kostol (*Pontes*) and Boljetin (*Smorna*).

Čezava (*Novae*)
Excavation in 1968, T/1282
4th century
Length: 19.5 cm.
Bibliography: И. Поповић, Античко оруђе, type IV Ba, 41, cat. 2.

Kostol (*Pontes*)
Excavation in 1980, C/14
4th century
Length: 20.5 cm.
Bibliography: И. Поповић, Античко оруђе, type IV Ba, 41, cat. 3.

Boljetin (*Smorna*)
Excavation in 1967, inv. nr. 539
Tool hoard, 4th century
Length: 20.5 cm.
Bibliography: Љ. Зотовић, Старинар XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type IV Ba, 41, cat. 6.

Boljetin (*Smorna*)
Excavation in 1968, inv. nr. 864
Tool hoard, 4th century
Length: 21 cm.
Bibliography: Љ. Зотовић, Старинар XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type IV Ba, 41, cat. 7.

Agricultural tools	Type/variant	Number of tools	Dating
Site ČEZAVA/NOVAE			
hoe	IV A/a	1	IV century
hoe	IV B/a	1	IV century
Site SALDUM			
ploughshare	XXIII A/a	1	IV century
ploughshare	XXIII B	1	IV century
ploughshare	XXIII E	1	IV century
ploughshare	XXIII C	1	IV century
hoe	IV A/a	2	IV century
hoe	IV B/b	1	IV century
Site BOLJETIN/SMORNA			
ploughshare	XXIII A/a	3	IV century
ploughshare	XXIII A/b	3	IV century
coulter	XXIV A	3	
coulter	XXIV B	1	
hoe	IV Ab	3	IV century
hoe	IV B/a	3	IV century
hoe	IV B/b	3	IV century
hoe	IV B/c	3	IV century
Site RAVNA/CAMPSA			
ploughshare	XXIII E	1	IV century
hoe	IV B/b	1	IV century
Site KARATAŠ/DIANA			
ploughshare	XXIII A/a	1	IV-VI century
hoe	IV Bc	1	IV century
Site KOSTOL/PONTES			
ploughshare	XXIII A/a	1	IV century
ploughshare	XXIII A/d	1	IV century
ploughshare	XXIII B	1	IV-VI century
ploughshare	XXIII E	1	IV-VI century
cleaner hoe	XXVI A	1	IV century
hoe	IV B/a	1	IV century

Table 1 The agricultural tools from the Roman sites on the Danubian limes in Upper Moesia.

Boljetin (*Smorna*)
Excavation in 1966, inv. nr. 261
4th century
Length: 26 cm.
Bibliography: Љ. Зотовић, Старинар XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type IV Ba, 41, cat. 8.

Variant *Bb* of this type possesses a blade in the shape of a long triangle with a rounded top. It was also discovered in several fortifications along the limes:

Ravna (*Campsa*)
Excavation in 1968, field inv. 65
4th century
Length: 20 cm.
Bibliography: И. Поповић, Античко оруђе, type IV Bb, 103, cat. 2.

Saldum
Excavation in 1968, field inv. 269
Tool hoard, 4th century
Length: 26 cm.
Bibliography: И. Поповић, Античко оруђе, type IV Bb, 42, cat. 4; G. Jeremić, *Saldvm*, 165, cat. 490.

Boljetin (*Smorna*)
Excavation in 1966, inv. nr. 261
4th century
Length: 25 cm.
Bibliography: Љ. Зотовић, Старинар XXXIII -XXXIV, 221; И. Поповић, Античко оруђе, type IV Bb, 42, cat. 5.

The third variant of this hoe type possesses a short blade, with an approximately equal length and width.

Karataš (*Diana*)
Excavation in 1982, C/589
4th century
Length: 14 cm.
Bibliography: И. Поповић, Античко оруђе, type IV Bc, 42, cat. 4.

Boljetin (*Smorna*)
Tool hoard, 4th century
Length: 11 cm
Bibliography: Љ. Зотовић, Старинар XXXIII-XXXIV, 221; И. Поповић, Античко оруђе, type IV Bc, 42, cat. 7.

The obtained statistics reveal that along the Danubian limes in Upper Moesia, among Roman soldiers, agriculture played an important role (Table 1). The development and improvement of tools used for cultivating grain, which can be established after analyses of archaeological material, influenced the intensity of agricultural production and increased quantities. At the same time, this indicates the importance of the Danubian limes in the production of grain as the basic food intended for the military stationed in numerous *castella* along the Danube.

According to inscriptions, it can be concluded that the military administration possessed specific territory, separated from that of a municipal nature. An inscription from the time of Alexander Severus gives testimony that, in 228, in Viminacium, such a military territory (*teritorium legionis*) was arranged (В. Поповић, 1968: 42). This kind of land ownership played an important role in supplying the army (Zaninović 1985: 63).

Nevertheless, it is not known who owned the land and where the borders of the public land (*ager publicus*) were, separating it from the legionary owned land (*teritorium legionis*). During the entire Early Imperial Age, outside these properties, there were certainly important rural communities of autochthonous populations, also practicing farming. This is indicated by a sacrificial altar from Ratiaria, dedicated to the god of herds and pastures, *Pali sancto pastorali* (Mirković 1968: 138).

While considering Late Roman fortresses along the Danubian limes and the question of

agricultural producers, one should bear in mind that during this period, apart from major changes in the social life and social status of farmers, there was also a change in the military organisation, which was again reflected in land ownership. From the 4th century onwards, military units along the border, *limitanei*, living within military camps, were given land that was used as pastures (*paludes*) (Jones 1973: 629). In 365, according to the law of Valens, for nine months, *limitanei* were paid in kind, while for three months, they were paid with money. In 406, according to the law of Arcadius, they were fully paid with money (Jones 1973: 630).

The nature of Roman border troops, *milites limitanei*, during Late Antiquity, is still partly unknown. In 363, for the first time, the name *limitanei* is mentioned (CTh. XII, I, 56), claiming that these represented troops stationed along the borders of the Empire. According to B. Isaac, one cannot claim that the limitani were just ordinary rural militia, consisting of farmer-soldiers, as was explained in earlier theories, still accepted by many scholars. According to him, these were territorial military units under the command of a *dux limitis*, whose main role was to control and protect the bordering area of the Empire (Isaak 1988: 146).

The earliest source describing *limitanei* that till their own land comes from the first half of the 5th century. The law from 423 prohibited anyone, apart from the owner, from tilling land in the vicinity of *castellani milites* (Jones 1973: 653). The law from 443 prohibited the leasing of land to newcomers, since only the limitanei (*milites limitanei*), who were previously excused from paying taxes, were allowed to till it (Jones 1973: 654). In such a way, at the beginning of the 5th century, a social layer of land owners was created – the border soldiers – *limitanei*. Their agricultural activities are attested not only with finds of agricultural tools from the Late Roman layers of the fortifications along the Danubian limes, but also with finds of granaries. In the 1980s, during archaeological research at the military camp in Kostol (*Pontes*), a large number of oval pits containing burned grain were discovered within the Late Roman layer. Such pits were unearthed in the area of the former *principia*, already abandoned at this time.[3]

Regarding remains of rural settlements with wooden houses, discovered near the military camps along the Danubian limes and dating from the end of the 3rd century to the time of Valentinian I (Petrović, Vasić 1996: 22), as well as other small finds discovered within some of the Late Roman fortresses (Gabričević 1986: 71-91, figs. 23-24) one can speak about the existence of civilian settlements near the military fortifications along the limes in the 4th and at the beginning of the 5th century (Vujović 2012: 29-43).4 It cannot be said with great certainty whether these were settlements of the families of the *limitanei* or whether rural civilian settlements were established in the vicinity of military camps, in order to supply the neighbouring troops.

3 Information was obtained from Dr. Sofija Petković, senior research fellow of Archaeological Institute from Belgrade, to whom I express my gratitude.

4 This topic was partly addressed by M. Vujović, in his paper about Late Roman helmets from the Danubian limes: M. Vujović, New Contributions on the Late Roman Helmets from Iron Gate, Весник Војног музеја у Београду 39, 2012: 29-43.

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REZIME
NALAZI RIMSKOG POLJOPRIVREDNOG ORUĐA NA DUNAVSKOM LIMESU U GORNJOJ MEZIJI KAO POKAZATELJ RAZVOJA ZEMLJORADNJE NA TERITORIJI VOJNIH LOGORA

KLJUČNE REČI: POLJOPRIVREDNO ORUĐE, UTVĐENJA NA DUNAVSKOM LIMESU, GORNJA MEZIJA, KASNOANTIČKI PERIOD.

Oruđe korišćeno prilikom obrade poljoprivrednog zemljišta registrovano je u znatnom broju u utvrđenjima uglavnom kasnoantičkog limesa, što ukazuje na promene koje su u ovom periodu nastale u načinu snabdevanja vojske. Većina poljoprivrednog oruđa koje potiče iz vojnih logora predstavlja pojedinačne nalaze, mada su registrovane i ostave poljoprivrednog oruđa poput one iz kastruma Boljetin ili Saldum. U radu smo se posebno osvrnuli na oruđe korišćeno za oranje zemlje i pripremu za sadnju žitarica: različiti tipovi raonika, crtala, otikača i motika.

Analizom dostupnog materijala možemo da zaključimo da je na Dunavskom limesu u Gornjoj Meziji poljoprivreda igrala značajnu ulogu. Razvoj i usavršavanje oruđa namenjenog kultivaciji žitarica uticali su, svakako, na intenzitet poljoprivredne proizvodnje i povećanje prinosa. Isto tako, to govori i o značaju koji je oblast Dunavskog limesa imala u proizvodnji žitarica kao osnovne životne namirnice namenjene vojnicima stacioniranim u brojnim kastelima na Dunavu.

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SIGNIS RECEPTIS AS A REVERSE MOTIVE ON ROMAN IMPERIAL COINS

ABSTRACT

Different signa militaria played an important role in legionaries' religious life, possessing a deep symbolic meaning. The highest honours were paid to the legionary eagle which, together with other insignia, was kept in a special sanctuary within a military camp. During battle, legionaries followed their insignia and died for them, since their loss would represent the biggest disgrace and meant the dismissal of a legion. Romans rarely lost their aquilae, and even if they did, they would attempt to retrieve them for decades. Some of these events were depicted on coins, with the inscription SIGNIS RECEPTIS. They are encountered on the coins of Augustus, Caligula and Vespasian.

KEYWORDS: ROMAN IMPERIAL COINS, REVERSE IMAGES, SIGNA MILITARIA, SIGNIS RECEPTIS.

The religion of the Roman military was special and complex and, during the Principate, it was based on two components[1]. First of all, there was the official cult of the emperor and the cult of state deities, but there was also a private, soldier's cult (local deities from a soldier's place of birth or from places where he was previously stationed, as well as local deities from the area of the actual military camp), practiced by groups or individuals seeking the protection of deities (Stoll 2007, 451). A special place, with deep symbolic meaning for soldiers, was taken by different *signa militaria*, which they followed into battle, died for, the loss thereof representing the greatest disgrace and usually meant the dismissal of a legion. Military insignia played an exceptional role in soldiers' everyday and religious life. They were worshipped as spiritual divinities, as they were deeply incorporated into the Roman military ideology and symbolism. They represented signs of the bravery and morals of each military unit and a stronghold of its pride and were kept in a special sanctuary within each military camp.[2] However,

1 The article results from the project: *Viminacium, Roman city and military camp – research of material and non- material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalization and 3D visualization (no 47018)*, funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.

2 There is a difference between *signa*, *vexilla* and *aquilae* (*RE* II.A.2: 2325-2327 (*signa militaria*), *RE* VIII.A.2: 2446-2454 (*vexillum*), *RE* II: 317-318 (*aquila*)). Each maniple and cohort possessed its own signa – a spear with a crossed piece of wood on top, while on the spear there were circular medallions and wreaths, often with a hand on the very top. During Republican times, on medallions, there were images of Mars or Minerva, while from the beginning of the Principate, there was an image of an actual or deified emperor (*imagines*). Vexilla belong to the oldest type of insignia, playing various roles, modified over time, and it was never actually understood to which military units and according to which crietria they were given. They were encountered with equestrian units, veterans, parts of legions (*vexillatio*), praetorian and scout cohorts and some other units (*RE* VIII.A.2: 2451). A vexillum is a square flag hung across a piece of wood on top of a spear. Sometimes, there was an eagle, Victoria or some other figure on top (*RE* VIII.A.2: 2451-2452). The legionary eagle represented the insignia of every legion (*numen legionis*)

although the appearance of specific military insignia is known, the question of their allotment to certain military formations has not yet been completely answered (Rossi 1965: 41-81; Helgeland 1978: 1473-1480; Борић-Брешковић 1986: 132-133, ref. 50-56).

Ever since the 1st century BC, as reverse motives, different military insignia appeared on Republican coins. On early Imperial coins, they became quite usual, both on imperial and provincial mintings. They appeared independently, sometimes without an inscription that would indicate whether the series was dedicated to a specific legion or any other military formation, but also with inscriptions containing the names of specific legions. On the other hand, they also appeared with numerous motives as accompanying attributes, such as: *Concordia*/*Fides militum*/*exercituum*, *Princeps iuventutis*, *Matri castrorum*, *Virtus*, *Profectio*, *Adlocutio*, etc. A special place is taken by reverse motives and insignia with an accompanying legend SIGNIS RECEPTIS, indicating the return of previously seized military insignia. As already mentioned, the loss of military insignia represented the biggest disgrace for a legion. Such tragic events were noted several times in the history of Roman warfare. In certain cases, the seized military insignia were later retrieved, while some remained forever lost or their destiny remained unknown.

During the 1st century BC, the Romans were severely defeated three times by the Parthians, their legionary eagles seized and many soldiers captured. The first time was in 53 BC, the defeat and death of Crasus by Carrhae, after that in 40 BC, there was the defeat of the Syrian governor Decidius Saxa in Cilicia and finally, in 36 BC, the defeat of Mark Antony, during his retreat from Media.[3] Although it was never specifically stated, it is presumed that, in 19 BC, a legionary eagle was lost by one of the legions during in the final stages of the war against the Cantabri and Asturians.[4] Following this incident, there was a huge shock, which left a strong impression in Rome, caused by the loss of three legions and their insignia (*Legio XVII, Legio XVIII* and *Legio XIX*), in 9 AD, in Teutoburg Forest (Dio Cass. LVI. 21-22; Suet. Aug. 23). In 66 AD, during the First Judean war, a legionary eagle was lost by the *Legio XII Fulminata* and its destiny remains unknown.[5] In 70 AD, during the Revolt of the Batavi, under Civilis, the *Legio XV Primigenia* was completely destroyed, while the *Legio V Aleudae* suffered severe losses. On this occasion, some of the insignia were lost, although it can not be said with any certainty to which legions they belonged (Tacit, Historije, IV, 16, 18).[6] In 86 AD, during Domitian's Dacian wars, the *Legio V Aleudae* was finally destroyed and on that occasion, it lost its legionary eagle, whose destiny remains unknown.[7] Also uncertain

and, as such, it was respected in a special sanctuary within the military camp. It consisted of a spear with a silver or gold-plated eagle on top, holding a lightning bolt in its talons. They were introduced at the end of the 2nd century BC, during Marius' military reform, when each legion was given a number and an eagle, as a symbol of the supreme Roman divinity, Jupiter (Helgeland 1978, 1473).

3 The battle of Carrhae, in which some 20.000 soldiers died and an additional 10.000 captured, represents one of the greatest defeats in Roman history (Plut. Life of Crassus, 31.7; CAH IX, 611-612). For the defeat in Cilicia, *cf. Dio Cass. XL.25; CAH IX, 47. When it comes to losses, an approximate equivalent to Crasus' defeat was the one of Mark Antony, when about 25.000 soldiers were lost (CAH X, 33-34, ref. 159).*

4 In 19 BC, during the final stages of this long and difficult war, the command was taken over by Agrippa. He finally succeeded to crush the rebellion, although with great losses. One of the legions (presumably the *Legio I Germanica) lost its honorary name Augusta (Dio. Cass. LIV.11.5) and it is, therefore, suspected that it lost its eagle or signum.*

5 About 400 legionaries of the legion *XII Fulminata died defending their military insignia. As a result of this heroic act, the legion was not punished for the loss of the insignia, but it was restored (Helgeland 1978, 1475, ref. 14).*

6 *Legio XV Primigenia was not restored, unlike the Legio V Aleudae. However, during Domitians*' Dacian wars, it was completely destroyed and it was not restored thereafter.

7 Suetonius states that Domitian lost two legions in Dacia: the first one after the defeat of the consul Opius Sabinus and the second one after the defeat of Cornelius Fuscus, the praefectus of the praetorian cohorts (Suet. Domit. 6). According to historians' opinions, during the second defeat of Cornelius Fuscus, the *Legio V Aleudae* was destroyed, never to be restored (Salmon 1990, 248; Jones

Fig. 1-2 Avgust Oktavijan (preuzeto: http://www.ancientcoins.ca/RIC/index.htm);

is the destiny of the *Legio XXII Deiotariana* and its legionary eagle.[8] However, ever since Momsen, the greatest scientific discussion revolves around the *Legio IX Hispania*, whose disappearance has been left without any satisfactory explanation.[9]

Only three times during the Principate do reverse motives of *signis receptis* appear; on coins of Augustus Octavian, Caligula and Vespasian. Between the years 20 and 18 BC, the greatest number of different types appear on Augustus mintings:

1. Rv. SIGNIS (above) RECEPTIS (below), Mars, standing and holding an aquila in right hand, wearing a standard over left shoulder (RIC I: 44, no. 41; 46, no. 58; 47, nos. 80-84) (Fig. 1).

2. Rv. SIGNIS RECEPTIS, Aquila (on left) and standard (on right) flanking S P Q R arranged around shield inscribed CL V. (RIC I: 47, nos. 85-87) (Fig. 2).

3. Rv. CAESAR AVGVSTVS SIGN RECE, Kneeling Parthian, presenting standard with his right hand (RIC I: 62, no. 287) (Fig. 3).

4. Rv. CIVIB ET SIGN MILIT A PART RECVP, Facing quadriga on central part of trium-

1992, 141).

8 In 119 AD, the legion was attested for the last time (or maybe in 123), as it was still stationed in Alexandria. The next known legion list is from the time of Marc Aurel, but the *Legio XXII Deiotariana* does not exist in it any more. There is a presumption that it was destroyed between 132-135, during the second Judean War (Keppie 2000, 223-224, 225-232). Nevertheless, this scenario is considered uncertain and it is generally not accepted as a fact (Menahem 2003, 118).

9 For a long time, there was an opinion that, soon after 108, the legion was destroyed in Britain. However, the latest evidence discovered in Holland shows that in 108, the legion was still stationed on the lower Rhine, most likely between 121and 130 (CAH XI 2000, 497). Based on this, two new theories evolved: the legion was either destroyed during the second Judean War (132-135) or during the Parthian War, during the reign of Marc Aurel (161-166) (Keppie 2000, 173-181 with bibliography).

Fig. 3-4 Avgust Oktavijan (preuzeto: http://www.ancientcoins.ca/RIC/index.htm)

phal arch: figures on left and right hold, respectively, standard, Aquila and bow. (RIC I: 50, nos. 131-137) (Fig. 4).

5. Rv. S P R SIGNIS RECEPTIS, legend in three lines in the opening of the triumphal arch; above the opening, there is the inscription IMP IX TR PO IV or V; on top of the arch there is a triumphal quadriga; to the left and right, on each wall there is an aquila (RIC I: 82, nos. 508-510) (Fig. 5).

6. Rv. SIGNIS RECEPTIS or SIGNIS PARTHICIS RECEPTIS, Capricorn on right (RIC I:. 83, nos. 521-522) (Fig. 6).

7. Rv. SIGNIS PARTHIC RECEPT or SIGNIS PARTHICIS RECEPTIS, inscription in three lines (RIC I: 83, nos. 523-526) (Fig. 7).

Such aurei and denarii commemorate the retrieval of the standards previously captured by the Parthians, as well as of the captured soldiers, which all occurred as a result of Augustus' great diplomatic activity. On this occasion, he was acclaimed imperator for the ninth time, while this diplomatic victory was celebrated in Rome as a victory on the battle-field, with a triumph and a triumphal arch. The standards that were brought to Rome were dedicated to Mars Ultor and were temporarily placed in the small temple on the Capitoline Hill, while in the year 2 BC, they were transferred to the glorious temple in Augustus' forum, dedicated to Mars Ultor (CAH X: 263). In connection to the dedication of the retrieved standards to this deity, as a reverse motive, there is a round temple with Mars standing in it, holding an aquila and a trophy, but with legend MAR VLT (RIC I: 46, no. 68) (Fig. 8).

Reverse motives clearly reflect different aspects of this event: a subordinated Parthian handing over a standard; Mars Ultor, to whom the stan-

Fig. 5-8 Avgust Oktavijan (preuzeto: http://www.ancientcoins.ca/RIC/index.htm)

Sl.9 Kaligula (preuzeto: http://www.ancientcoins.ca/RIC/index.htm);

Sl. 10 Vespazijan (preuzeto: BMC II, Pl. 35.6)

dards were dedicated, with the temple they were kept in; an image of the triumphal arch, built to honour this event, with the image of an aquila; Aries, the birth sign of Augustus, was considered a good omen; an image reflecting Augustus' virtues, owing to which he managed to retrieve the standards – the motive of the shield of virtues, given to him by the Senate.[10]

After one of the heaviest Roman defeats in Teutoburg Forest, it took over twenty years to retrieve the legionary eagles of two legions. This was during Germanicus' campaigns against the Germans. The eagle of the *Legio XIX* was retrieved in 15 AD and another one the year after (Tacitus, Annales, I.60; II: 25). The third eagle was only retrieved in 41 AD, during Claudius' reign (Cass. Dio, LX.8.7). Caligula minted commemorative mintings to honour Germanicus and his victories over the Germans:

8. Av. GERMANICVS CAESAR, Germanicus, bare-headed, with a cloak, standing in an ornamented slow quadriga, on right; in left hand he holds an eagle-tipped sceptre.

Rv. SIGNIS RECEPT DEVICTIS GERM S C, Germanicus in military dress, standing left, raised right arm and holding an aquila in his left (RIC I: 112, no. 57) (Fig. 9).

In 17 AD, Germanicus celebrated a triumph for his victories in Germany and retrieving the eagles lost under Varo. On this occasion, a triumphal arch was built close to the ancient Temple of Saturn (Tacitus, Annales, II.41; Cass. Dio, LVII.18.1). On coins, Germanicus is shown as a

10 In 27 BC, the shield of virtues (*clipeus virtutis*) was given to Augustus by the Senate for "*virtutis clementiaeque iustitiae et pietatis causa*", virtues that represent a sum of qualities that must be owned by a good princeps. This is a motive that often appears on Augustus' mintings (RIC Ia, 46).

triumphator, on the obverse in a quadriga with a sceptre, on the reverse in a military suit, holding an Aquila that he managed to retrieve to Rome. The gesture of the raised right arm, to shoulder height or higher, was connected only to the emperor or members of his closest family, expressing untouchable power (Brilliant 1963: 68-69).

Only once more during the Principate, in 71 AD, during Vespasian's reign, does the inscription SIGNIS RECEPTIS appear on coins:

9. Rv. SIGNIS RECEPTIS S C, Victoria flying right and offering aquila to Vespasian, standing to the left, on a platform (RIC II : 71, no. 461) (Fig. 10).

It is not completely clear which quila is represented. One of the possibilities is that it represents the aquila of the *Legio XV Primigenia*, lost during Civilis' uprising in Gaul, which ended in 70 AD (RIC II, 8; Gambash, Gitler and Cotton 2013: 100). The other, less plausible, possibility could be connected to the Fall of Jerusalem, in 71 AD and the possible retrieval of the aquila of the *Legio XII Fulminata* (Bianco 1968: 208-209).

The official religion of the Roman army was conceived in such a way as to secure the soldiers' satisfactory lives, actually to enrich the meaning of the soldiers' lives. It represented a system of cultic rituals regulated for all of the military units, no matter in which part of the Empire they were stationed. Besides this official military religion, there were religious rituals brought by various soldiers and respected for private reasons. A special feature of the Roman army was the huge symbolic meaning of the insignia, which played an important role both in soldiers' every-day and cultic lives. Our knowledge about the religious meaning of the insignia of specific military units is limited, although the cult of the legionary eagle is very well documented. The aquila was paid divine respect, mostly because it was connected to the supreme deity Jupiter. The day when a newly established legion was given an aquila was celebrated as *diem natale aquilae*. It was kept in a special sanctuary within military camps, along with other insignia. It was regularly honoured during different rituals. The loss of an aquila during battle would represent the ritual death of a legion, which would be dismissed and never restored with the same number and name (Baumgarten 2002: 87-88). Romans rarely lost their aquilae, but in cases when it occurred, they tried for decades to retrieve them. Some of these events were immortalised with depictions on coins, remaining as an eternal testimony to the great dedication and to the losses suffered in order to retrieve the aquila.

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REZIME
SIGNIS RECEPTIS KAO REVERSNI MOTIV NA RIMSKOM CARSKOM NOVCU

KLJUČNE REČI: RIMSKI CARSKI NOVAC, REVERSNA PREDSTAVA, SIGNA MILITARIA, SIGNIS RECEPTIS.

Oficijelna religija rimske vojske bila je koncipirana tako da obezbedi zadovoljavajući život vojnika, odnosno da obogati smisao vojničkog života. Predstavljala je sistem kultnih obreda kojisu bili propisani za sve vojne jedinice, bilo gde da su bile stacionirane u Carstvu. Pored ove oficijelne vojne religije, izdvajaju se religiozni obredi koje su vojnici doneli sa sobom i koje su poštovali iz privatnih razloga. Posebna karakteristika rimske vojske bilo je veliko simbolično značenje insignija, koje su imale ulogu kako u svakodnevnom, tako i u kultnom životu vojnika. Naše znanje o religijskom značaju insignija pojedinih odreda vojske je ograničeno, ali kult legionarskog orla je veoma dobro dokumentovan. Akvili su ukazivane božanske počasti, samim tim što je bila povezana sa vrhovnim božanstvom Jupiterom. Dan kada je novoustanovljena legija dobila akvilu proslavljan je kao *diem natale aquilae*. Sa drugim insignijama čuvana je u okviru logora u posebnom svetilištu, gde joj redovno ukazivane počasti u sklopu različitih ritualnih radnji. Gubitak akvile tokom bitke značio je ritualnu smrt legije, koja bi bila raspuštena i nikada nije ponovo formirana legija sa istim brojem i imenom.

Ovakvi tragični događaji zabeleženi su nekoliko puta u istoriji rimskog ratovanja, u izvesnim slučajevima zaplenjene vojne insignije su kasnije povraćene, dok su neke ostale zauvek izgubljene ili je njihova sudbina ostala nepoznata.

Neki od tih događaja zabeleže*ni* su predstavama na novcu sa legendom *SIGNIS RECEPTIS*. Pojavljuju se u kovanjima Avgusta, Kaligule i Vespazijana. Najveći broj različitih tipova reversnih predstava iskovan je između 20. i 18. g. s. e. povodom povratka ranije zaplenjenih insignija od strane Parćana. Sjajnom diplomatskom aktivnošću je Avgust Oktavijan uspeo da mirnim putem povrati rimske svetinje i preživele zarobljenike. U kovanju Kaligule se pojavljuje komemorativni novac u sećanje na njegovog oca Germanika i povratka legionarskih orlova izgubljenih u Teutoburškoj šumi. Motiv *signis receptis* pojavljuje se smo još u kovanju Vespazijana iz 71. g.n.e. s tim što ostaje nejasno koja akvila je u pitanju (*Legio XV Primigeniaili Legio XII Fulminata*).

Rimljani su retko gubili akvile, a i u tim slučajevima su decenijama pokušavali da ih povrate. Neki od tih događaja obeleženi su i predstavama na novcu i ostali zauvek kao svedočanstva velike požrtvovanosti i gubitaka uloženih u njihov povratak.

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CONCEPT OF PROVIDENTIA DEORUM WITHIN THE IMPERIAL CULT AND PROPAGANDA ON ROMAN IMPERIAL COINS DURING THE PRINCIPATE

ABSTRACT

Ever since the beginning of the Principate, after establishing the imperial cult, propaganda was also developed and adjusted to support this cult. Reverse images on coins expressed different aspects of the imperial cult, among others the concept of providentia deorum. Starting during Domitian's reign, then during Trajan's, in Hadrian's time, the concept of providentia deourum is clearly focused, expressing multiple connections of the emperor with the gods. Not only does the emperor enjoy divine protection, first of all from Jupiter, but even more importantly, he was chosen by him to rule. An image of the current emperor was created, who became emperor by Jupiter's prudence alone. This fact, hidden in the multiple meanings of the aforementioned images of emperors and Jupiter, was clearly shown on Hadrian's mints, in the scene depicting Jupiter's eagle, which brings and hands over a sceptre to Hadrian with the legend providentia deorum.

KEYWORDS: ROMAN EMPIRE, COINAGE, REVERSE IMAGES, PROPAGANDA, IMPERIAL CULT, PROVIDENTIA DEORUM.

The institution of the imperial cult, as known during the Principate, originated in the 1st century B.C., but the breaking point in its development is represented by the deification of Caesar, in 42 B.C.[1] From one point of view, in the 1st century B.C., the problem of the legitimacy of military a commander's position, not institutionalised in a republican sense,[2] relied on the developing personality cult. Caesar's tendency to stress the origin of the Julii from Venus was actually one of the methods he used to justify his position. However, at the same time, it represented the beginning of the imperial cult.[3] Caesar transformed into a living symbol of all of the virtues familiar to the Romans – he was a *triumphator, liberator* and *pater patriae*. The connection between the invincible military commander, political leader of the

1 The article results from the project: *Viminacium, Roman city and military camp – research of material and non- material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalization and 3D visualization (no 47018)*, funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.

2 The Triumvirate was not an institutional body, but was created with the initiative of men in power supported by the military, with the excuse that the state needed order.

3 Whenever possible, Caesar highlighted the origin of the Julii from Venus, starting with the famous laudative speech at the deathbed of his aunt Iulia, in 68 B.C. (Suet. Caes. 6). He would express the idea about the divine origin of the Julii through his speeches and deeds. After Pompeius' defeat, he started wearing red boots and toga picta in public, as a symbol of the connection to the kings of Alba Longa, whose establishment is connected to Ascanius, the son of Aeneas (Dio Cass. XLIII.43.2). During his lifetime, he was given numerous honours (a golden chair in the Senate, permission to ride a horse in Rome, statues and prayers were dedicated to him, he had his special priests' collegia, the month of July was given his name and, finally, his image appeared on coins) and, as Suetonius notes: “bigger honours than a man is allowed to achieve”(Suet. Caes. 76). Similar comments are encountered from Plutarch (Plut. Caes. 57).

state and the gods was established, at the same time leading towards the establishment of a monarchical autocracy. After that, Octavian wisely established a new governmental structure – the Principate – within the framework of the already existing republican institutions.[4] During his reign, the imperial cult was gradually established and, in time, it was institutionalised.

After Caesar's apotheosis, by a decision of the Senate, a decree was issued that people would be allowed to respect his Genius, in the same way they had always respected the Genius of their house masters (*pater familias*). At the same time, it was made possible for Octavian to become *divi filius*, who, in 29 B.C., dedicated the temple to the divine Julius (*divus Iulius*) at the place where Caesar was cremated.[5] The next important moment in the development of the imperial cult was in 27 B.C., when Octavian allegedly handed over power to the senate and to the people of Rome. This "resignation" was undoubtedly formal, accompanied by senators' pleas for him to retain power. At the same meeting of the Senate, Octavian received a series of authorities, securing him supreme power. Besides this, he also received the honorary title of *Augustus*,[6] and a decision was made to place a laurel wreath on his house door and a golden shield, or a shield of virtues (*clipeus virtutis*), in the Senate, bearing an inscription that praises his basic virtues: courage, gentleness, equity and piety (*virtus, clementia, iustitia, pietas*) (*Res gestae* VI. 34). During the Principate, these four virtues would represent the sum of qualities to be possessed by a "good" princeps. As propaganda, these virtues were skilfully incorporated in accordance with tradition, tending to be restored by Augustus.[7]

During his lifetime, throughout the Empire, Augustus was respected as the most important person of the state, who also enjoyed great religious respect. Testimony is given in a paragraph from "Life of Augustus" by Nicolaus of Damascus: "Men gave him this name in view of his claim to honour; and, scattered over islands and continents, through city and tribe, they revere him by building temples and by sacrificing to him, thus requiting him for his great virtue and acts of kindness toward themselves."[8] In all of the provinces, temples were built dedicated to Roma and Augustus' genius, following the tradition of the former decision of the Senate regarding the respect of Augustus' genius. By using religion, politics and propaganda, Augustus managed to establish an imperial cult, through which he achieved the recognition of his divine nature after death. By modifying the concept of Genius and accepting honour to be paid to his own Genius, he established a way for the public to unofficially worship his possible divine nature. At the same time he also relied strongly on the model of the cult of Alexander of Macedon, which led to the gradual development of the imperial cult as a unique Roman institution. At the same time, within the imperial cult established in such a way, the concept of *providentia* was developed. Writers and poets of Augustus' time highlight recognition of divine will in the fact that they were given such a great rescuer and ruler (Charlesworth 1936: 109).

4 The main republican institutions, the magistratures and the Senate, still existed, although the Roman state was made a monarchy from Augustus' time, under the authority of the first man in the state (*primus inter pares*).

5 After Caesar's deification and the following civil war, Octavian often pointed to his position as son of divine Caesar (*divi filius),* according to which he had legitimate right to revenge for his father's murder. In 38 A.D., in connection to this, he appears on sidus Iulium coins, also portraits of Octavian and Caesar with the inscriptions IMP DIVI IVLI F or DIVOS IVLIVS DIVI F (RRC I, p. 535, no. 534/1, 2, T. LXIII.19,20).

6 Ever since then, his new name is *Imperator Caesar divi filius Augustus (Kienast 2010, 63).*

7 About the choice of exactly these virtues, *cf. Wallace-Hadrill 1981, 300-307);* for development of visual images of virtues on coinage from Vespasianus to Alexander Severus, *cf. Nore*ña 2001, 146-168.

8 „Men gave him this name in view of his claim to honor; and, scattered over islands and continents, through city and tribe, they revere him by building temples and by sacrificing to him, thus requiting him for his great virtue and acts of kindness toward themselves." (FGhH 90, f. 125). About sacrifice in Roman imperial cult *cf. Price 1984, 28-43.*

Fig. 1 BMC II, Pl. 75.8

On 19th August 14 A.D., Augustus died. He was cremated on the Field of Mars and buried in his family tomb (Suet. Augustus 100). After the funeral, an eyewitness appeared who swore he had seen Augustus' apotheosis, making an association with Romulus.[9] Soon after that, on September 17th, he was officially deified by a decision of the Senate, followed by consecration, performed by Tiberius (Chalupa 2008: 202, ref. 19-20). The practice of deifying a deceased emperor was established and it was continuously developed during the Principate, also spreading to members of the imperial family. From Augustus to Constantine, 36 emperors and 27 members of imperial families were deified (Price 1984: 57).[10]

For the purpose of spreading the imperial cult, propaganda was skilfully used, manifested through different media: public monuments and inscriptions, altars and temples honouring emperors, their priestly collegia and festivals, writers engaged in state service etc. However, emperors reached the high level of general political propaganda, even the segment connected to the imperial cult, by minting coins. Coins had an advantage compared to all the other means of propaganda, basically because of their role as a mean of payment, which made them an inevitable part of every-day life and were, thus, required in high quantities. Among other things, the emperors' power depended on the belief of his subjects that he personally possessed gifts or talents essential for their own good, but which were beyond the reach of ordinary mortals. The belief was that these powers actually come from the outside and did not originate in usual human nature (Wallace-Hadrill 1981: 298, ref. 2).

One of the aspects of propaganda, incorporated into reverse images on coins, is a motif with the legend PROVIDENTIA DEORVM. The users were given a message that rule and power in the state was for the benefit of all of its citizens, given to the emperor through the will and prophecy of the gods, primarily Jupiter. From this basic propaganda message, with the concept of *providentia deorum*, its connection with the problem of inheritance in the Principate also emerged. Basically, there were no rules for inheriting the throne. Attempts by current principes to seek out legitimate ways of naming their heirs went in two directions: either by choosing from among their family members or through adoption. The wrong choice could lead to civil war and to an ever increasing interference by the army in the process of choosing principes, which would become the rule during the 3rd century A.D, after the Severan dynasty. The best solution seems to have been adoption, successful from Nerva to Marc Aurel (Vojvoda, Tapavički-Ilić 2012: 303-304). Popularising the chosen heir was an important part of the imperial propaganda at all levels, in order to secure a peaceful change of rule.

In developing the concept of *providentia deorum* on coins and its role in the imperial cult, one should certainly mention the Domitian sestertius, from 86 (Fig. 1). On the reverse, the emperor is shown in his military uniform, holding Jupiter's lightning bolt in his right hand and a spear in his left; behind him, there is Victoria, holding a palm branch and coronating Domitian.[11] The palm in Victoria's hand, as an symbol of victory, corre-

9 The eye-witness was Numerius Atticus, senator and a former praetor, who was given one million sestertii from Livia for this testimony (Dio Cass. 56.46.2). Tradition says that the legendary king and the founder of Rome, Romulus, rose to heaven and ever since then, the Romans pray to him as Quirinus (Plut. Romulus 28.1-3).

10 For the development of the emperors' divinisation process and certain problems that are encountered in modern science related to this, *cf. Chalupa 2008, 201-207* with literature.

11 BMC II, p. 381, no. 381; Pl. 75.8; RIC II, p. 195, no. 322. Inscription is missing, except S C in ex.

Fig. 2 http://www.wildwinds.com/coins/ric/trajan/RIC_0249_denarius.jpg
Fig. 3 BMC III, Pl. 51.8;
Fig.4 BMC III, Pl. 79.3

sponds to the divine lightning bolt in Domitian's hand, connecting him with Jupiter. Even more importantly, this motif is connected to the central theme of the Principate as a system: the emperor is Jupiter's representative on Earth and his rule expresses the *providentia* of the supreme deity (Hannestad, 1986, 141). The propaganda message of this reverse motif was intended to depict a divine ruler, addressed as *dominus et deus noster* (Suet. Domit. 13). In other words, the motif expresses the self-apotheosis of Domitian, as suggested by Carradice (Carradice, 1993: 170, ref. 22).

The first adoption in the Principate brought certain changes in depicting the inheritance of the throne on coins. In order to pacify and satisfy the army, Nerva (Dio Cass. LXVIII. 3-4) adopted Trajan, but did not mint any motives that would indicate the position of the chosen heir.[12] However, during the first year of independent rule, Trajan himself minted aurei and denarii depicting his reception of the globe from Nerva (RIC II: 246, no. 28). The accompanying legend of PROVID (in the sense of *providentia augusti*) indicated Nerva's clever choice of heir. *Providentia augusti* was related to the emperor's care in a broad sense, from choosing his heir to supplying citizens and represented his foresight for the welfare of the state and his subjects. The connection with Jupiter was specific (especially on motifs when the emperor was depicted as being protected by Jupiter's lightning bolt), indicating not only under whose protection the emperor stood, but also by whom he was chosen to rule. In that sense, motifs on Trajan's mints are peculiar, showing Jupiter's giant figure, holding a lightning bolt in his outstretched arm, above a much smaller figure of Trajan, with the legend CONSERVATORI PATRIS PATRIAE (RIC II: 261, no. 249) (Fig. 2). Already in Hadrian's mints, this original expression of stratification was explicitly shown in the scene depicting Jupiter handing over the globe to the emperor.

The circumstances of the election of Trajan's heir are not completely clear, with some of them remaining as pure hypotheses. Although Trajan highly respected Hadrian's military capabilities, he did not officially adopt him and proclaim him as his heir, the reasons for which remain unclear.[13] Seriously ill, Trajan died on his way from Syria to Rome. After hearing the news, the eastern legions under Hadrian's command proclaimed him as emperor (CAH XI: 299-300). Only after that, the news reached Rome that Trajan had proclaimed Hadrian as his heir on his deathbed. This caused rumours similar to those after Augustus' death (Tacitus Ann. I.7; SHA, Vita Hadriani IV. 8-10). Hadrian enjoyed great sympathy from Trajan's wife Plotina and the praefectus pretoriae, Acilius Atianus and, according to Dio Cassius, he was

12 It is the period from Trajan's adoption at the end of October 97 B.C. to Nerva's death, on 27th (?) January 98 B.C. (Martin, 1982, 227-228).

13 Seriously ill, Trajan began his journey to Rome, leaving Hadrian as the commander of the greatest army in the East (he had eleven legions and a great number of auxiliary troops under his command), basically giving him the second position in the empire.

not adopted at all, but received his power because of their engagement (Dio Cass. LXIX 1. 1-2).[14] Hadrian's early emissions are related to adoption and inheriting the throne: Trajan hands the globe over to Hadrian (RIC II: 338, no. 2) or Hadrian and Trajan shaking hands, with the legend ADOPTIO (RIC II: 339, no. 3). The symbolic reception of global rule (empire), depicted with the placing of a globe into Hadrian's hands, as well as with the motive of the *dextrarum iunctio* gesture, highlighting the legend ADOPTIO, clearly indicates that the inheritance of the throne was secured by virtue of Trajan's *providentia augusti*.[15]

The development of the *providentia augusti* theme started during Nerva's reign. During Hadrian's reign, it received new associations, such as the idea of *providentia deorum*. This represents the development of a new propaganda idea, which was adjusted to the needs of the current circumstances (Martin 1982: 266). On aurei, minted between 119 and 122 A.D., Hadrian is shown, wearing a toga, receiving the globe with both hands from Jupiter, with an eagle next to Jupiter's feet (BMC III: 269, no. 51.8, Pl. 51.8; RIC II: 353, no. 109) (Fig. 3). At the same time, for the first time, there is a scene with the legend PROVIDENTIA DEORVM, representing a unique motive of this kind during the Principate. Hadrian is shown wearing a toga, looking to the skies, towards an eagle that flies to him, bringing a sceptre in its beak (BMC III: 417, no. 1203, Pl. 79.3; RIC II: 415, no. 589) (Fig. 4). Hadrian is shown as a princeps, in a civilian aspect, his right arm outstretched in a gesture of receiving the sceptre from Jupiter's eagle. Although the reception itself is not performed in this scene, Hadrian's outstretched arm leaves no doubt that this will occur (Brilliant 1963: 130). In this way, Hadrian's right to inherit the throne is expressed – he becomes emperor in accordance with Jupiter's divine decision of *providentia*.

In order to complete the propaganda idea of Hadrian as the rightful heir, a series of aurei and denarii was minted, depicting the emperor as a genius of the "golden age", standing in an oval frame, holding in his hand a symbol of eternal renovation (in this case, inheriting) and Fenix on a globe, with the legend SAEC AVR (RIC II: 356, no. 136). In this case, the legend *saeculum aureum*, usually hidden behind phrases such as *felicitas temporum* or *saeculi felicitas*, is explicitly stated and represents the only example of its kind in Roman mints (BMC III, CXXXI). Hadrian is represented as a new ring in the unbroken chain of world rulers. Propaganda expressed in such a way, strictly related to the throne inheritance, is certainly connected with the aforementioned unclear situation connected to the change on the throne (Martin 1982: 279).[16]

After that, until the end of the Principate, different motifs would be depicted with the legend PROVIDENTIA DEORVM, but always as allegories, with an image of a personification, but never as clear as with Hadrian. At the beginning of his rule, Antonine Pius, adopted by Hadrian,[17] minted aurei with the legend PROVIDENTIAE DEORVM and the motif of a winged lightning bolt (RIC III: 35, no. 80) (Fig. 5). Although depicted discretely, the idea clearly indicates that Antonine Pius was given power by the will of Jupiter. The model was adopted and in early, so-called "programmed" series, it became usual to promote the power of the current

14 It was clear that coins should be minted as soon as possible, on which Hadrian was named augustus and heir. An aureus was minted with Trajan's bust on the obverse and Hadrian's bust on the reverse, with the legend HADRIANO TRAIANO CAESARI (RIC II, 338, n. 1). According to this, the conclusion could be that Hadrian was a Caesar, but not an August and that the coins were minted during Trajan's lifetime. It is possible that it was minted after Trajan's death, but before the news reached Rome (RIC II, 338, ref. 1).

15 *Dextrarum iunctio* is a gesture of great ritual symbolism, first of all indicating the concept of Fides, uniting two depicted people in an unbreakable bond whilst, at the same time, announcing concordance (Concordia).

16 It seems that speculation mentioned in written sources was not without reason.

17 After the death of Lucius Aelius, his first chosen heir, Hadrian, claimed that he would adopt Antoninus Pius, under the condition that he adopted Marc Aurel (at that time engaged to the daughter of the late Aelius) and Lucius Verus (Aelius' son) (SHA, Vita Hadriani XXIV.1).

Fig. 5 http://www.coinarchives.com/a/results.php?results=100&search=providentiae
Fig. 6 http://www.wildwinds.com/coins/ric/marcus_aurelius/RIC_0020.jpg;
Fig. 7 http://www.wildwinds.com/coins/ric/pertinax/RIC_0011a,Aureus_2.jpg

princeps. Apart from representing the will of his predecessor, it also represented Jupiter's wish to make him the ruler of the world.

In the early Augustan series of Marc Aurel and Lucius Veraus, from 161 A.D, on aurei and denarii, the legend PROV DEOR appears with the motif of Providentia, sitting and holding a patera or standing, holding a globe and a cornucopia (RIC III: 215, nos. 18-25; 251, nos. 460-466) (Fig. 6). The same motif would be repeated by Marc Aurel during the celebration of the decennalia in 171 A.D. (RIC III: 296, no. 1045). In Commodus' early series from 180 A.D, the same legend with a variant appears on an image – Providentia holds a stick above the globe and a sceptre in the other hand (RIC III: 402, no. 301). During his short reign, Pertinax minted aurei, denarii and sestertii with the legend PROVID DEOR/PROVIDENTIAE DEORVM (RIC IV: 1, 8, nos. 10-11; 11, nos. 29-31) (Fig. 7). Here, one encounters an exceptional image – Providentia stands with her hands lifted towards a large star. In this case, the star probably represents the emperor as *caelo demissus*, sent from heaven to the earth as salvation (RIC IV: 1, 4, ref. 2).

The motif of Providentia holding a stick above the globe and a sceptre in the other hand, as well as a variant in which the personification holds a cornucopia instead of a stick, was later most commonly repeated with the legend *providentia deorum* and they are encountered in the mints of Geta, Caracalla, Macrinus, Elagabalus, Alexander Severus, Balbinus and Pupienus, and later still with Tacitus. In the period from Gordian III to Aurelianus, it is interesting to note that there were no mints with the legend *providentia deorum*, with types bearing the legend *providentia augusti* being much more frequent. This is a consequence of the historical circumstances of the time, in which many emperors changed on the throne, there were many usurpations and serious external difficulties. In Aurelianus' time, there was a change regarding patronage of the supreme deity. Actually, by that time, in the early mints, it was common to mint motifs of *Jupiter Conservator*, but during Aurelianus' reign and his introduction of the Sol Invictus cult, the most common reverse legends became *Oriens Aug* and *Soli Invicto*. Eventually, this influenced changes in motifs with the legend *providentia deorum*. A personification is depicted (Providentia or Fides) holding two insignia, standing across Sol and holding a globe (npr. RIC V: 1, 268, no. 19; RIC V: 1, 281, no. 152) (Fig. 8). Pacification is highlighted, achieved in the East, under the patronate of Sol Invictus. Tacitus repeats Aurelianus' motif with Sol, but also mints other motifs, returning to the more traditional values. Besides the most common, earlier motif of a personification with a stick and a cornucopia, there is a motif with the emperor holding an insignia and receiving the globe from Jupiter (RIC V: 1, 331, no. 54). Aurelianus' model of depicting Providentia with Sol is encountered during the Principate only with the mints of Florianus and Probus (RIC V: 1, 359, no. 110; RIC V: 2, 496, no. 380).

To modern scholars, compared to other histor-

Fig. 8 http://www.wildwinds.com/coins/ric/aurelian/RIC_0152_T.jpg

ical sources, Roman imperial coinage offers great possibilities, primarily due to the huge number of preserved pieces. The advantage of this mass evidence is to study the symbolic system created with the iconography of imperial mints. Firstly, with the frequency of reverse types in different periods and by comparing them, one can gain insight into the function of such a symbolic system. At the same time, new possibilities are opened for reading the "visual language" of the Roman imperial coinage (Noreña 2001: 164). Starting during Domitian's reign, then during Trajan's, in Hadrian's time, the *providentia deourum* concept is clearly focused, expressing multiple connections of the emperor with the gods. Not only does emperor enjoy divine protection, first of all from Jupiter, but even more importantly, he was chosen by him to rule. The image of a current emperor was created, who was given power by the will of Jupiter himself. This fact, hidden in the multiple meanings of the connections between the emperor and Jupiter, is explicitly shown on Hadrian's coins, in the scene where Jupiter's eagle brings and hands over the sceptre to the emperor, with the legend *providentia deorum*. The same meaning is given to the scenes in the mintings from Hadrian to Probus, in which emperors receive the globe from Jupiter, as a symbol of world rule.

During the 3rd century, with the ever increasing problems in external and internal political, military and economy spheres, changes occur in the priorities of the imperial propaganda. The propaganda of solid and responsible emperors, especially during the 2nd century, did not consist of promises concerning a hazy future, but represented a reminder of actual achievements. As time passed by, beliefs and emotions were focused on a single person, on the *virtus* and *providentia* of the emperor, which threatened to produce an attitude of an overgrown addiction and underdeveloped initiative, too huge an expectation for a single person to solve a problem. In the 3rd century, emperors faced pressure from external enemies, internal political problems, a difficult economic situation and a moral crisis. As the situation grew more difficult, the propaganda, sober and based on facts during the 2nd century, became louder and louder, in order to settle the uneasiness, but without much success. Coinage proclaimed loyalty and concordance in the army, at exactly the same time as there were constant mutinies and rebellions among the soldiers. In the period when Rome was faltering, there was still an insistence to depict the emperor as eternal and invincible.

With the stabilisation of the state in Aurelianus' time, there were changes regarding the patronage of the supreme deity. The introduction of the cult of Sol Invictus was reflected in the motifs of reverse images with the legend PROVIDENTIA DEORVM, on which there was a personification of a military kind, with insignias, accompanied by Sol Invictus. Historic circumstances led to changes in all the social spheres, including religion. The propaganda of the imperial cult was always adjusted to it and within it was also the concept of *providentia deorum*.

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REZIME
KONCEPCIJA PROVIDENTIA DEORUMU OKVIRU KULTA CARSKE LIČNOSTI I PROPAGANDE NA RIMSKOM CARSKOM NOVCU TOKOM PRINCIPATA

KLJUČNE REČI: RIMSKO CARSTVO, NOVAC, REVERSNE PREDSTAVE, PROPAGANDA, KULT CARSKE LIČNOSTI, PROVIDENTIA DEORUM.

Institucija kulta carske ličnosti, kakvu poznajemo tokom Principata, svoje početke ima u 1.v.s.e., a važan momenat u njenom razvoju predstavlja deifikacija Cezara 42.g.s.e. Težnja Cezara u naglašavanju porekla roda Julijevaca od Venere, bio je zapravo jedan od načina kako bi opravdao svoj položaj, ali istovremeno predstavlja i začetke razvoja carskog kulta. Oktavijan je, potom, mudro osmislio i utemeljio novo državno uređenje – Principat – i to u okviru postojećih republikanskih institucija. Tokom njegove vladavine carski kult je postepeno uspostavljan i vremenom institucionalizovan.

Avgust je uspeo da uspostavi carski kult preko koga je dosegao prepoznavanje njegove božanske prirode nakon smrti. Modifikujući koncepciju Genija i prihvatanjem da se odaju počasti njegovom ličnom Geniju, bio je način da javnost nezvanično obožava njegovu potencijalnu božansku prirodu. Istovremeno se, u velikoj meri, oslanjao i na model kulta Aleksandra Makedonskog, što je dovelo do postepenog razvoja carskog kulta kao jedinstvene rimske institucije. U okviru na ovaj način ustanovljenog carskog kulta, razvijala se istovremeno i koncepcija *providentia.* Pisci i pesnici Avgustovog vremena daju veliki naglasak prepoznavanju božije volje u činjenici da su dobili takvog spasioca i vladara.

U svrhu širenja carskog kulta vešto i obimno je korišćena propaganda manifestovana kroz različite medije: javni spomenici i natpisi, oltari i hramovi u čast careva, njihovi sveštenički kolegiji i festivali, književnici angažovani u državnoj službi, itd. Međutim, carevi su visok nivo opšte političke propagande, pa i segmenta vezanog za carski kult, ostvarivali koristeći novac. Jedan od aspekata propagande ostvarivan putem reversnih predstava na novcu, jesu i motivi sa pratećom legendom PROVIDENTIA DEORVM. Korisnicima je trebalo preneti poruku da je vlast i upravljanje državom u dobrobit svih građana, caru dato po volji i promišljenošću bogova, u prvom redu Jupitera. Iz ove osnovne propagandne poruke koncepcije *providentia deorum*, proizilazi i njena povezanost sa problemom nasleđivanja u Principatu.

Počev od Domicijana, preko Trajana, u vreme Hadrijana se jasno fokusira koncepcija providentia deourum, koja izražava višeslojnu povezanost cara sa bogovima. Ne samo da car uživa zaštitu božanstava, u prvom redu Jupitera, nego, što je još važnije, da je od njega izabran da vlada. Kreirana je slika aktuelnog cara, koji je to postao zahvaljujući promišljenosti samog Jupitera. Ova činjenica, skrivena u slojevitosti značenja pomenutih predstava cara i Jupitera, eksplicitno je prikazana na novcu Hadrijana u sceni gde mu Jupiterov orao donosi i predaje skiptar uz legendu *providentia deorum*. Isto značenje imaju i scene u kovanjima od Hadrijana do Proba, u kojima carevi primaju od Jupitera glob, kao simbol svetske vladavine. Sa izvesnom stabilizacijom u državi u vreme Aurelijana, došlo je i do promena u pogledu pokroviteljstva vrhovnog božanstva. Uvođenje kulta Nepobedivog Sola odrazilo se na motive reversnih predstava uz legendu PROVIDENTIA DEORVM, na kojima se pojavljuje personifikacija u vojnom aspektu, sa insignijama, u pratnji Sola Inviktusa. Istorijske okolnosti dovele su do promena u svim društvenim sferama, pa i u religiji, kojima se nužno prilagodjavala i propaganda carskog kulta, a u okviru toga i koncepcija *providentia deorum.*

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FEMALE POWER THAT PROTECTS: WHO IS THE WOMAN WHO TAKES CARE OF THE CITY? GODDESS PROTECTRESSES ON THE TERRITORY OF THE CENTRAL BALKANS IN LATE ANTIQUITY

ABSTRACT

Although many ancient goddesses, like Athens, Artemis, Nemesis and Aphrodite, as well as Isis and Cybele had the function of protecting the city, in the period of Late Antiquity, the Greek Tyche and Roman Fortuna were the ultimate protectresses of the city. On the territory of the Central Balkans, their important role during Late Antiquity can be equated with the instability of this region due to the constant barbaric Hun attacks and the permanent need of the people who had lived here for the protection and good fortune of their cities and land.

KEYWORDS: GODDESS PROTECTRESSES, TYCHE, FORTUNA, CENTRAL BALKANS, LATE ANTIQUITY.

INTRODUCTION[1]

In the period of the Late Antiquity, the population of the Central Balkans region worshiped various divinities, with the most popular goddesses being of Greco-Roman or Eastern origin. Archaeological material confirms the important protective functions of some pagan goddesses that remained dominant not only in the period after the Edict of Milan, but also in the time of Justinian's reign, when pagan cults were forbidden but still present in popular motifs and during their transformation into Christian symbols. Many aspects of the worship of these divinities were changed by historical circumstances. On one hand, it is very hard to follow the path of certain cults, due to the barbaric attacks of the Huns from 441 to 443, while on the other hand, the mentioned historical background induced a more tangible popularity of female deities with protective functions.

On the central Balkans territory, during the antiquity period, Greek cults were mostly transferred via trade routes, and among the most popular goddesses were: Hera, Artemis, Hestia, Aphrodite, Ananke, Hecate and Nemesis (Марић 2003: 53-77). The representations of Greek goddesses, as well as their Roman equivalents, were mostly rendered in accordance with their Greek models and, in the period between the 4th and 6th centuries, they allow an insight into the popularity of certain

1 The article results from the project: *Viminacium, Roman city and military camp – research of the material and non material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalization and 3D visualization* (no 47018), funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.

cults within the visual culture of religious syncretism and the rise of Christianity in Roman society.

During the Antiquity period, many goddesses, such as Athena, Artemis, Nemesis, Cybele and Isis were worshiped as protectresses of the city, but the most popular goddess, honoured as the one who guards and reigns over the boundaries and the fate of the city and the people in it, was the Greek goddess Tyche, or her Roman equivalent, Fortuna (Luyster 1965: 133-163; McCown 1931-1932: 131-134, 138).

Since almost every Greek, and later Roman, city had its own Tyche, i.e. Fortuna, the cults of these deities were widely accepted and, thus, very popular all over the Roman Empire (*Cf.* Matheson, Pollitt 1994). The goddess Tyche (Fortuna) is usually represented as a seated or standing female figure, with the so-called mural crown, a crown in the shape of the city walls (*corona muralis*), on her head, holding different attributes like a cornucopia (frequently with fruits), a ship's rudder, a wheel of fortune, a globe, the horn of Amalthea, ears of grain etc. Sometimes, she is represented blind-folded and carrying the infant Ploutos. In the period of Late Antiquity, goddess protectresses of cities like Alexandria, Antioch, Trier, Rome and Constantinopolis, were depicted in calendar iconography (for the year 354), with decorations of silver handles of Esquiline treasure, consular ivory diptychs etc.[2]

GODDESS PROTECTRESSES ON THE TERRITORY OF THE CENTRAL BALKANS IN LATE ANTIQUITY

One of the interesting presentations of the goddess Tyche was found on the territory of present day Serbia, within the imperial palace at Sirmium, and is dated to the 4th century (Popović 2008: 159-162, Fig. 4; Popović 2009a: 269-270, Fig. 2; Popović 2009b: 452; Popović 2012: 58-60, kat.

Fig. 1: Head of the Sirmium's Tyche (documentation of the Institute of Archaeology)

2 More about this visual material in: Bertelli 1999: 129-131; Toynbee 1947: 135-144; Grig 2012: 31-52.

Fig. 2: Gold ingots from the site of Crasna, with the representation of Sirmium's Tyche (documentation of the Institute of Archaeology).

36, sl. 36a-c; Jeremić 2009: 489-490, 495, Fig. 27). It is a fragmented marble head of a mature woman, slightly inclined backwards (Fig. 1). The face of the woman has a gentle expression; the facial features are softly and carefully modelled, yet without individual portrait characteristics. The eyes are emphasised and the shape of the woman's lips suggests a slight smile, while the nose and the top of the chin are damaged. The coiffure, parted in the middle, is modelled with gentle waves, thus surrounding the face, while on the back of the head the hair is gathered into a bun. The treatment of the woman's face and her coiffure are characteristic of representations of Roman empresses and women in the 4th century (Petković et al. 2015: 81-83). On the top of the woman's head is a crown, and its appearance is similar to a corona muralis, the type of crown characteristic of goddesses who protected and ensured the fortune and prosperity of the city (Анђелковић et al. 2013: 388-389).[3] The symbol of the corona muralis is of great importance for the identification of the goddess in question, from Sirmium, and it probably belonged to a standing or seated sculpture.[4] The statue of the Sirmium goddess was possibly located near the finding place of the head, in the niche above the entrance to the imperial palace complex,

3 Bust of the goddess, made of bronze, from Ravna is dated in the period of the 2nd and 3rd century. On her head is represented corona muralis, atribute that identified her as city protectress – Tyche. Петровић, Јовановић 1977: 86. кат. 4; Vulić 1941-48: 49, бр. 206.

4 The motif of corona muralis on the head of goddess, unlike the high, cylindrical crowns with accentuated forms of city walls known from representations of Tyche of Alexandria or Antioch, here is lower and reduced on concave and convex forms that only suggest the impression of city walls. Popović 2008: 159, 161; Popović 2012: 110-112, kat. 36.

Fig. 3: Tyche of Naissus, on a gold ingot from the site of Feldioara-Bod (after: Дрча, кат. 196, 2004).

Fig. 4: The statue of Dea Dardanica (documentation of the National Museum Niš).

where the sculpture of the goddess was placed as a symbol of the identification of the palace with the city, i.e. "city inside of the city" (Jeremić 2009: 495). Besides this find, two more representations of female figures, carved on gold bars, from the site of Crasna, near Brashov, in Romania, dated to the last quarter of the 4th century, were identified as Sirmium's Tyche (Fig. 2)[5]. On both depictions there is schematically rendered seated figure of a woman presented in profile, holding a palm branch and cornucopiae in her hands, while on her head is a mural crown. On both, there are stamps with the inscription SIRM, which allows the identification of these representations as city protectresses, analogous to similar representations on gold bars from Rome, Thessaloniki, Naissus and Constantinople, dated to the end of the 4th, or the beginning of the 5th century (Mundell Mango 1992: 205-206, Fig. 2a-f; Baratte 1978: 107-108).

Tyche of Naissus is depicted on a gold bar from the site of Feldioara-Bod, near Brasov, in Romania, which is dated to the second half of the 4th century (Fig. 3).[6] The Naissus city protectress is depicted seated on the throne, dressed in a long chiton, with a himation placed over her shoulders, a mural crown on her head, an olive branch in the right hand and cornucopiae in her left. Beneath the goddess, on the throne base, there is the inscription NAISI.

The female personification of the homeland of the Dardanians, *Dea Dardanica*, is presented in a statue discovered in 1933, during excavations of the residential complex of Mediana, near Niš (Jovanović 1980: 53-60, сл. 1; Srejović, Cermanović-Kuzmanović 1987: 134, kat. 58; Tomović 1992: 94, cat. 95, Fig. 28/3; Петровић 1993: 78; Дрча 2004, кат. 70; Поповић 2008: 31-32, сл. 1-1а; Љубомировић 2014: 738-739, сл. 5). The

5 Dating is suggested by representations of three busts, probably of emperors Gratian, Valentinian II and Theodosius, represented on one of these two bars. Popović 2008: 159-160, Fig. 5a-b.

6 As is the case with the Tyche of Sirmium, dating is suggested by three busts of emperors in medallions, probably Gratian, Theodosius I and Valentinian II. Дрча 1993, кат. 1, сл. 1; Дрча 2004, кат. 196.

Fig. 5: Personification of the province Moesia Superior on the reverse of coins minted in Viminacium (source: http://www.cnvaldostano.it/la_zecca_di_viminacium.htm#_ftn17, accessed: 15.5.2015).

sculpture represents a woman dressed in a long chiton and short himation (Fig. 4). Unfortunately, the sculpture's head is missing, but it can be presumed that she wore a veil on her head, since traces are visible on the woman's shoulders and from where the veil runs over her back and finishes near her feet. The weight of the woman's body is on her left leg, while her right leg is moved slightly backward. Her right arm is bent at the elbow and placed on her chest and in her right hand the woman holds a small figure of an ox, while in her left hand she holds a bag of money (*marsupium*). Beside her left feet, the head of a wild boar and a double-edged axe (labrys) are presented. Analysis of the goddess' attributes has determined that the animals symbolise cattle breeding and hunting, while the money bag implies mining and the wealth of the province for which the goddess was protectress - ancient Dardania. As the main deity (*dea patriae*) of Dardania, *Dea Dardanica* was the protectress not only of the province and the people, but also of nature, animals and natural resources. The stylistic characteristics of the sculpture point to the period from the second half of the 3rd to the early 4th century (*Cf.* Tomović 1992, cat. 95; Поповић 2008: 31, реф. 2-5). Other existing analogies for the statue of Dea Dardania show that the representations of the personification of Dardania were not only associated with the province itself, but also with the wider region that the Dardanians inhabited (Поповић 2008: 32-40; *Cf.* Dobruna-Salihu 2013: 217-224.). Also, it is important to emphasise that the context in which the the statue of Dea Dardania was found, near the entrance of the villa with peristyle in Mediana, clearly shows that the sculpture carried a deeper, ideological meaning. Located at the very entrance of the residential palatial complex of the emperor Constantine the Great, the statue of Dea Dardania, the *dea patria* of the emperor himself, was protecting not only him and his family, but also the Roman state and its people (Васић 2013: 100).

Therefore, it can be assumed that the placing of the statue of *Dea Dardania* at the very entrance of the villa with peristyle in Mediana, and possible placing of the statue of the Sirmium Tyche not far from the assumed entrance to the residential complex in Sirmium, confirm the placing of goddess protectresses at the entrances of imperial complexes, to guard the emperor, his family and thus, the state and the people in it.

Iconographic representations associated with the protectress of Moesia Superior or its capital city Viminacium, are preserved on the reverse of coins minted in Viminacium during the period between 239-240 and 254-255,[7] as well as in the

7 A representation of the province on the reverse side of coins can sometimes be depicted with symbols of branches or a globe, the whole scene is surrounded with the title

Fig. 6: Relief with the personification of the province Moesia Superior (documentation of the National Museum Požarevac).

relief at the National Museum in Požarevac (Figs. 5 and 6).[8] The representation of the goddess in the relief shows a woman dressed in a stola, while her standing figure symmetrically divides the relief composition into two parts. Her hands rest upon the heads of an ox (left) and a lion (right), which are the symbols of the legion VII Claudia (which was present at Viminacium during the entire Roman period) and the legion IV Flavia. Thus composed, the relief iconography demonstrates the ideological notion that the power and strength of the province of Moesia Superior relied on two military forces, which were responsible for its foundation. Based on the significance that the goddess Tyche had as the main protectress of a city, province or region during the 4th century, it would be justified to assume the worship of the protectress of Upper Moesia or Viminacium in this city until the year 441-443.

CONCLUSION

The goddesses who were worshipped as protectresses of a city/metropolis (*metropolis* – μήτηρπόλις – mother city), were Athena, Artemis and Aphrodite/Venus (Greaves 2004: 27). During the period of Roman reign and especially in the Late Antiquity, this role was, however, characteristic of personifications such as Tyche and Fortuna, associated not only with large urban centres like Rome, Constantinople, Antioch, Alexandria or Trier, but also with smaller centres in Roman provinces. On the territory of the Central Balkans, such deities were also associated with regions i.e., lands, and among them were the Syrian goddess Dea Siria (whose cult is confirmed with two findings from the 1st century)[9] and the Egyptian goddess Isis, who was assimilated with the Roman goddess Fortuna (whose cult is confirmed with three statues of the so-called Isis-Fortuna type) (Vulić1941-48: 92, бр. 199, 200; Zotović 1966: no 47, pl. XVI/1, no 49, pl. XVI/2.; Срејовић, Цермановић-Кузмановић 1987a: 102, кат. 42; Tomović 1992: 74, kat. 82, 105; Петровић, Јовановић 1977: 61, 62 кат. 5, 8; Дрча 2004: кат. 62; Lisičar 1961: 127-130).

The deification of the goddess Tyche-Fortuna, was developed owing to the popularity of these, predominantly politically oriented, personifications in Roman literature and art (Smith 2011: 119-122). The largest city of the Roman Empire, the unique *Urbs, caput mundi*, with its protectress Roma, not in a political context, but in accordance with the early Christian visual culture, had fallen under the shadow of New Rome, Constantinople (Grig 2012: 31-52). Similar situations in the cities within the Roman provinces of the Central Balkans can be explained not only with the ideal of *Roma Aeterna*, but also with the geographically-strategic positions of urban centres near the Danube Limes and the familiar atmosphere of the uncertainty of survival of the Greek polis(es), when the power-

P(rovincia) M(oesia) S(uperior) COL(onia) VIM(inacium), while at the bottom, the local year of mintage is inscribed *AN (I-XVI)*. Борић-Брешковић 1976; Борић-Брешковић 1986: 138-142; Душанић 1961: 141-143. Dušanić 1976: 53-58.

8 This coat of arms was found as spolia, built into the old structure in the village of Stari Kostolac. More about this finding in: Јацановић, Пиндић 1986, 61-64; Спасић-Ђурић 2002: 168, сл. 132; Спасић-Ђурић 2015, кат. 114.

9 More about the cult of Dea Siria and findings from Dolno Nerezi and Skopje in: Gavrilović 2010: 228-237.

ful protective force of these deities was evoked (Beerden 2013: 208). Tyche-Fortuna was more powerful than other Greek or Roman personifications, since the fate of the city was in her hands, as *genius loci*, yet she was just a deity, not a goddess and, thus, did not have the characteristics of protection which saints or Theotokos would have during the Middle Ages (Bertelli 1999: 129-130). Therefore, at one point, the idea of the protection of this long worshiped deity was abandoned. Unlike the process of the gradual abandonment of pagan motifs or their transformation into Christian symbols, this cessation of the worship of Tyche-Fortune happened in the 5th century, before the powerful patroness of Christianity and Theotokos' cult, Empress Pulcheria (Herrin 2000: 14).

Theotokos became the main and only protectress of the capital city and the whole state, and her associations with the divine dimensions of Tyche are recognisable in the attributes of ancient goddesses, namely Tyche in Akathist Hymn,[10] while in the visual culture of Constantinople, Tyche coexisted with Theotokos during the 5th and 6th centuries (Pentcheva 2010: 19-21).

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REZIME
ŽENSKA MOĆ KOJA ŠTITI: KO JE ŽENA KOJA BDI NAD GRADOM? BOGINJE ZAŠTITNICE NA TERITORIJI CENTRALNOG BALKANA U PERIODU KASNE ANTIKE

KLJUČNE REČI: BOGINJE ZAŠTITNICE, TIHE, FORTUNA, CENTRALNI BALKAN, KASNA ANTIKA.

Različite boginje grčkog porekla, poput Atene, Artemide, Afrodite ili Nemeze, a potom i njihovi rimski ekvivalenti, među svojim funkcijama imale su i one koje se tiču zaštite gradova i njihovog stanovništva. Ovde spadaju i boginje istočnjačkog porekla poput Izide i Kibele. U kasnoantičko vreme najpoznatije zaštitnice gradova bile su grčka Tihe i rimska Fortuna, odnosno boginje čija se zaštita odnosi i na provincije ili pak oblasti. U vizuelnoj kulturi kasnoantičkog perioda pored nekadašnje, najvažnije zaštitnice Rima, dominirajuću ulogu stiču i zaštitnice gradova poput Trira, Aleksandrije, Antiohije, te ponajviše novoosnovane prestonice Konstantinopolja. Na prostoru centralnog Balkana, sa njima korespondiraju Tihe Sirmijuma, Naisa, Viminacijuma... Ovakva situacija odgovara pogledu provincijskih gradova prema najvažnijem uzoru – Rimu, ali može biti objašnjena i istorijskim okolnostima, koje podrazumevaju stalne upade varvara na ove prostore, te želju i potrebu stanovništva centralnog Balkana za uspešno vođstvo i zaštitu boginja koje će brinuti o sudbini grada ili zemlje na kojoj žive. Prekid u poštovanju Tihe kao zaštitnice grada, odgovara širenju Bogorodičinog kulta, te je od 5. veka Bogorodica preuzela ove funkcije i postala najvažnija zaštitnica grada, najpre Konstantinopolja.

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THE DECIPHERMENT OF SUPERSYLLABOGRAMS IN LINEAR B

ABSTRACT

In partnership with The Association of Historical Studies, Koryvantes (Athens), we address the phenomenon of the supersyllabogram, which has never been properly identified since the initial decipherment of Mycenaean Linear B in 1952. A supersyllabogram is the first syllabogram, i.e. the first syllable of a major (never minor) economic indicator combined with a closely related ideogram in the four economic sectors of the Mycenaean economy, agricultural, military, textiles and vessels or pottery. With very few exceptions, change the economic sector and you change the meaning of any particular supersyllabogram. Of some 3,500 tablets and fragments from Knossos, about 800 or 23% contain at least one supersyllabogram and sometimes as many as four or five. The whole point of supersyllabograms is that they are meant to eliminate text on tablets to the greatest possible extent. In a syllabary of 61 syllabograms + one homophone (AI), 36 syllabograms or 59% are supersyllabograms. Supersyllabograms serve to greatly economize on the precious space available on the tiny inventory tablets in Linear B. Any complete decipherment of Linear B must fully account for the supersyllabogram as a unique phenomenon without which any approach to the interpretation of the Linear B syllabary is squarely compromised.

KEYWORDS: MYCENAEAN LINEAR B, SUPERSYLLABOGRAMS, LINEAR B TABLETS, DECIPHERMENT, TRANSLATION, ECONOMY.

INTRODUCTION
THE DECIPHERMENT OF LINEAR B

Michael Ventris (1922-1956), an architect by profession, but an "amateur" philologist by choice (a real understatement), spent close on three years (1950-1952) of gruelling experimentation struggling to decipher the mysterious syllabary called Linear B. Originally, he had assumed, just like everyone else grappling with the decipherment of the script, right on down from Sir Arthur Evans, that Linear B must be a variant of Etruscan. It was only by dint of patient experimentation, his strict empirical methodology and brilliant assumptions integrating disparate clues, that he finally realized that the Linear B syllabary was in fact a very archaic Greek.

Indeed, by the spring of 1952, in a series of twists and turns not even he could have anticipated, it finally hit him like a thunderbolt that Linear B could not be related to any ancient language other than Greek. On 1 June 1952, in *Work Note e 20*, he openly surmised, "Are the Knossos and Pylos tablets written in Greek?" He was on the very threshold. Exactly one month later, on 1 July 1952, in a BBC broadcast, he announced to the world that he had cracked the syllabary. You can listen to his startling discovery on UTube, as he reveals that "...during the last few weeks I've

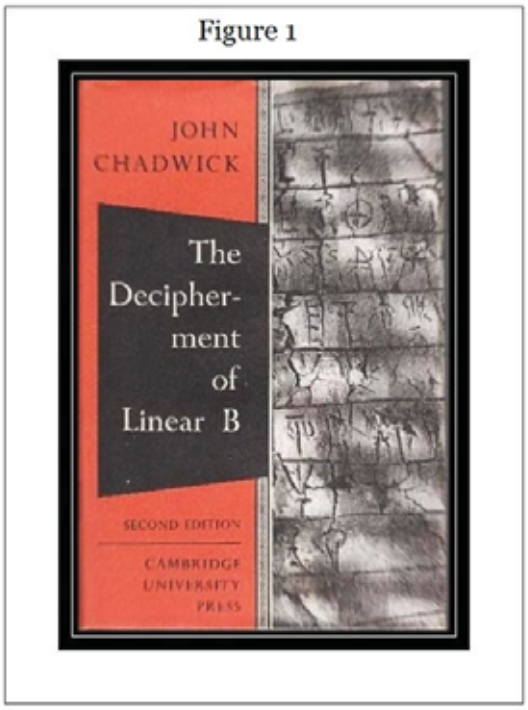


Fig. 1 – The Decipherment of Linear B.

suddenly come to the conclusion that the Knossos and Pylos tablets must, after all, be written in Greek, a difficult and archaic Greek, seeing that it is 500 years older than Homer and written in a rather *abbreviated form,* but Greek nevertheless..." (*italics mine*).[1] However, since he lacked a professional background in Greek philology and linguistics, that same month he turned for support to John Chadwick, an outstanding scholar specializing in ancient Greek and a professor of Classics at the University of Cambridge. Getting on famously, they worked as a highly effective team in the continuing refinement of Ventris' original decipherment, and were able to decipher numerous tablets from both Pylos and Knossos.

But the tablet which stole the show was Pylos TA 641-1952. You can read all about its decipherment in great detail in my article in this same journal last year, No. 10 (2014) (Vallance 2016) Ventris' decipherment of this tablet, unearthed by Prof. Carl Blegen at Pylos earlier in 1952, is nothing short of brilliant. Without recourse to his translation of this highly informative Linear B tablet on vessels and pottery, the most famous of all Linear B tablets to date, any close to definitive decipherment would have been unthinkable.

Sadly, Ventris died in an automobile accident a few weeks before the publication of his crowning work, *Documents in Mycenaean Greek*. This left Prof. John Chadwick (1920-1998) in the unenviable position of having to plot the progress towards the decipherment made by his intimate friend, Michael Ventris. This he did with his seminal work, *The Decipherment of Linear B* (1958, 1970) (Chadwick 1970).

Prelude to the Discovery of Supersyllabograms in Mycenaean Linear B: so-called "adjuncts":

Shortly after the initial decipherment of Linear B in 1952-1953, researchers gradually came to realize that there was more to the decipherment than merely words comprised of syllabograms. There in fact appeared a substantial number of single syllabograms on 800+ Linear B tablets from Knossos, of which many were directly linked with an ideogram, while others were incised inside ideograms. This proved to be a real puzzlement to researchers, right on down from Prof. John Chadwick through to the most recent philologists in the second decade of the twenty-first century. Though all of these professional linguists have grappled with this phenomenon, none has been quite able to get a firm handle on what it is tantamount to.

Beginning with Prof. John Chadwick himself (Chadwick 1987) we immediately see single syllabograms either directly linked with an ideogram or incised inside ideograms in this cutaway I made from his chart of Linear B (Fig. 2).

In 1959 he correctly identified 15 of these single syllabograms concatenated with ideograms (a o u di ki ku pe pu qa qe ri se te ti & zo), attempting to decipher only a few, without realizing what they

1 You can listen to Ventris' startling discovery, as he announces that "... during the last few weeks I've suddenly come to the conclusion that the Knossos and Pylos tablets must, after all, be written in Greek, a difficult and archaic Greek, seeing that it is 500 years older than Homer and written in a rather abbreviated form, but Greek nevertheless..." BBC News http://www.bbc.com/news/magazine-22799109.

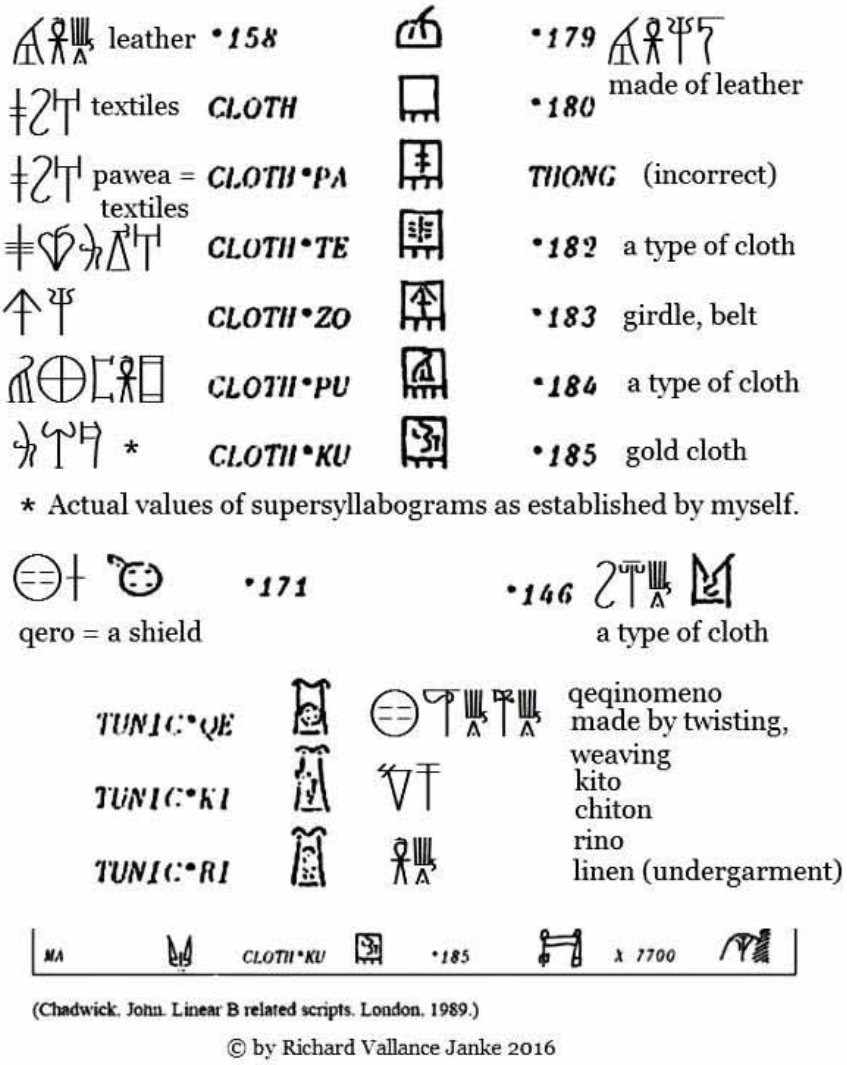


Fig. 2 – "Supersyllabograms" identified by John Chadwick.

constituted as a phenomenon. Again, in 1964, Prof. John T. Killen, "in a brilliant piece of deduction"[2], deciphered 4 of these rogue single syllabograms, ki, ne, pe & za, all in the field of sheep husbandry, again without realizing what they actually were. Here Chadwick concludes, "The *mysterious abbreviations* were thus solved by Killen..." *(italics mine*). We still see that as yet neither Chadwick nor Killen had divined what these "mysterious abbreviations" were supposed to amount to.

But that was soon to change. In an astounding breakthrough in his paper, "Olive Oil and Other Sorts of Oil on the Mycenaean Tablets" (1974) (Melena 1974) an historical turning point, Prof. José L. Melena deciphered (though not always correctly), the following single syllabograms directly associated with the ideogram for 'olive oil': A KU PA SI TI and WE. His translations and my own reinterpretations of them, where applicable, figure prominently in this study. For the first time ever, the term "adjunct" is utilized. Prof. Melena had finally come up with a nomenclature for this phenomenon. Much later on, in 2014, Prof. Melena once again identified and translated a significant number of "adjuncts" (Melena 2014) arraying them hand in hand with ideograms in the same

2 Bibliography: Chadwick, John 1976: 128. With the exception of KI, which Prof. Killen incorrectly construed as meaning "lambs", instead of the correct *kitimena* = "a plot of land", all of his interpretations are in agreement with mine. See *supra*, Table 6, Supersyllabograms in the agricultural sector of Mycenaean Linear B.

class by amalgamating them with the latter. In so doing, he effectively downplayed the critical rôle of supersyllabograms in his fuller decipherment of Linear B tablets. In addition, these researchers have made telling contributions to the decipherment of so-called "adjuncts": Chris Tselentis (Tselentis 2011), Carlos Varias García[3] and above all, Marie Louise B. Nosch,[4] the last of whom brought significant advances to the decipherment of "adjuncts" in the textiles sector in which she specialized. Without their splendid contributions, I would never have come to extrapolate their findings to the General Theory of Supersyllabograms.

Single syllabograms are not just "adjuncts": they are supersyllabograms. The question is, if all of these single syllabograms condign with ideograms are not merely *adjuncts*, how did I come to realize that they were much more, that they were in fact what I have chosen to call "supersyllabograms"? But what is a supersyllabogram? Supersyllabograms are my own definition for what previous researchers have all tagged as "(surcharged) adjuncts". While most supersyllabograms appear to be mere "adjuncts", none are by nature, and many are *not adjuncts at all*. The systematic isolation, identification and classification in every major sector of the Minoan/Mycenaean economy of what I call supersyllabograms is nothing short of revolutionary in the field of decipherment of Mycenaean Linear B. Allow me to demonstrate graphically in simple terms what a supersyllabogram actually is (Fig. 3):

Closely examining the facsimile of the actual tablet presented here, Knossos KN 791 G c 101, we note right off the top that, with the sole exception of the shepherd's or flock owner's name, Sfakosos, *it contains no cursive text*. What is going on here? Are these two so-called "adjuncts", KI & O, simply that and nothing more? Very far from it. They are "adjuncts" only insofar as they immediately precede the ideograms with which they are directly associated. They are not even "surcharged" — the term by preference *par excellence* which all researchers to date have erroneously dubbed as just that. But the term *surcharged* implies that these so-called adjuncts are situated *above* (on top, or either to the left or right) of the ideograms they modify, which in this case and the vast majority of others, they most certainly are not. So even on this count alone, the term "surcharged adjunct" is a contradiction in terms, thereby invalidating the very notion. Moreover, adjuncts in and of themselves are merely *subsets of supersyllabograms,* rather than the converse. Supersyllabograms are only occasionally adjuncts, while all adjuncts are *subsets* of supersyllabograms. Once more, the concept of the adjunct invalidates itself, except at its own highly restrictive level as a subset of the supersyllabogram. And that is precisely what the syllabograms KI & O on this tablet are, supersyllabograms, where KI = kitimena = a plot of land and O = onato = a usufruct lease field.

What we have here on this downsized, abbreviated tablet is a double set of two supersyllabograms, KI & O. What then does the tablet "mean"? You can plainly see for yourself in Figure 3 above. What we have here is *the deployment of supersyllabograms alone without any text* on a given Linear B tablet – and this happens over and over and over on hundreds of tablets. This is nothing short of revolutionary. It is patently clear from this single tablet alone that the deployment of these two supersyllabograms, *exclusive of text*, saves a considerable amount of precious space on what is ostensibly a very small tablet. That is the whole point. Given that most Linear B tablets are rarely wider than 15 cm. (6 inches), is it any wonder that the Minoan/Mycenaean scribes so frequently resorted to this ingenious stratagem, not only to save precious space on these tiny tablets, but to cram as much information into the narrow constraints the tablets

3 For Carlos Varias García, see Bibliography: Vallance Janke, Richard 2015. In the extremely comprehensive bibliography to this presentation, consisting of 144 items, Carlos Varias García is cited from 41-45.

4 For Marie Louise Nosch, see Bibliography: Del Freo, Maurizio, Nosch, Marie-Louise and Rougemont, Françoise 2010.

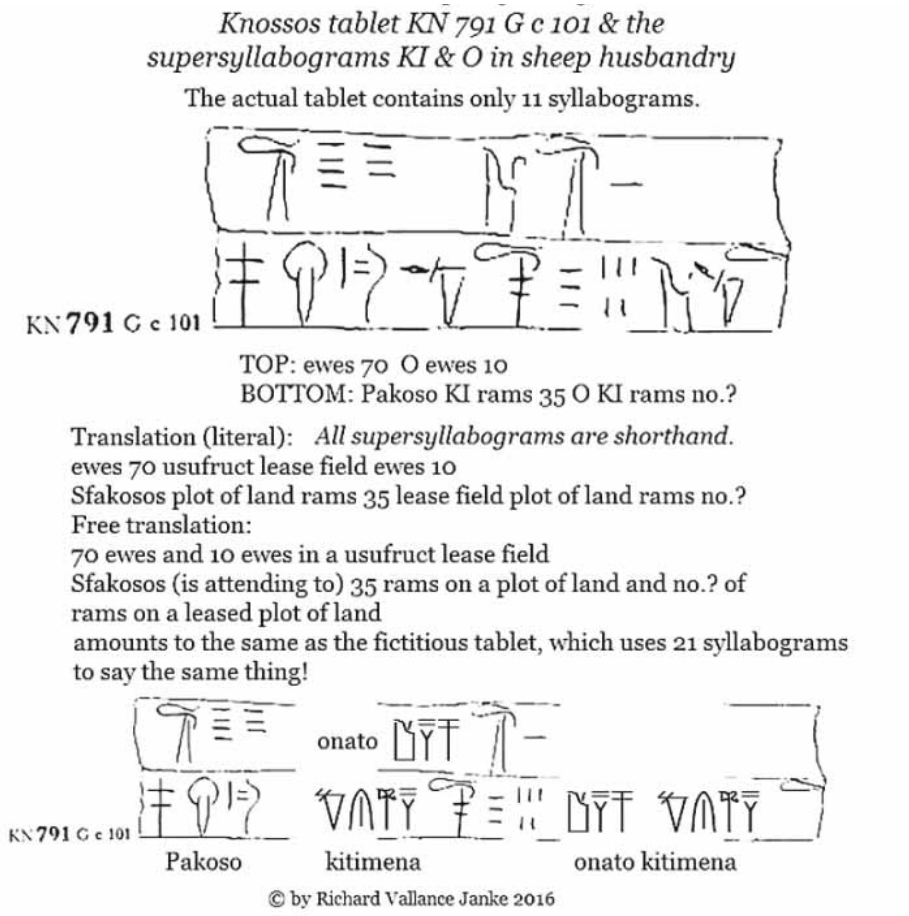


Fig. 3 – Introduction to Supersyllabograms.

imposed as they possibly could, without having to have recourse to a lot of cursive running text which would otherwise have cluttered them up?

You just have to take one glance at the difference in the space occupied by the actual tablet above, utilizing supersyllabograms almost exclusively, and the "same" imaginary tablet with the text spelled out in full. On the actual tablet, there are 11 syllabograms, inclusive of supersyllabograms, but exclusive of the numerics. In the case of the fictitious tablet, the number of syllabograms exclusive of supersyllabograms (because there are none), skyrockets to 21, almost double the original (also exclusive of the numerics). You get the point. Certainly the Linear B scribes were bent on making a point of it, and with a vengeance. As a guild, both at Knossos, where supersyllabograms were in extensive use, and at Pylos, they were clearly conscious of the power of supersyllabograms, and resorted to them without compunction as often as they possibly could – which was very often indeed. The whole point is, and I must emphatically stress this: *No-one deliberately resorts to any linguistic device when writing in any language, unless it serves a useful purpose beneficial to more effective communication, contextual or otherwise.* And the linguistic device *par excellence* the Linear B scribes resorted to like clockwork, over and over, practically *ad nauseam*, is none other than the ubiquitous supersyllabogram.

But there is more to these mysterious supersyllabograms. The vast majority of supersyllabograms, heretofore tagged as *dependent*, are almost always configured in conjunction with any one of several pre-assigned ideograms in each of these sectors. The few rare exceptions, supersyllabograms not associated with any ideogram, are qualified as *independent* supersyllabograms.

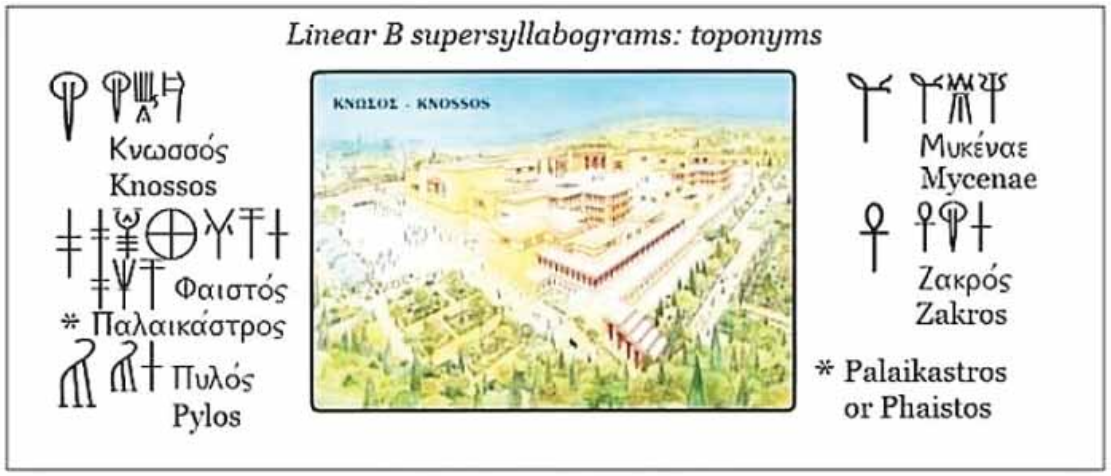


Table 1 – Linear B Supersyllabograms: Toponyms.

Statistical Summary:

From a statistically significant subset of 1146 fragments and tablets out of approximately 3,500 from Knossos, I recently extrapolated a total of 225 which sport supersyllabograms in every major sector of the Minoan/Mycenaean economy, these 225 accounting for fully 24% of every last fragment and tablet in the subset. As it turns out, in a syllabary of 61 syllabograms + one homophone (AI) for 62, 36 or 59% are supersyllabograms. That is a staggering return for the scribes' deliberate and eminently practical investment in what is a remarkably clever stock technique to shortcut lengthy text, which would have otherwise simply cluttered up the very small Linear B tablets they routinely worked with. All this illustrates just how far the Linear B scribes were willing to go in swapping in supersyllabograms for text deliberately swapped out, replacing what would otherwise have been fictional tablets anywhere from 2 to 4 or even 5 times as long!

The Path to Discovery:

Although I had already translated scores of Linear B tablets by the winter of 2014, when I came across Prof. Thomas G. Palaima's excellent translation of Linear B Tablet Heidelburg HE Fl 1994, I hit upon something remarkable I had never before even noticed. Palaima, discerning that each city or settlement name was abbreviated to a single syllabogram, realized that each was the first syllabogram, i.e. the first syllable of their names in full, *Konoso* in Linear B or Knossos, *Zakoro* or Zakros, *Paraikasatoro* or Palaikastro (or possibly, *Paito* or Phaistos), *Puro* or Pylos and *Mukene* or Mycenae. These abbreviated codes for Minoan and Mycenaean cities and settlements uncannily mirror the two-character modern city codes symbolizing their international airports. This reveals something of the symbolic sophistication of the proto-historic syllabary, Mycenaean Linear B, taken to its limits. Table 1 identifies the five supersyllabograms KO, PA, PU, MU and ZA, each representing in turn the full names of the aforementioned Minoan/Mycenaean cities and settlements (Table 1).

In Mycenaean Linear B, out of a total of 36 supersyllabograms, while most of the rest of the supersyllabograms are typified as being *dependent* (*see* above), there exist only a few *independent* supersyllabograms, being these 5 + two more in the textiles sector (for a total of 7). This excerpt from my presentation at the Pultusk Academy of the Humanities, July 1, 2015, provides a succinct overview of supersyllabograms:

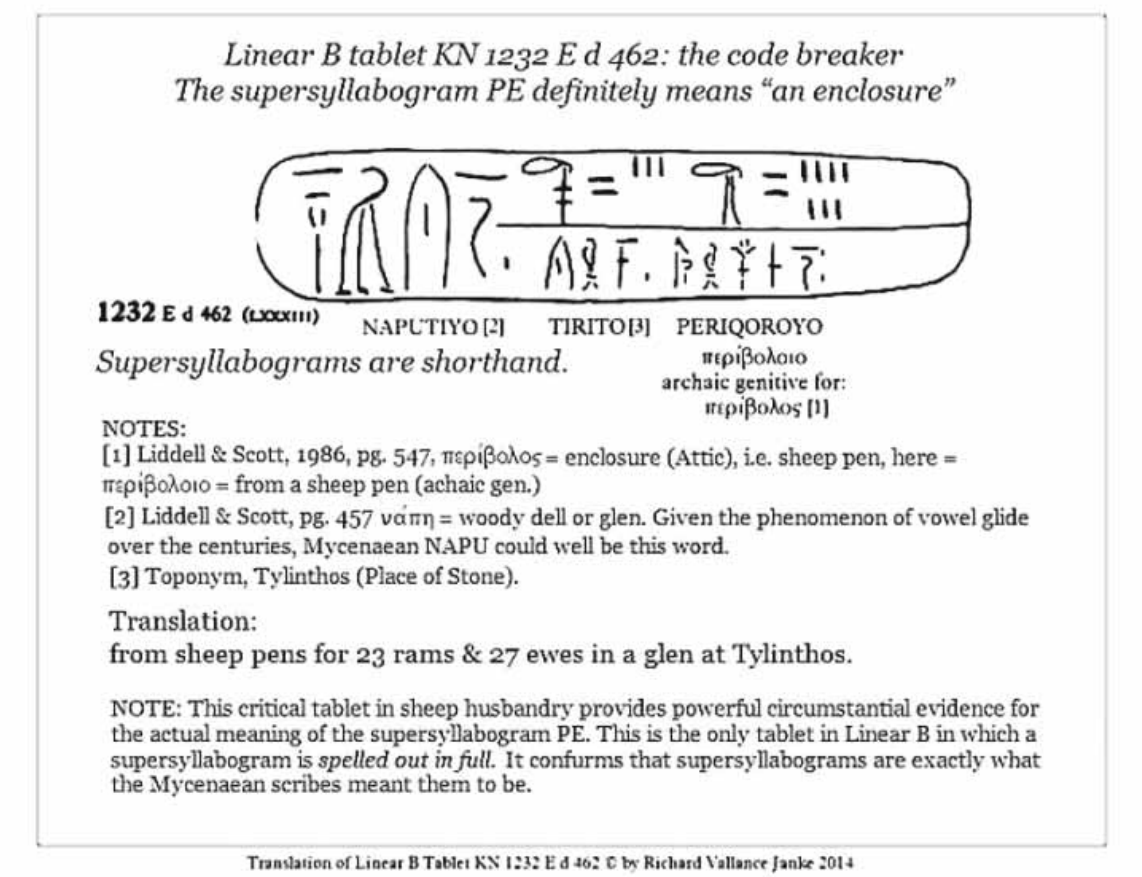


Fig. 4 – Linear B Tablet KN 1232 Ed 462: the code breaker.

Supersyllabograms are so information rich that they call for considerably more clarification, which is exactly what we intend to deliver. Careful examination of even a relatively small cross-section of tablets from Knossos alone confirms beyond a shadow of a doubt that this is the case.

On Knossos tablet KN SO 4439, we see the syllabogram **ze** post-charged onto the ideogram for "wheel". Checking it against Chris Tselentis' *Linear B Lexicon*, under the syllabogram **ze**, I found only one entry which fit the bill, the word zeukesi, the attested (A) dative plural for the derivative zeukos(D = derived or unattested nominative singular), meaning "a pair of" or "a team of". This was almost too good to be true. I had discovered the exact word to suit the context, because this syllabogram, which is the first syllable of the word *zeukos* in both dictionaries, is paired with the ideogram for a chariot wheel. So the syllabogram **ze** is yet again the first syllable of the Mycenaean Linear B word or phrase it symbolizes.

The next supersyllabogram, mo is the first syllable of mono = "a single" or "one only" or even "a spare". The translation, "a set of chariot wheels on axle and a spare one, made from a willow tree" leaps to the fore. Still, since I had *no collaborative empirical evidence* that the translation was correct, even though it made perfect sense, I could only surmise that this was a standard scribal practice. Was there any real proof that there was any substance to the use of supersyllabograms, or even better, that scribal use of them was persistent?

I was about to be richly rewarded. I hit upon that rarity of rarities, the "magic bullet" on Knossos tablet KN 1232 Ed 462, which spells out the word periqoro, meaning "an enclosure", in other words "a sheep pen" immediately adjacent to the ideogram for "ram", viz. (Fig. 4):

The very next tablet, KN 1233 En 224 *replaces the word periqoro = "an enclosure"* with

the syllabogram PE, the first syllable of the very same word, again locked in with the ideogram for "ram". Thanks to an obliging ancient scribe, I had adventitiously broken the code. Hard on the heels of these two eye-popping tablets, a whole string of them with the supersyllabogram PE sprang to the fore (inside the range of KN 1223 En 223 to KN 1360 En 225). The code had been cracked wide open. The time had finally come for me to be able *to isolate, identify, define and classify once and for all the phenomenon of the supersyllabogram, if possible across every single sector of the Minoan/Mycenaean economy.* If only the scribes resorted to this practice not on just a few scattered tablets, but on hundreds of them, I would have proof positive. As it fortuitously turns out, they did, and with a vengeance.

Moving right on then, we now proceed to examine in minute detail every single supersyllabogram in all the major sectors of the Minoan/Mycenaean economy, starting with the military sector, followed by the vessels and pottery, then by the textiles and finally by the agricultural sector.

The determination of the polysemiotic accuracy of supersyllabograms in Mycenaean Linear B:

One of the greatest problems besetting an adequate decipherment of any Linear B tablet is the proper determination of the meanings of each and every character on it. In the case of supersyllabograms, this all boils down to a question of (poly) semiotics. Are there any discriminative criteria we may apply to the accurate decipherment of supersyllabograms, insofar as that is possible? Definitively yes. These are:

Criterion 1: The establishment and strict application of a *scalar weighting system* to supersyllabograms clearly identified on Linear B tablets, as follows: 1 = improbable, 2 = possible, 3 = (highly) probable and 4 = definite.

Supersyllabograms must of necessity be tagged with a numeric weight commensurate with the likelihood that there exists a *major* (never minor) Linear B economic term equivalent to it. We can establish the weighting scale as follows:

1 = a supersyllabogram for which there exists *no term* in the lexicon of the Linear B vocabulary attributed anywhere on any extant tablet(s), but rather for which a term must be derived by an expert philologist. The primary problem with this consists in the fact that the *etymological roots* of so many archaic and anachronistic Mycenaean Greek words are irretrievably lost and beyond our reach, either because they fell into disuse with the collapse of the Mycenaean Empire ca. 1200 BCE or because, even though they survived beyond 1200 BCE, they only did so in very small numbers and almost always in the Homeric lexicon only, beyond which such terminology fell out of the lexical repertoire forever in all of the subsequent ancient East Greek dialects. Thus, the etymological roots of such Mycenaean terms is at best very doubtful, and at worst impossible to confirm.

The fact that the meanings of almost all of the supersyllabograms at a scalar weight of 1 are irretrievably lost does not in the least invalidate supersyllabograms *per se*, since they are a subset of the Linear B words which they symbolize. If then the words they replace are included in the Linear B lexicon — and they are — then by the same token, so must their equivalent SSYLS. Moreover, there are also plenty of other terms in Linear B at level 1 for which there are no supersyllabograms, and so what is good for them is good for supersyllabograms at the same level. Just because we cannot recover the meanings of so many of the words at level 1 does not signify that they are not Mycenaean Greek, or at the very least of proto-Indo-European origin, or that a few of them may possibly even be Minoan. It is a commonplace phenomenon that any language, ancient or modern, inherits at least a few words from previous languages, even if the latter are in no way related to the former, as apparently Minoan and Mycenaean Greek are. Indeed, if we take the example of English, we find that thousands and thousands of words prior to English are incorporated into the Lexicon. This is especially true of medieval Norman French, of which there are at least 100,000

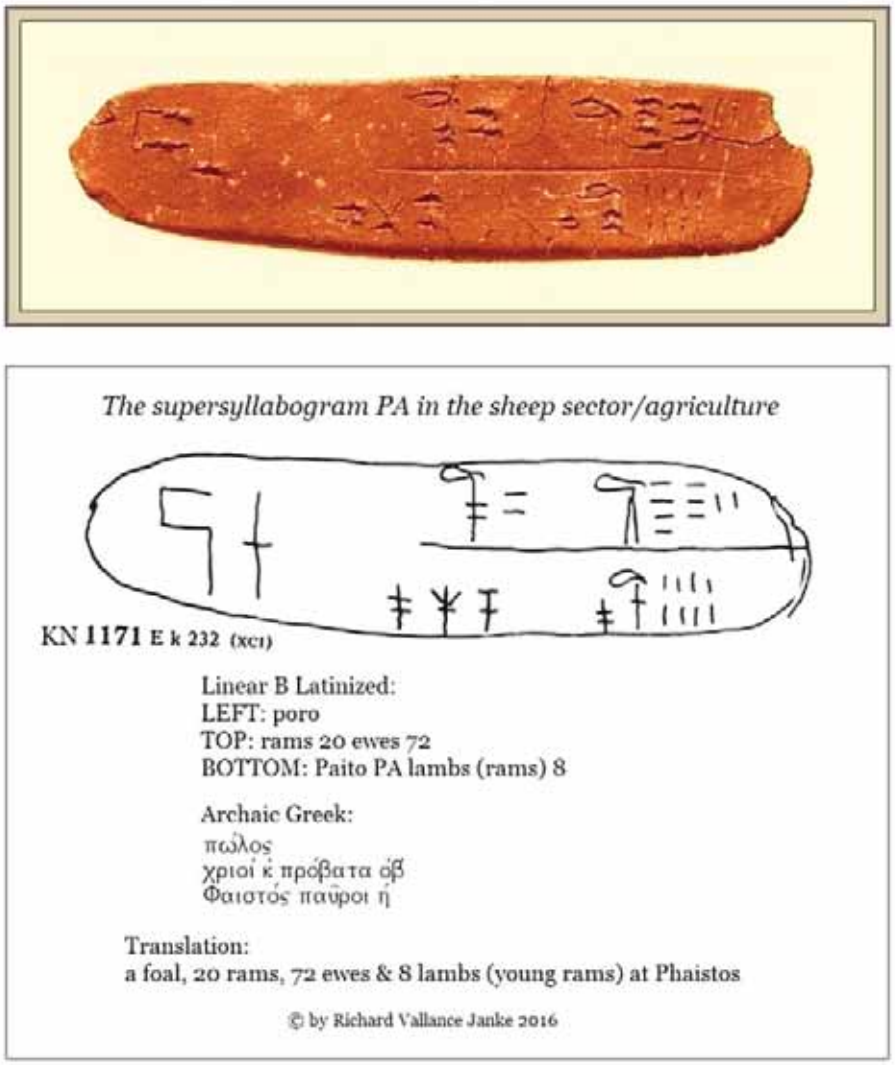


Fig. 5 – Linear B tablet KN 1171 E k 232, The supersyllabogram PA in sheep husbandry.

words in English. So what is good for one language is good for another, ancient or modern. Although the importation of non-Mycenaean terms into Mycenaean Greek may be minimal, it is not non-existent. For instance, we find in Mycenaean the words *serin*o = celery and *sasama* = sesame, neither of which are Greek at all. A supersyllabograms is a single syllabogram subset of *consecutive* syllabograms comprising Mycenaean words.

There are so many archaic Mycenaean Greek words at level 1, a considerable number of which are the counterparts to the supersyllabograms which symbolize them, that it would be rash to assume that we have any accurate account of what these terms actually mean. Such supersyllabograms are said to correspond to *improbable* terminological equivalents. They are by semiotic account quite unverifiable. There are, however, some instances where it can be established that there may potentially exist a *derived* term corresponding to the supersyllabogram which supposedly symbolizes it. In such cases, the scalar weight is cautiously raised to a value of 2. One exemplary instance of this phenomenon is attested in 38 Linear B tablets in the sheep husbandry sub-sector of the agricultural sector (Fig. 5).

Although the supersyllabogram PA occurs scores of times on Linear B tablets in the sheep husbandry sub-sector of the agricultural sector of the Minoan/Mycenaean economy, there un-

fortunately exists *no attributed Linear B term* to which this supersyllabogram can conceivably correspond. This poses a serious problem. It is obvious that the supersyllabogram PA meant a very great deal to the Linear B scribes. Otherwise they would not have resorted to it so often (on some 38 tablets, mostly in the KN 1200-1300 and KN 1500-1600 range). But what on earth can it possibly mean? To the rescue the *Pocket Oxford Classical Greek Dictionary* (Morwood and Taylor: 250). The problem inherent to this approach, i.e. reliance on a classical Greek dictionary diachronically centuries posterior to the disappearance of the Mycenaean dialect ca. 1200 BCE is that it assumes that the Mycenaean Linear B term corresponding to the supersyllabogram (in this case PA) was *not* archaic by the time of the advent of the earliest avatars of the Greek alphabet (ca. 900-800 BCE) , but that it survived at least until the Homeric era. Nonetheless, there exists in Classical Attic Greek a term which fits the context like a glove, and this is the word *pauro* παῦρος = very small or little, which in turn corresponds to the same word in Latin, *parvus* = little. But what is "very small" supposed to refer to? Given that the scores of tablets on which this supersyllabogram occurs all deal with sheep *without exception*, we may assume with reasonable confidence that the scribes are referring to "small sheep", in other words "lambs". But once again the caveat: there is absolutely no way of our telling whether or not the term is commensurate with the supersyllabogram. So we are going out on a limb here. On the other hand, the word "lamb" fits the context so well that it certainly should be considered as a potentially viable candidate. For more on this, see Criterion 2 below.

2 = a supersyllabogram for which there exists *one instance* or rarely two or three for a term corresponding to that supersyllabogram. This scenario is scarcely much of an improvement on a scalar value of 1, but it is better than nothing. A term correspondent to a supersyllabogram at this level often entails a necessary differentiation between supersyllabograms for which there exist comparable *attributed* terms on one or perhaps 2 or 3 tablets, and on the other hand *derived* terminology for which there exists no equivalent terminology on any Linear B tablet at level 1 above. Supersyllabograms at level 2 are construed as referring to a comparable Linear B word which may *possibly* have existed.

3 = a supersyllabogram which is susceptible to the application of a sound methodology for the determination of its accuracy in the context of a methodological *cross-contextual* comparison of the attributable (poly)semiotic values of any given supersyllabogram *over a wide range of tablets*, the more the better. Such supersyllabograms are said to be *probable* or even highly probable, and there are plenty of these, as we see for instance with this tablet (Fig. 6).

The supersyllabogram PU in the textiles sector, which occurs on something like 20 tablets, refers to a *type of textile* or cloth, called *pukateriya* φυγατέρια by the Minoan and Mycenaean scribes. Unfortunately, this Mycenaean Greek word is archaic, appearing nowhere in any East Greek dialect diachronically posterior to Mycenaean Greek. But in this case, contrary to what one might expect, this does *not* mean that we at least do not know that this is definitely some type of cloth, because, along with several other types of textiles in Mycenaean Greek, all of which are also archaic and all of which appear on scores and scores of Linear B tablets in the textiles sector, it is incontestable that this is a type of cloth. Why? — because this supersyllabogram is *attributive*, with PU appearing *inside* the ideogram, as is invariably the case with all attributive supersyllabograms in any sector of the Minoan/Mycenaean economy. By attributive we mean that the supersyllabogram, in this case PU, is in fact *an actual attribute of the ideogram in which it is incharged*. In other words, since the blank ideogram definitively means "textiles", the supersyllabogram must be an attribute of a textile, circumscribing it adjectivally. We shall encounter plenty more incharged supersyllabograms, not

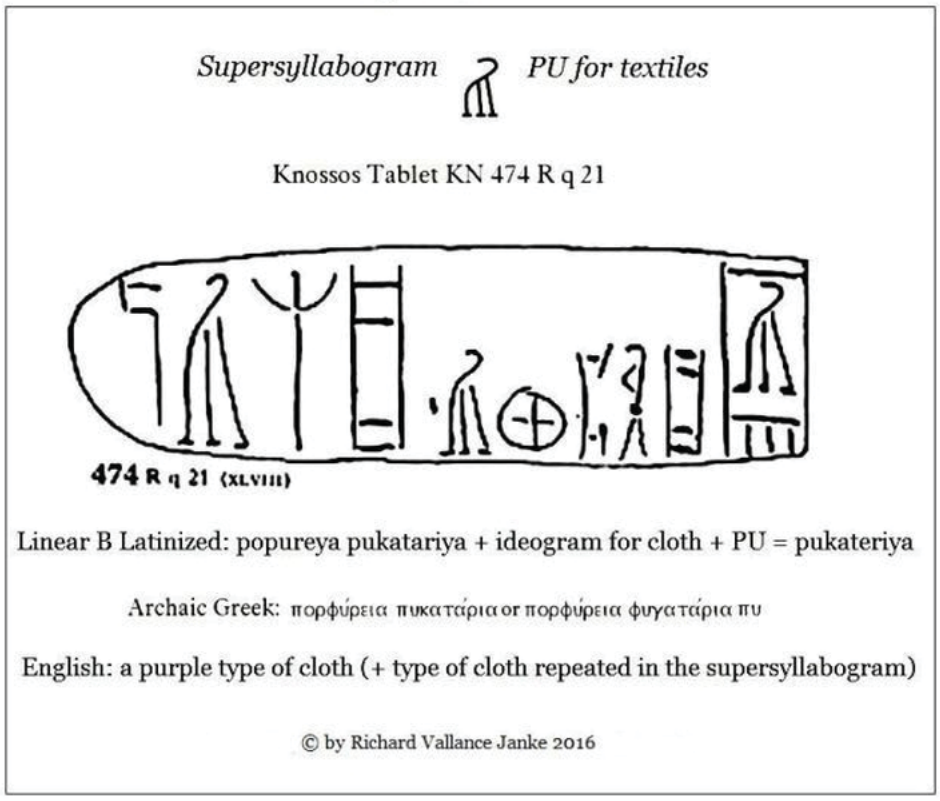


Fig. 6 – Knossos tablet KN 474 R 1 21, the supersyllabogram PU in the textiles sector.

only in the textiles, but in the vessels and pottery and in the military sectors as well (but never in the agricultural sector).

4 = a supersyllabogram for which there exists a commensurate Linear B term on several or a great many tablets, which cannot conceivably be in any doubt. These terms, actualized on numerous tablets, are said to be rooted in the real life world of each of the 4 major sectors of the Minoan/Mycenaean economy. Such supersyllabograms are invariably tagged as *definite and incontestable*. They include KI and O in the sheep husbandry sub-sector of the agricultural sector of the Minoan/Mycenaean economy, for which there can be no doubt whatsoever attached to their meaning. KI = kitimena = a plot of land, and O onato = a lease field. For an actual demonstration of the inviolability of such supersyllabograms, please refer back to Fig. 3.

Criterion 2: This is the rigorous application of the *incontestable* principle that the Linear B scribes always resorted to *specific determinative terminology equivalent to a supersyllabogram which was invariably descriptive of a* ***major****, never a minor, aspect of the métiers, activities, commodities and end-products intrinsically proper to any of the four primary sectors of the Minoan/Mycenaean economy*, be it the military, vessels and pottery, textiles or the agricultural sector. While this is far and away the paramount consideration to be taken into account in the determination of accurate terminology of Linear B vocabulary commensurate with the polysemiotic values of each supersyllabogram, this does not in least preclude the concomitant application of Criterion 1, which must unfailingly be considered in tandem with Criterion 2.

Supersyllabograms in the military sector of the Minoan/Mycenaean economy:

All in all, there are 15 supersyllabograms in the military sector of the Minoan/Mycenaean economy. The Table of Supersyllabograms in the

Table 2 – Supersyllabograms in the military sector of the Minoan/Mycenaean economy.

military sector of the Minoan/Mycenaean economy, lists the 10 most frequently used, as illustrated here in Table 2.

Assigning scalar weights to the supersyllabograms in this chart, we have: DA *dapu* λαβρύς = labrys = 2| KI *kiton* χιτών = chiton = 4 | KO *kowo* κώας =fleece = 3 | QE *qero* γέρρον = shield = 2 | QE *qeqinomeno* γεγινωμένος = made by twisting = 2 | RI *rino* λίνον = linen = 4 | RO *rousiyewiya* ρουσιεία = part made of leather = 2 | WE *perekeu* πελεκεύς = hewer (axeman) = 2/3 | WI *wirineo* Φρίνεος = made of leather = 4 | ZE *zeukesi* ζεύγεσι = with a pair, set or team of = 4| TE *temidwe* = τέρμιδΦες = (wheel) rim(s) (derived <- circumference) = 3. These weights determine the reliability of the terms to which I have assigned the supersyllabograms, where 1 = least and 4 = most reliable.

Two points of particular note. The attributive SSYL KI *kito* = chiton, with a weight of 4 is exceptionally used in conjunction with the associative supersyllabogram O, which in this context = *opero^* ωορκ (or "debt/liability or asset"), in other words a tailor "is working on a linen undergarment or tunic for armour, which is an asset". The SSYL WE is equivalent to *perekeu* = hewer (axeman). This is highly unusual, and is the sole instance in all the Linear B supersyllabograms where the SSYL WE does *not* correspond to the Linear B word which it symbolizes, i.e. *perekeu*. Nevertheless, I feel relatively confident of this meaning. This assumption is of course wide open to academic dispute.

[* Once I have assigned the Greek equivalent for any Linear B word, I do not repeat it for the same word again.]

Associative versus Attributive Supersyllabograms:

At this point that we are called upon to draw the marked distinction between *associative (as)* and *attributive (at)* supersyllabograms, since both types figure prominently in the military sector. All syllabograms in Mycenaean Linear B, without exception, appear either (a) *adjacent to* the ideogram or (b) *inside* the ideogram they qualify, and (c) they repeat themselves over and over, like clockwork. Supersyllabograms which appear adjacent to their ideograms are invariably *associative (as)*, while those which appear inside their ideograms are invariably *attributive (at)*. Associative supersyllabograms, which appear primarily and in droves in the agricultural sectors of the Minoan-Mycenaean economy, are either surcharged, appearing to top right or occasionally to the top left, supercharged, appearing right on top of the ideogram they qualify or pre-charged or post-charged (far more often than sur/supercharged). Attributive supersyllabograms are invariably *incharged*, bound inside the ideogram they qualify. The distinction neatly summarizes the marked difference between associative (as) syllabograms, which account for all of the SSYLS in the agricultural sector, and attributive (at) supersyllabograms, which appear primarily in the textiles and vessels (pottery, amphorae, cups etc.) sectors of the Late Minoan III and Mycenaean economies.

Associative Supersyllabograms:

Associative (as) dependent supersyllabograms inform us of some physical real-world element, usually in the agricultural sector, often a land tenure factor, which relates to the ideogram itself, or which circumscribes its environment, especially in the livestock raising sub-sector, but which does *not* define the ideogram itself in any way. As we have already seen in Fig. 3, the ideogram for "ram" coupled with the number of rams accounted for in this inventory, the supersyllabogram KI informs us that these rams are being raised on a *kitimena* κτιμένα or a "plot of land", while the supersyllabogram O with the ideogram for "sheep" informs us that the sheep are being raised on an *onato* όνατον or "a lease(d) field", actually "a usufruct field leased by an overseer to a tenant". That is a great deal of text to cram into one syllabogram and one ideogram. The scribe could have simply stated that x no. of sheep were being raised, and left it at that, without recourse to supersyllabograms. But he did not. Optionally but intentionally conjoining just one supersyllabogram (KI or O) with the ideogram for "sheep" or "rams", the scribe has effectively telescoped what would otherwise have been discursive descriptive text. In other words, these two supersyllabograms in and of themselves are very precise, information-rich semiotic symbols of the descriptive text they so neatly replace.

The associative supersyllabogram sets the ideogram, which all alone would simply mean "sheep" "rams" or "ewes" in a highly specific context. But, since they are utterly meaningless unless immediately adjacent to the ideogram they qualify, single syllabograms in this class are never used unless strictly paired with an ideogram. While the syl-

labogram KI must mean "a plot of land" when associated with any of the three ideograms for sheep, strip away that ideogram, and KI all by itself could be the first syllable of any one of no fewer than 175 entries under KI in Chris Tselentis' Linear B Lexicon. Utterly meaningless without context with the appropriate linked ideogram.

In the military sector of the Minoan/Mycenaean economy, with only 2 of them all told, MO = *mono* = single -or- spare (wheel) and ZE = *zeugesi* = with a pair of, with a team of (horses) or with (a set of) wheels on axle, associative supersyllabograms are distinctly in the minority. It is absolutely essential to understand at this point the powerful impact of the all-pervasive *formulaic language* on Linear B tablets in all sectors of the economy. While the Linear B vocabulary is formulaic, supersyllabograms are to the extreme.

Attributive Supersyllabograms:

Attributive (at) dependent supersyllabograms always appear inside the ideogram which they qualify, never adjacent to it. They always describe an *actual attribute of the ideogram*. Neither the supersyllabogram nor the ideogram can exist without the other being present, if one is to make any sense at all of what the two, once married, can possibly mean. They are intrinsically symbiotic. In the military sector of the Minoan/Mycenaean economy, attributive supersyllabograms figure far more prominently than associative, there being a total of 10 major ones in Table 2, as opposed to 2 associative supersyllabograms.

For instance, the syllabogram RI inside the ideogram is the first syllabogram, i.e. the first syllable of the Mycenaean word for *rino* = linen. Neither type of dependent supersyllabogram, associative (as) or attributive (at), was ever even noticed, let alone systematically isolated and tabulated in Mycenaean Linear B until I took it upon myself to do just that from 2014-2016.

The artificiality of Mycenaean Linear B as a construct:

It is of critical importance for us to realize in the twenty-first century, so extremely far removed from the Minoan/Mycenaean world, with its own peculiar economic superstructure/infrastructure of some 3,500 to 3,200 years ago, that the way we *conceptualize language*, and by this I mean the *lexical function of natural vocabulary* in particular, is so alien to the manner in which the Linear B scribes visualized it (language) that it takes the utmost effort on our part as modern philologists not to inject our ingrained and to some extent unconscious prejudices into the system which the Linear B scribes so ingeniously invented *for the purposes of accounting and inventory keeping alone within the strict confines of the structure of the Minoan/Mycenaean palatial administration*. While present day lexicologists in all modern languages are almost exclusively concerned with both the literary and natural colloquial language, especially the latter, nothing could be further from the truth when it comes to Mycenaean Greek. Mycenaean Greek as attested in the corpus of Linear B tablets alone, regardless of provenance (Knossos, Pylos, Mycenae, Thebes etc.) never was reflective of any "literary" language, simply because there was none, nor with spoken Mycenaean, though we can be certain that the latter contained a much larger vocabulary than is attested on the tablets.

But if the tablets are not concerned with the natural Mycenaean language, what "language" do they reflect? In short, they do not reflect the Mycenaean language in its broadest sense as a natural language at all. They, the tablets, are a highly restricted subset of Mycenaean Greek, which is concerned solely with inventory keeping and accounting*, and nothing else whatsoever*. This is the precise reason why there is no dialectical variance across tablets of different provenance (Knossos, Pylos etc.). Accounting and inventorial language is just that, and nothing more. Allowing for and more to the point, even permitting or tolerating variations in accounting and inventory terminology, was out of the question then as now in modern

inventories, regardless of the language in which such inventories ever were or are still compiled. To draw a parallel which neatly illustrates my point, take the terminology of the computer and online world. Even though it has nothing to do with accounting, it too is formulaic. So if this is true for the vocabulary in highly specialized areas of modern vocabulary, regardless of language, how much more so must it be for Mycenaean Greek.

We must bear uppermost in mind this vital distinction between natural and technical language at all times, for failure to do so warps the Mycenaean Linear B lexicon beyond recognition and plausibility. Why so? — because, and I insist on emphatically repeating, all vocabulary in Mycenaean Greek is *formulaic to the extreme*, as that is what one would naturally expect of inventories and accounts. But of all the lexical phenomena in Mycenaean Linear B, it is the supersyllabograms which are *the most radically formulaic*, because they constitutionally must be. Extreme formalism is intrinsic to their very nature. A supersyllabogram *never* varies, whether it is associative or attributive. What does this imply? A very great deal.

For instance, while it would appear at first sight that the two associative supersyllabograms in the military sector, MO = *mono* = single, a spare, and ZE = *zeugesi* = with a pair of, mean that and nothing more, this is simply not the case. Given that supersyllabograms are intrinsically formulaic in the extreme, because they are in effect *fossilized*, the same supersyllabograms, in this case, MO and ZE must be used over and over in the context of and in conjunction with (*radically) different ideograms,* with a particular emphasis on the highly variable *connotations* of these ideograms.

What do you imagine the Mycenaean Linear B scribes actually meant when they paired the SSYL (supersyllabogram) ZE with the ideogram for "horse" or with that for "wheels"?

Although the supersyllabogram ZE is formulaic and fossilized, this does *not* in the least mean that the scribes were not aware of the critical distinctions between pairing for instance ZE (ostensibly meaning just "a pair of") with horses on the one hand, and chariot wheels on the other. They knew exactly what IQO (horse) + ZE meant and what wheel + ZE meant. What they clearly intended ZE to mean, and what it actually meant to them when post-charged with IQO = horses is "a *team* of horses", not simply just a pair of horses. On the other hand, when it comes to "a pair of wheels", it does not take much imagination to realize that what the scribes intended the supersyllabogram to mean was not simply a pair of wheels, but "*a set of wheels on axle*" or better yet, simply "w*heels on axle*", since after all that is precisely what they were, the wheels of chariots on axle. In other words, while the supersyllabogram *per se* (in this case ZE) is formulaic and fossilized, its lexicographic meaning is *not*. It is *polysemiotic*, exemplifying the principle that when the scribes changed the specific context of the ideogram with which the supersyllabogram, regardless, was paired, they inevitably and automatically changed its fundamental meaning. This distinction is critical, for it allows us to peer straight through the apparently suffocating confines of fossilized supersyllabograms into the actual meaning of each supersyllabogram in various contexts in the collegial mindset of the scribes as a guild. They knew exactly what each supersyllabogram meant, even if it was the same one in (slightly) different contexts and even if in the same economic sector, because each supersyllabogram was meant to *precisely*, never vaguely, symbolize a particular major economic indicator.

Allow me to elucidate further. Take the supersyllabogram MO = "one" or "single" used in conjunction with the ideogram for "wheel". It just so happens that almost all Linear B tablets concerned with the manufacture of wheels in chariot construction not only assign the post-charged SSYL ZE to specify *wheels on axle*, but by the same token account for the pre-charged MO + wheel. If then wheels + ZE means wheels on axle, it reasonably follows that MO + wheel or wheels does not simply refer to "a single wheel". Other-

wise, how on earth could it be that a single wheel is a single wheel *many times over?* But you cannot tout one single wheel as being one and one only, when, more often than not, there are several "spare wheels" for the same number of sets of wheels on axle. Tablets which list n number of sets of wheels on axle, where n > 1, almost always list the same number of spare wheels for each *set* of wheels on axle. Now we must be careful to make the distinction between the fact that a *set* of wheels on axle means a *pair* of wheels, in other words, 2 of them, and the fact that for each set of wheels (2 wheels), there is only **1** spare wheel. Although there are 2 wheels on axle in a set, there is only **1** set, hence the correlation between the set and the spare is 1 to 1. As in present-day car manufacturing, the Mycenaean chariot builders always included a spare wheel just in case. Makes perfect sense.

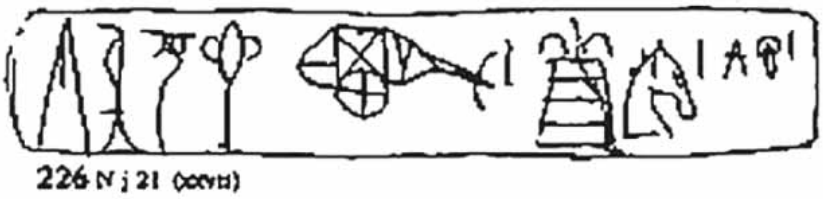
Now for a completely different example, this time with reference to the *attributive* supersyllabogram QE. When QE *qeqinomeno* is incharged in the ideogram for armour, it means "made by twisting", probably with reference to intertwining small armoured chains by criss-crossing. On the other hand, when QE is incharged inside the ideogram for a shield, it probably means just that, γέρρον "a shield", since after all the syllabogram QE by itself, *without* the little handle to the top left, is otherwise a simple syllabogram which means nothing unless part of a Linear B word. Refer back to Figure 2 above.

There remains one more particularly bizarre concatenation of not one, but two supersyllabograms, both bound with the same ideogram. This is the one and only instance in the entire repertoire of Linear tablets where such a phenomenon occurs. These I refer to as the *composite* supersyllabograms E & KO (Fig. 7):

The text and translation are pretty much self-explanatory. But what is truly tantalizing about this particular tablet is that, by cramming two supersyllabograms together with one ideogram IQO = horse, it manages to convey so much information, but with far fewer syllabograms than if the tablet had been written out in full... which it wasn't, for the obvious reason that the scribe simply could not be bothered wasting what was ostensibly precious space on such a tiny tablet. This brings us to the next defining characteristic of supersyllabograms, be they associative or attributive. *Supersyllabograms, though formulaic in the extreme and fossilized, are information rich*. A single supersyllabogram coupled with an ideogram can replace a lot of what would have otherwise been totally needless discursive text. But **2** supersyllabograms paired with one ideogram carry this feature to even further extremes. If this is not a linguistic practice for which there is no equivalent in any language, ancient or modern, I do not know what is. And the fact that the Linear B scribes consciously and deliberately resorted to this stratagem over and over, hundreds of times (800+), makes it crystal clear that this was (and is) a linguistic device unlike any other ever seen before or since Mycenaean Linear B. That this fully standardized and formulaic practice on the part of the scribes was a brilliant stratagem goes without saying.

In the end it does not matter one jot whether we, in the twenty-first century, find this stratagem counter-intuitive. My point, the very same I made in my presentation, "The Rôle of Supersyllabograms in Mycenaean Greek" at *The Third Interdisciplinary Conference, "Thinking Symbols"*, July 1 2015, at the Pultusk Academy of the Humanities, simply is this, and I quote:

They (supersyllabograms) are there because the scribes, as a guild, all understood perfectly well that each and every supersyllabogram always meant one thing and one thing only to them in its *proper context* (context being variable). The very notion of future interpretations of what was obvious to them as accountants would have never entered their minds. But we owe it to ourselves to decipher as many supersyllabograms as we can. Otherwise we learn nothing new of value to the field of historical linguistics in Mycenaean Linear B ... *passim* ... To summarize, Mycenaean Greek texts in Linear B are formulaic on at least



This is the one and only tablet in Linear B on which two supersyllabograms appear with the ideogram they modify. But why 2? ... & why are they flanked by the numeric for "1" in Linear B? *See* this post for the most credible explanation. The supersyllabogram E probably means = eeropayoqene = a part of the harness, possibly the bridle.
The supersyllabogram KO probably means = kononipi * = cross-bar.
kononipi * in (archaic) Greek = κονονίδιφι.

Literal translation:
Tirisoka + ideogam for chariot 1 + ideogram for armour + ideogram for horse 1 + supersyllabograms E & KO 1

Free translation:
1 chariot for the hunt with an armoured driver, with a part of the harness (bridle?) and a cross-bar for the horses. **
OR (much more likely)
Thrisokas' chariot with him in armour, and with a part of the harness (bridle?) and a cross-bar for the horses. **

** The supersyllabograms E & KO bracketed by 1 on the left side & 1 on the right appear to refer to 2 horses, which is what we would expect for a Bronze Age Mycenaean chariot.

Fig. 7 – The composite supersyllabograms E & KO with the ideogram IQO = horse.

three counts: Mycenaean text on extant tablets is routinely formulaic to the extreme. Mycenaean ideograms are likewise formulaic in all instances, completely standardized ... *passim*... Supersyllabograms, which are rampant on extant tablets from Knossos, appearing on some 800 out of 3,500 relatively intact tablets (exclusive of fragments), are also invariably standardized.

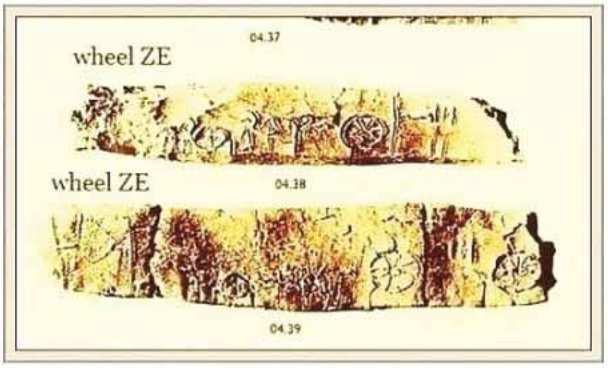
To round out our observations on supersyllabograms in the military sector, here you see Linear B tablets KN 04.38 and 04.39, which demonstrate the use of the supersyllabogram ZE in conjunction with wheels (Fig. 8):

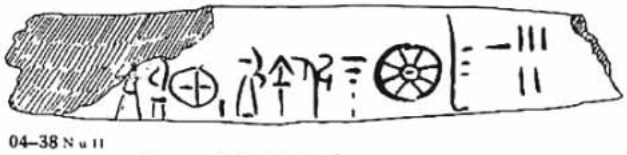
We can see that the ideogram for wheel + ZE represents "(a set of) wheels on axle", whereas the supersyllabogram MO preceding the ideogram for wheel stands for a "spare wheel". You will note that, with these two tablets, as with practically all others, I display the text not only in Latinized Linear B, but in (archaic) Greek and English as well.[5]

Supersyllabograms in the pottery and vessels sector of the Minoan/Mycenaean economy:

Here we have the Table of Supersyllabograms in the pottery and vessels sector of the Minoan/

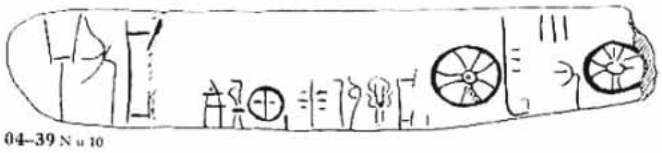
5 In the text of this article, with the exception of the Figures and Tables, all references to supersyllabograms and words in Linear B are Latinized, in accordance with L. R. Palmer's practice in *The Interpretation of Mycenaean Greek Texts* (1963).





04–38 N u 11

Linear B Latinized:
erika wozomena wheel ZE 15
Archaic Greek:
ἐλίκας ϝορζόμενος ἅρμοτα ζέ ΙΙ
Translation:
15 well-constructed wheels of willow on axle



04–39 N u 10

Linear B Latinized: *Supersyllabograms are shorthand.*
amota erika temidweta amota ZE 3 mono amota
Archaic Greek:
ἐλίκας τερμιδυέντα ἅρμοτα ζέ γ́ μόνος ἅρμοτα

Translation:
wheels: wheel rims made of willow, 3 wheels on axle & one spare wheel

Fig. 8 – Knossos Tablets K 04.38 & 04.39. Military

Mycenaean economy (Table 3).

Assigning scalar weights to the supersyllabograms in this chart, we have: A *aporewe* = α0μ(φι) φορή*F*ες = amphora = 4| DI *diuyo* -or- *diwiyo* = Διύ/ος/Δι*F*ίος= god, Zeus = 4| | KA *kakeyapi* = χαλκεί/αφι = with copper = 4 | NE *newa/newo* = νέ/Fα/νέ/Fος= new = 4 | PO *Potiniya* = πό/τνια= Potnia = 2/3 | SA *linon* = 3 | SO *soro* = σορός = funereal urn = 2 and | U *udoro* = ὕδρος = water flask = 4. We have had to assign the value of 2 or 3 to PO *Potiniya* = (the goddess) Potnia because it is uncertain whether or not PO actually refers to her and not to someone or something else. For more on this conundrum, see "An Archaeologist's Translation of Pylos Tablet TA 641-1952 (Ventris), with an Introduction to Supersyllabograms in the Vessels and Pottery Sector in Mycenaean Linear B", pp. 133-161 in *Archaeology and Science,* ISSN 1452-7448, 10 (2014), in which I introduce and discuss

Table 3

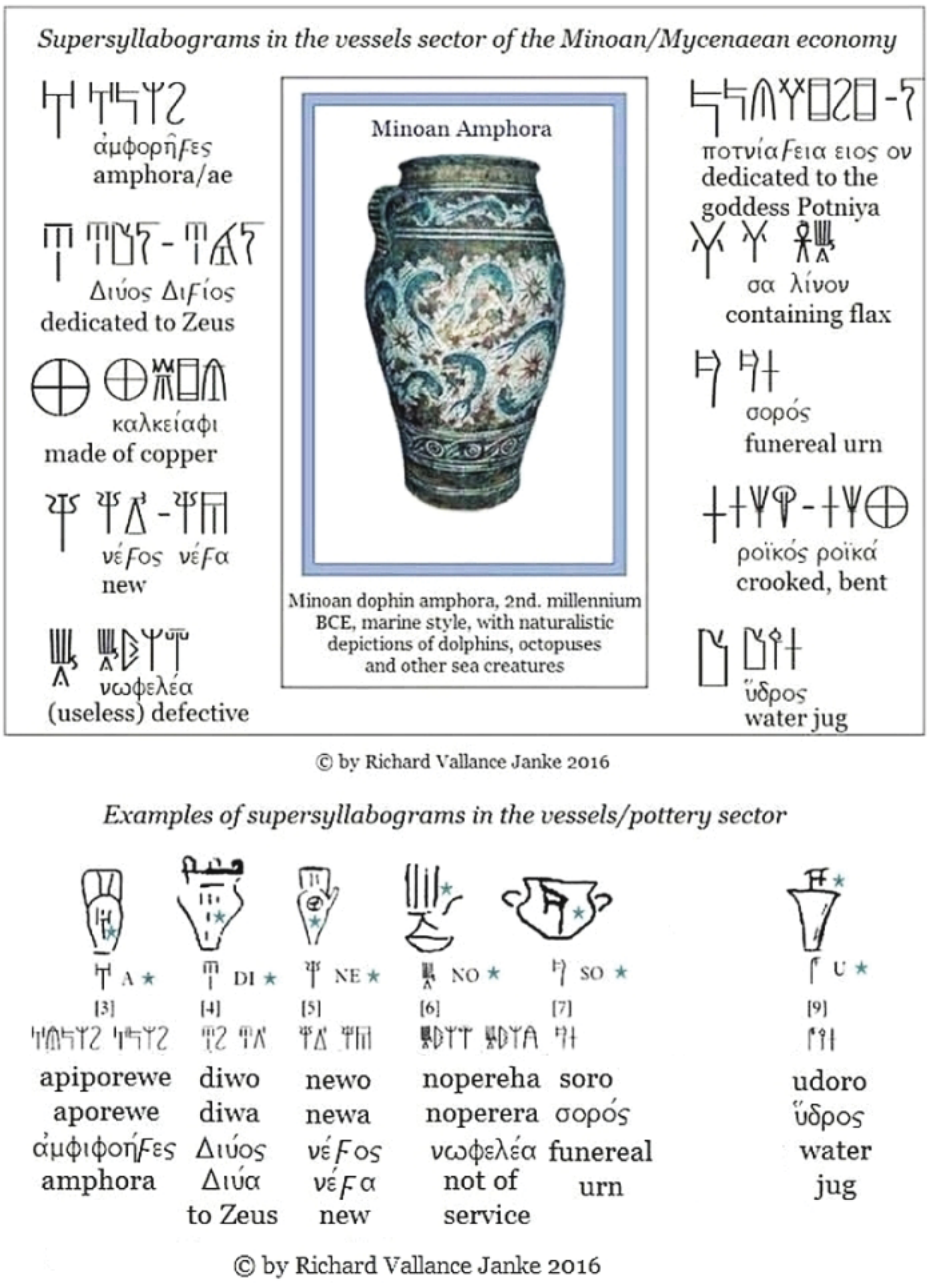


Table 3 – Supersyllabograms in the vessels sector of the Minoan/Mycenaean economy.

supersyllabograms in the vessels and pottery sector at great length. It was in that article that I fully addressed all of the possible variants of the supersyllabogram PO (pg. 153). Of the variants attributable to PO, Potiniya, the goddess Potnia, now seems after due consideration to be the best bet. In order for you to truly appreciate the great impact of supersyllabograms on the vessels and pottery sector of the Minoan/Mycenaean economy, I strongly urge you to read that article, as there is no point rehashing the analytical and synoptic progress I forged for these supersyllabograms in it.

We close out this section with an illustration of 4 tablets and fragments sporting supersyllabo-

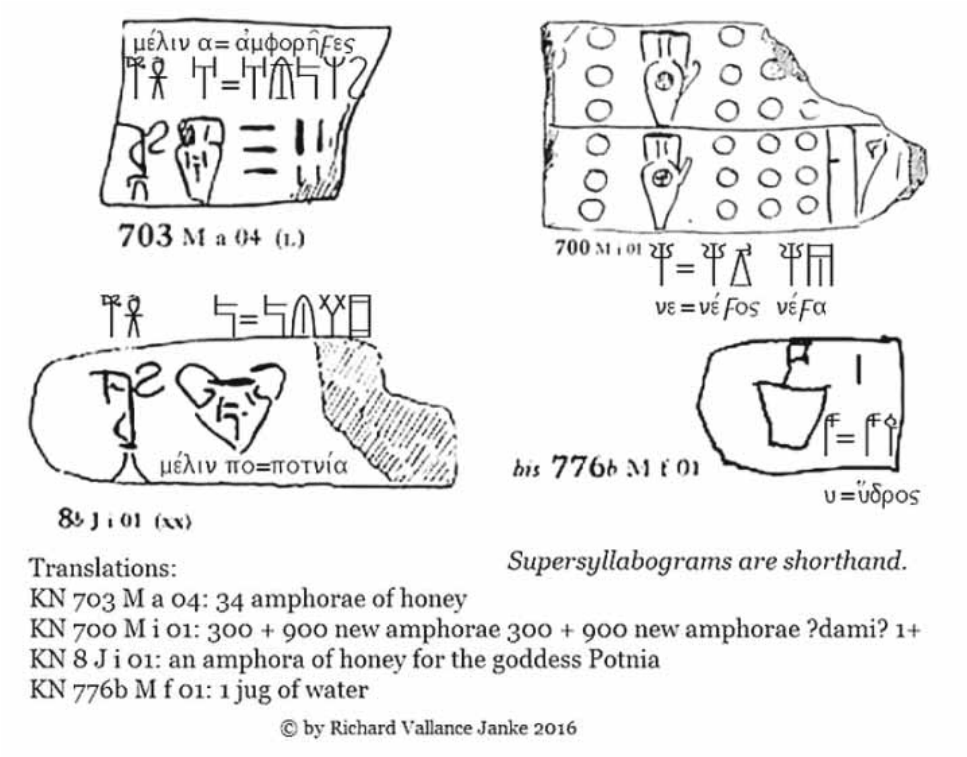


Fig. 9 – Supersyllabograms for pottery in Mycenaean Linear B.

grams in the vessels and pottery sector (Fig. 9).

All of the SSYLS on these 4 tablets are self-explanatory. I do wish to call your attention to the supersyllabogram NE on fragment KN 700 M i 01 (top right). This SSYL NE *newo/newa* = new, which appears in the vessels and textiles sectors, is one of only 5 which convey the same meaning across economic sectors. The others are KI kito = chiton, KO kowo = fleece, RI rino = linen and WI wirineo = made of leather, all of which appear in both the military and textiles sectors.

Supersyllabograms in the textiles sector of the Minoan/Mycenaean economy:

Here we have the Table of Supersyllabograms in the textiles sector of the Minoan/Mycenaean economy (Table 4).

Table 4 lists the supersyllabograms in the textiles sector, all of which are *attributive (at)*, as is to be expected. Assigning scalar weights to the supersyllabograms in this chart, we have: KI *kito* chiton = 4 | KO *kowo* = fleece = 3 | KU *kuruso(yo)* = χρυσό/ς xruso///io = (of) gold = 3 | NE *newo/newa* = new = 4 | O *opa* = o1lpa = (syn., *apudosis* = α0πύ/δοσις) = delivery = 2 | PA *pawea* = φά/ρ*F*εα = textiles = 3 | PE *pekoto* = πέ/κοτον = a kind of textile or a process in the refinement of textiles = 3 | PU *pukatariya* = fugate/ria = a kind of textile or a process in the refinement of textiles = 3 | RA *rapte* = ρά/πτερ = tailor = 2 | RI *rino* = linen = 4 | TE *tetukowoa* = τετυχύ/*F*οα = a kind of textile or a process in the refinement of textiles = 3 | WE *wehano* = *F*εhανό/ς= a kind of textile or a process in the refinement of textiles = 3 | WI *wirineo* = *F*ρί/νειος = made of leather = 4 | ZO *zone* = zw/nh = belt = 2. The fact that there are so many supersyllabograms in the textiles sector bears witness to its great significance in the functioning of the Minoan/Mycenaean economy.

The following table serves to clarify the structure of incharged supersyllabograms in the textiles sector, with our attention trained on the unusual appearance of the supersyllabogram RA = *rapte* = tailor (Table 5).

You can see for yourself that the supersyllabogram RA is peculiar. While it is incharged, in what sense is it incharged? The answer is in the pro-

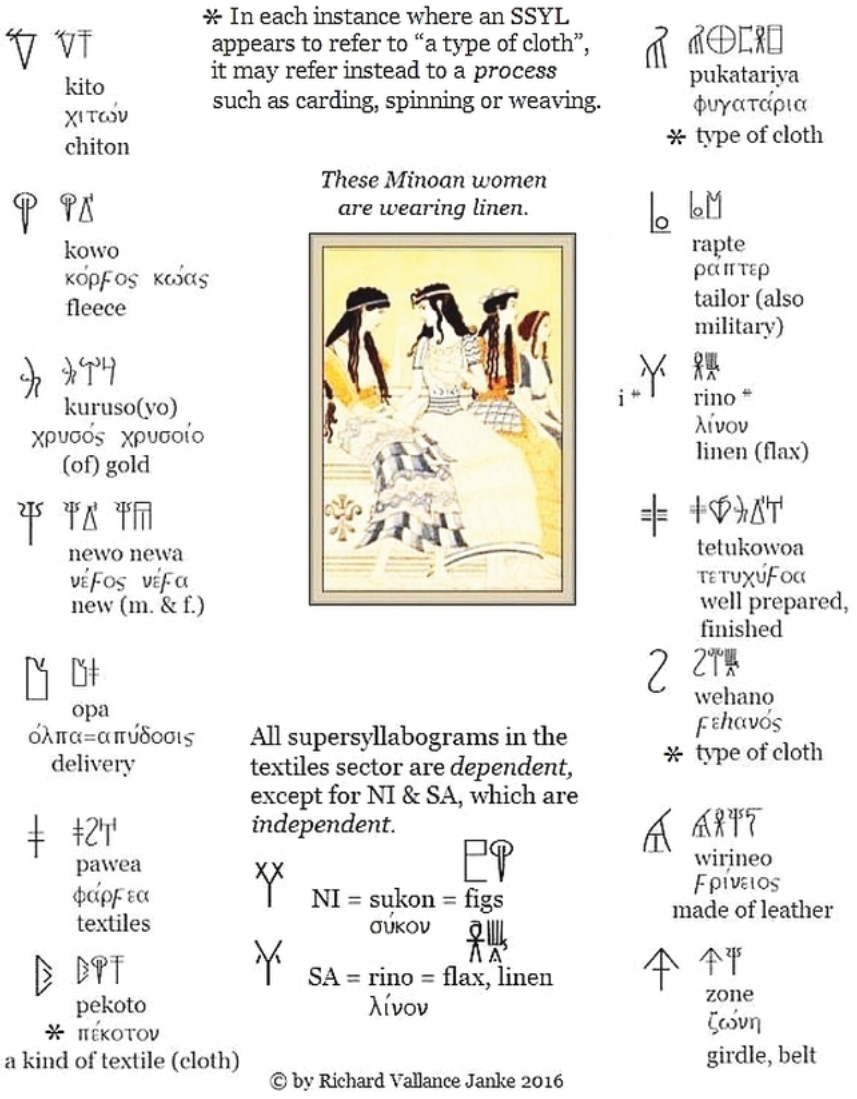


Table 4 – Supersyllabograms in the textiles sector of the Minoan/Mycenaean economy.

fession. A tailor works on an *unfinished* piece of cloth or textile which he fashions into a tunic, undergarment or any other article of clothing. Taking a closer look at this supersyllabogram, we note that it is positioned to the left and at the bottom of the ideogram in which it is incharged. We are confronted with another ideogram to the top and to the right which appears to be truncated. And it is. If we look closely at this ideogram, we can see that it looks very much like 1/2 of the ideogram for *rino* = linen (*See* Table 2 above, Military Supersyllabograms). If that is indeed the case, then it naturally follows that what we are dealing with here is unfinished cloth. The interpretation fits. This is not to say that it is correct. This is why I have assigned a scalar value of 2 to the SSYL RA in textiles (Fig. 10).

Zeroing in on the supersyllabogram TE on this tablet, we find that Chris Tselentis, in his *Linear B Lexicon*, defines it as "well prepared" or "ready". But what does this imply? Once again the scribes must have assigned a more precise sense to the supersyllabogram TE. I believe that what they intended it to mean was "finished (cloth)" on the one hand, or "ready for sale on the open market" or simply "for sale" on the other.

Until now, the research community of philologists and linguists has, without exception, treated

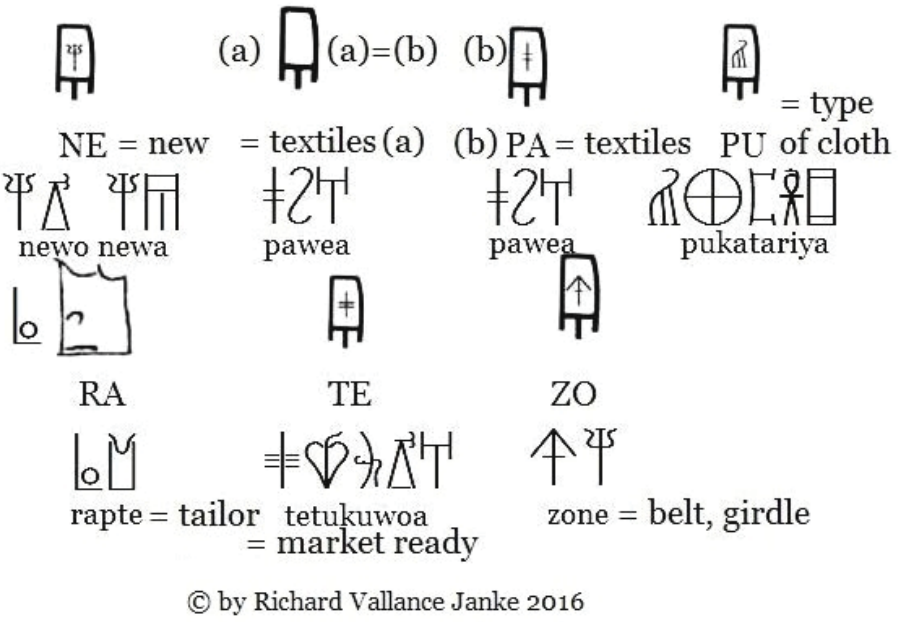


Table 5 – Supersyllabograms in textiles.

all of these supersyllabograms as being different types of cloth, given that they are all subsets of the generic ideogram for "textiles", namely, the blank ideogram in Table 5, which in its own turn is more often than not incharged with PA *pawea* = textiles. The meaning of the incharged SSYL PA (textiles) appears to be confirmed, which is why I have assigned it a scalar weight of 3. Still, I am uncertain of the true values of the four SSYLS PE, PU, TE, TU and WE. Combinations of some or all four of these supersyllabograms may also or instead refer to a *process* in the production of textiles, such as dying (see Figure 11), spinning, weaving or carding. But we shall never know, because all four of these textile terms are archaic Mycenaean Greek, having disappeared from ancient Greek forever after the fall of Mycenae ca. 1200 BCE.

In summary, then, here are all of supersyllabograms in the textiles sector (Fig. 11).

Translations: 2 units of cloth of gold = 6 + 2 units of linen cloth + ideogram for "cloth" + 20 units of TE *tetukowoa* = a kind of textile + 1 unit of *tunano* = τυνάνον = a type of cloth | WE *wehano* = a kind of textile | WI *wirineo* = made of leather | ZO *zone* = a belt or girdle | *rita*? (unknown word) + *pawea* = textiles + (left-truncated) ?*teweya* (unknown word, left truncated) = a kind of cloth? + the ideogram for "cloth" | KI *kito* = chiton | *ekisiya* (unknown word) = ἔκισία = a type of cloth? + *pekoto* = a type of cloth + 2 units of TE *tetukowoa* = a kind of textile + 2 units of the ideogram for "cloth" (*pawea*).

Supersyllabograms in the agricultural sector of the Minoan/Mycenaean economy:

If supersyllabograms predominate in the military, vessels and pottery and textiles sectors of the Minoan/Mycenaean economy, they proliferate in the agricultural sector. Astonishing as it may seem, over 80% of all supersyllabograms appearing in all sectors of the Minoan/Mycenaean economy *occur in the agricultural sector alone*. Taking the approximate total of some 3,500 tablets and fragments unearthed at Knossos as our benchmark, we find that a subset of some 800 or 23% feature supersyllabograms. In turn, a slightly smaller subset of around 640 (80%) tablets fall in the agricultural sector alone. What is even more astonishing is the fact that fully 90% or about 580 tablets of all the supersyllabograms in the agricultural sector are *specifically related to sheep (rams and ewes)*.

Researchers have attempted to account for this huge disparity between all SSYLS in the military,

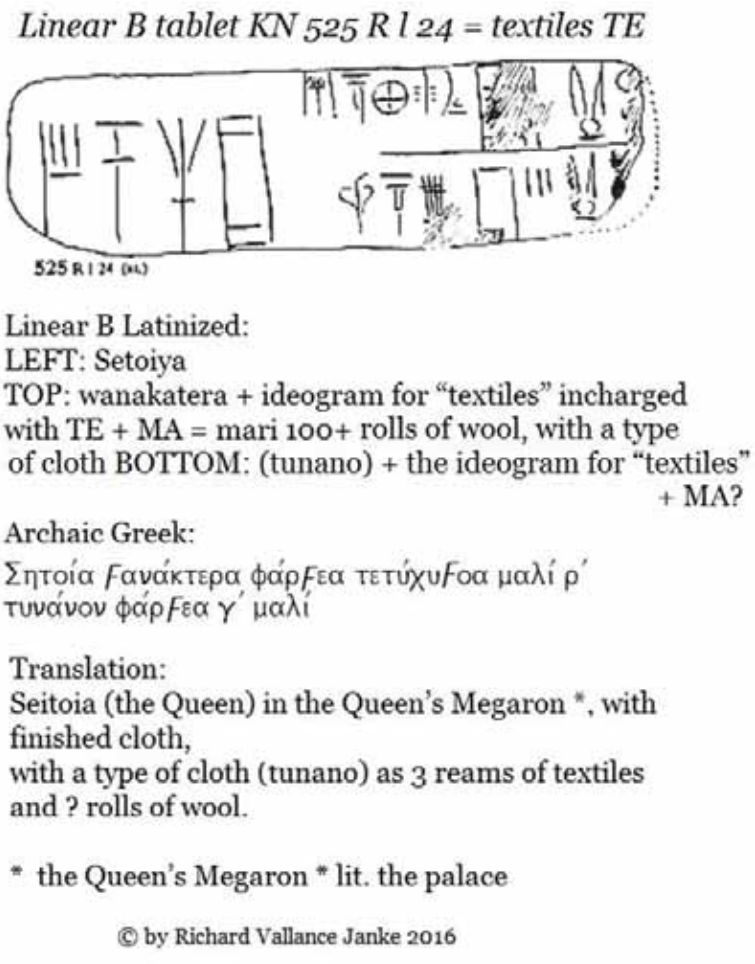


Fig. 10 – Supersyllabogram TE for textiles.

vessels or pottery and textiles sectors put together as a whole (amounting to no more than around 160 tablets) on the one hand, and the 640 or so supersyllabograms found on tablets in the agricultural sector alone on the other. In all likelihood, the Linear B scribes were far more focused on the agricultural sector than on any other because it would appear that the major revenues of the palace administrations at Knossos, Pylos and elsewhere accrued for the greatest part from the sheep husbandry and raising sub-sector of the agricultural sector, in spite of the fact that tens of thousands of vessels and pottery are inventoried on far fewer tablets in that sector. It does stand to reason that sheep would account for the major portion of palace revenues by some stretch, given that sheep husbandry and raising was very labour-intensive, and involved not only raising flocks from infancy (lambs), sheep shearing, the manufacture of wool and all other related activities, but primarily tending to flocks running to the 1,000s and even the tens of thousands, up to as many as close to 100,000 at Knossos.

This is confirmed by the fact that in the same sector (agriculture), the raising of cows and bulls and the submission of bulls or oxen to teams at the yoke account for only 6 tablets in all (KN 896 D o 21 to KN 900 D o 01). The discrepancy between the vast number of tablets with supersyllabograms dealing solely with sheep and those covering cows, bulls and oxen is so wildly lopsided as to defy "common sense". But there you have it.

Here we have the Table of Supersyllabograms for those 580 or so tablets dealing with sheep in

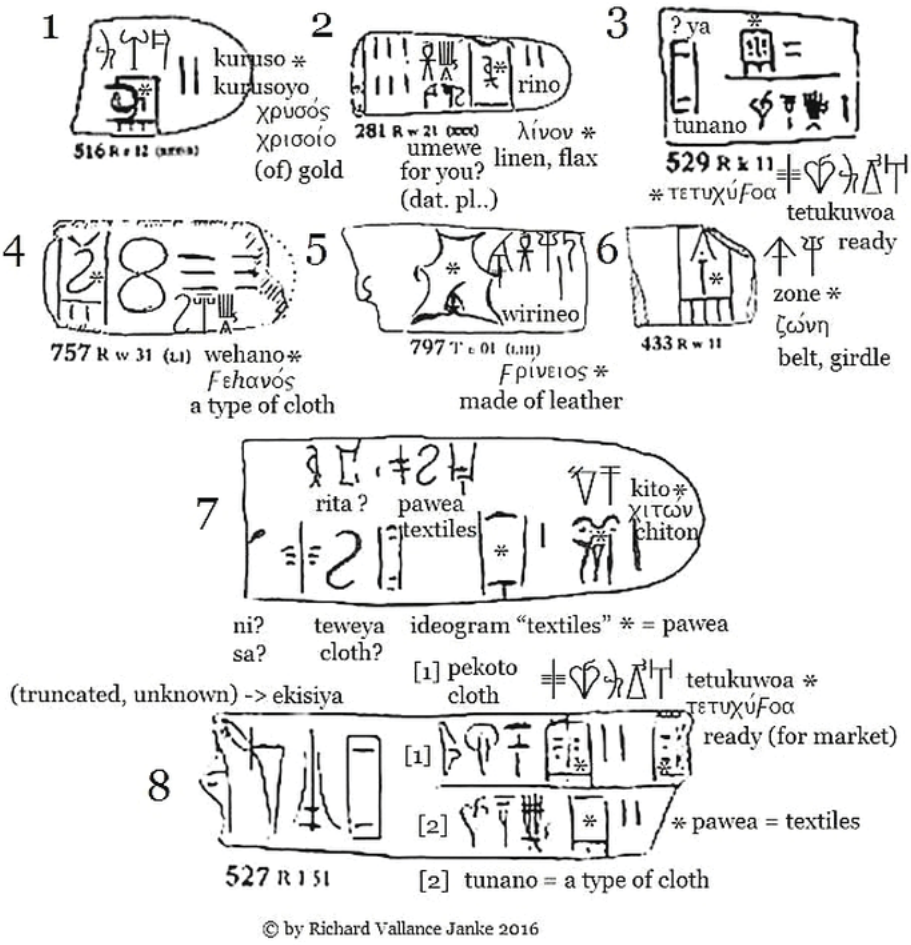


Fig. 11 – Supersyllabograms for textiles in Mycenaean Linear B.

the agricultural sector of the Minoan/Mycenaean economy (Table 6).

Table 6 lists the supersyllabograms in the agricultural sector, all of which are *associative (at)*, contrary to all the other sectors, in which there are either admixtures of attributive and associative supersyllabograms (military) or associative supersyllabograms alone (vessels and textiles). Assigning scalar weights to the supersyllabograms in this chart, we have: KI *kitimena* = a plot of land = 4 | O *onato* = a lease field = 4 | PA *pauro* παῦρος = small or little, i.e. lambs = 2/3 | PE *periqoro* περίβολος= sheep pen = 3 | SA s*apaketeriya* σφακτηρ/ίαι = for ritual slaughter = 2 | SE *sekazo* σηκάζω = (verb) to pen in 2 | and ZA *zawete* ζά/*Fετες* = this year = 3. The values for KI and O are absolutely certain, as the extant Linear B lexicon allows for no other interpretations. Those for PE and ZA are highly probable, since these two words figure prominently in the Linear B lexicon. SA and SE cannot be assigned weights higher than 2, because neither term is attested anywhere in the Linear B lexicon. I was obliged to ransack the *Pocket Oxford Classical Greek Dictionary* for both of these terms. As I have emphatically stressed before, there is no assurance whatsoever that Classical Greek words represented as s*apaketeriya* and *sekazo* in Linear B actually existed in Mycenaean Greek. However, they do make eminent sense in context.

PA or *pauro* = small, little, i.e. "lamb" is a special case. Once again, there exist no *attested* instances of this supersyllabogram spelled out in full on any extant Linear B tablets, in spite of

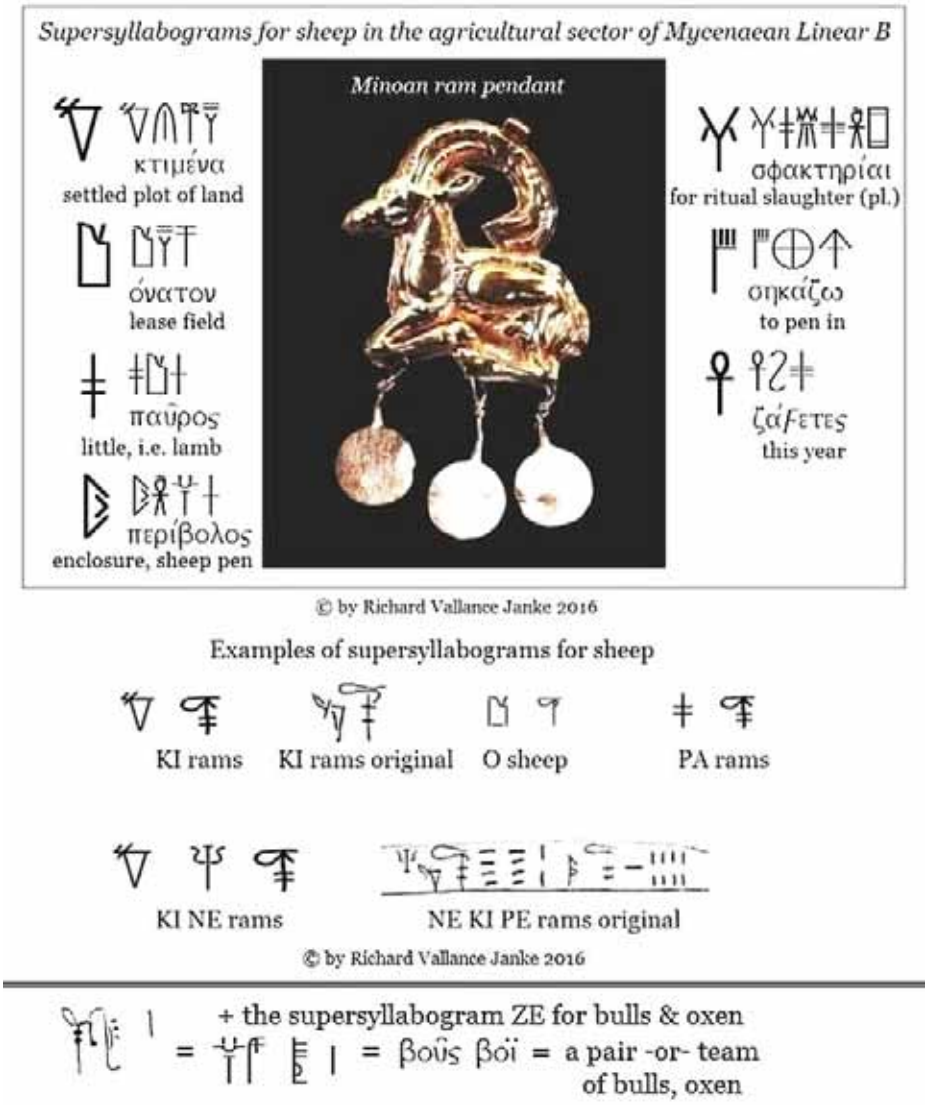


Table 6 – Supersyllabograms for sheep in the agricultural sector of Mycenaean Linear B.

the fact that this SSYL PA accounts for no fewer than 38 tablets. So it is obvious that the Linear B scribes held the SSYL PA in great stock. You will recall from my discussion of this supersyllabogram in Criterion 1 above that I assigned the meaning, "lambs" to it for various cogent reasons. The clincher is that on every last one of the tablets on which the SSYL PA figures, the number of "little" sheep associated with it is *always much smaller than the total number of sheep* on the same tablet. What is even more significant, the number of tablets on which the ideogram for "ewe(s)" figures = 27/37 or 73% always treat of lambs. This factor alone signifies that the commonplace presence of the ideogram for "ewes" could account for PA "lamb(s)" on the same tablets. Moreover, the number of lambs (if that is what PA means) is always less than the number of *ewes*. For the reasons outlined in Criterion 1 above and the last one cited here, I have deemed it expedient to raise the scalar value of PA from 1 to 2/3.

I conclude with 6 Linear B tablets in the sheep sub-sector of the agricultural sector, all of which serve to illustrate not only the accuracy of supersyllabograms in this sector but their intrinsic *economy*, in the sense that they replace discursive text which would have otherwise cluttered up these tablets, had they been spelled out in full.

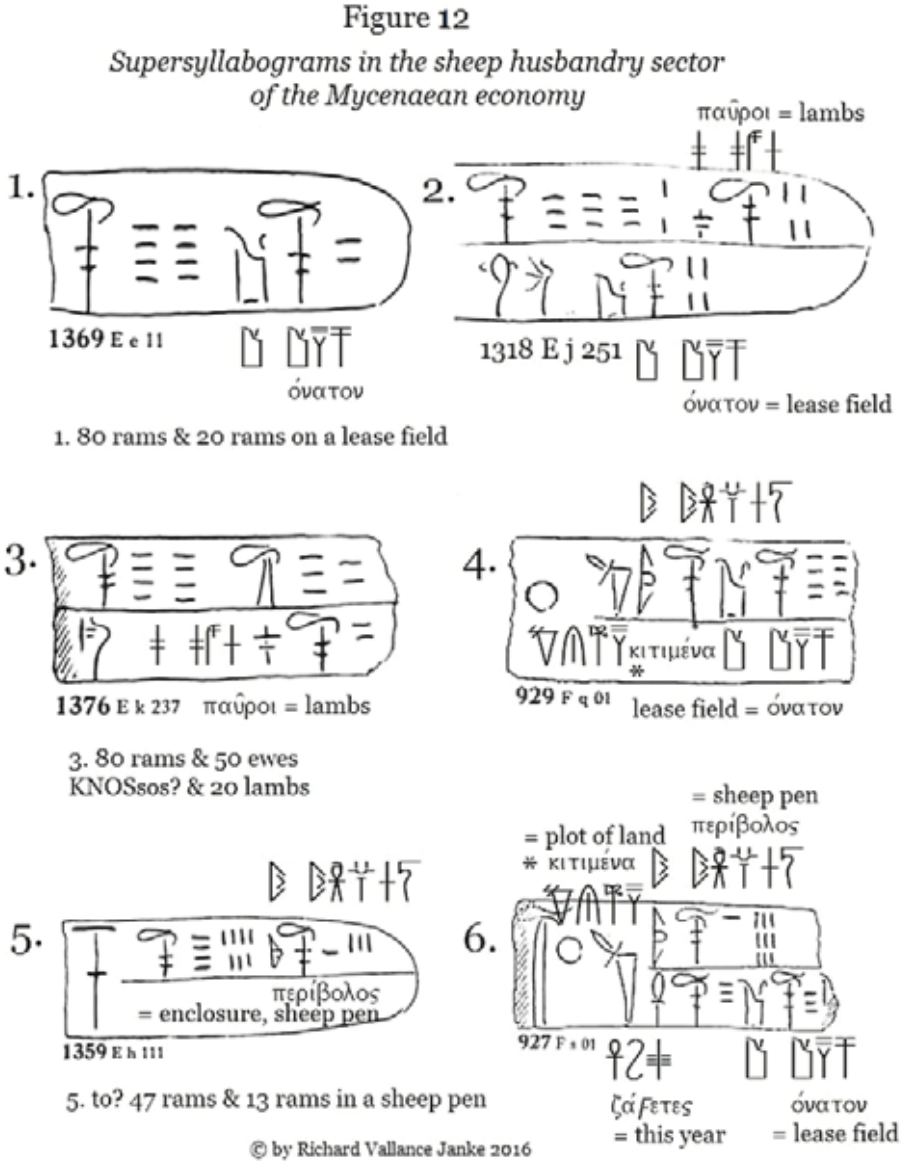


Fig. 12 – Supersyllabograms in the sheep husbandry sector of the Mycenaean economy.

We shall return to this prime characteristic of all supersyllabograms, regardless of sector in the conclusions to this study, with an extension of the sense of economy to a wider interpretation which is likely to astonish you.

Here are the 6 tablets to which I have just referred (Fig. 12).

While I was able to translate some of these tablets in this figure , I could not do so for all of them for lack of space in it. I shall do so now.

Tablet 2 translates as follows:

62 rams 4 male lambs *qamo*? (unknown) + 4 rams on a lease field. *Qamo* appears to be undecipherable but I suspect it is the name of the owner or shepherd, "Bamos".

Tablet 4, which is illustrative of *the greatest possible economy* served by supersyllabograms on Linear B tablets, *because there is no text on it all*, reads as follows:

a ram in a sheep pen on a plot of land (I have spelled out *kitimena*, "a plot of land", which is symbolized by the SSYL KI on this tablet) and 80 rams on a lease field. (I have spelled out *onato*, "a lease field", which is symbolized by the SSYL O

on this tablet.) It is extremely significant that this tablet deploys only 3 supersyllabograms to replace what would otherwise have been wasteful text.

Tablet 5 translates:

(*Kosou*)*to* (a name left truncated)+ 47 rams + 13 rams in a sheep pen. Once again, apart from the putative name of the shepherd, Ksouthos, *there is no text at all on this tablet.* No surprise here by now.

Tablet 6, heavily abbreviated, is the most economical of them all. There appear no fewer than 4 SSYLS on it, if you can believe that. I would, if I were you, because there is even one tablet in the sheep sub-sector which sports 5 supersyllabograms *with no text at all*. So once again, this greatly condensed tablet, deploying only SSYLS, reads:

100 ewes, 19 rams in a sheep pen, 30 rams from this year's flock on a plot of land and 31+ rams on a lease field. If spelled out in full, these words would have run as follows: *kitimena periqoro zawete onato*, consuming 10 syllabograms consisting of 19 characters, instead of the 4 supersyllabograms consisting of 8 characters on the actual tablet. The total of syllabograms alone on the hypothetical tablet add up to just shy of 3 times the number of syllabograms on the real tablet, given that supersyllabograms are a *subset* of syllabograms. The number of characters on the conjectural tablet = 19 versus 8 on the actual tablet (a little less than 2 and a half times).

The whole point of this exercise is to demonstrate beyond a shadow of a doubt that supersyllabograms are so economical of space on what are after all extremely small tablets that it is no wonder that the scribes resorted to this stratagem over and over. The phenomenon of the supersyllabogram is, in short, an amazingly effective invention on the part of those ingenious Linear B scribes of the distant past (over 32 centuries ago). More on the marvel of this rarest of linguistic practices in our conclusions.

Olive oil production in the agricultural sector:

There is one other sub-sector of the agricultural sector which demands our scrupulous attention. This is the olive oil production sub-sector. While, as with the other sectors of the Minoan/Mycenaean economy (military, vessels and textiles), there are only a few tablets featuring olive oil processing and consumption, this sub-sector is of particular significance strictly from the point of view of semantics. Here we have Table 7, Supersyllabograms for olive oil in the agricultural sector.

These supersyllabograms are of the utmost import in the effective decipherment of Mycenaean Linear B. The rest of the attributive supersyllabograms except TI = *tithasos* = a cultivated olive tree and WE *weyewe* = "this yea(r's crop or harvest)" raise serious doubts in my mind with respect to the research into their semantics conducted by the renowned philologist José L. Melena, in his seminal study, "Olive Oil and Other Sorts of Oil in the Mycenaean Tablets" (1974) [^{6} ,bis], as well as that of other prominent researchers in the field, who almost invariably fall prey to the same cast of semantic errors as does Melena. Referencing Melena's study on supersyllabograms in the olive oil sub-sector of the agricultural sector, we discover to our great disappointment that he has attributed capricious "meanings" to some of the supersyllabograms relevant to olive oil production. The question is why?

Let us carefully examine in turn most of his translations of the supersyllabograms A, KU, PA, SI, TI & WE. Beginning with A, Melena attributes the singularly peculiar sense of "wild olives" as attested by the conclusion he reaches on page 101: "As a conclusion we infer from the palaeoethnobotanical evidence that there were at least two kinds of olives in Crete during Minoan and Mycenaean times, and that there is then certain material support for the interpretation of the ligatures +A and + ? as standing for two kinds of OLIV. Moreover, it is likely that one of these kinds of olives was wild, and the other an early cultivated plant, a fact that would strengthen the proposal advanced by Dr. Chadwick of A standing for *agrios* for 'wild' and of 77 doing for *tithanos* 'domesticated'. At this point, a justification of the Mycenaean preference for 'wild' A olives, *as can*

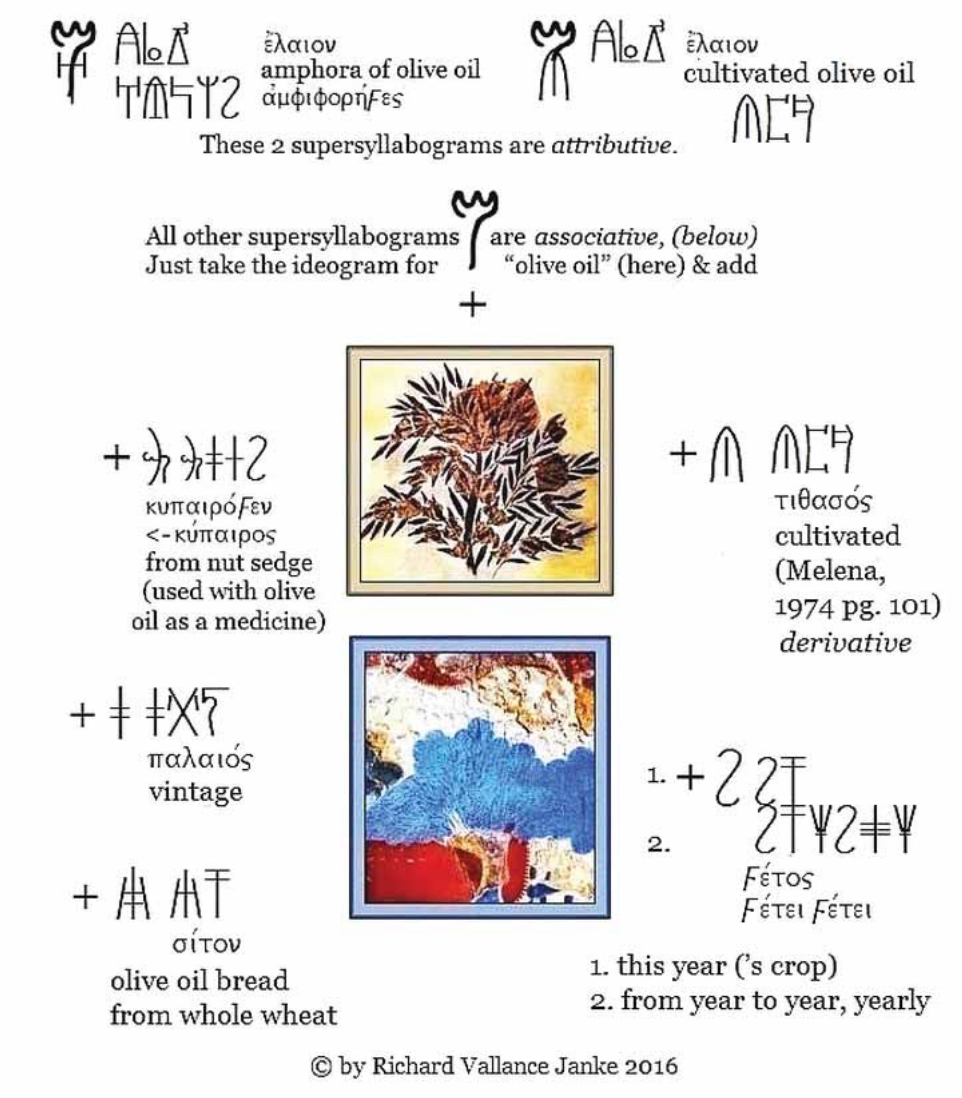


Table 7 – Supersyllabograms for olive oil in the agricultural sector.

be easily seen in the tablets, is needed."

Easily seen? By what criteria? The glaring problem with the first of these interpretations, *agrios* = 'wild', is that it simply does not make any sense in the context of olive oil production in Minoan-Mycenaean Greece. Returning to our discriminative question, why, the answer is not long coming. Instead of interpreting the supersyllabogram for what it incontestably must mean, i.e. olive oil *in amphorae* (Linear B, *aporewe*), he goes off on an academic tangent, struggling for dear life to dredge up a "meaning" which does not in the least bit suit the *context* of olive oil production. It is patently obvious that no one in their right mind would resort to trying to cultivate wild anything let alone wild olives in any *productive* agricultural practice. Wild plants are singularly resistant to cultivation; so I have to wonder why Melena opted for such a bizarre translation. All the more so in light of the incontestable fact that the Minoans at Knossos, Pylos and elsewhere stored their olive oil in huge amphorae, otherwise known as Greek *pithoi* in Classical times. (*See* Linear B tablet TA 641-1952) [², *bis*] for a conclusive confirmation of my own decipherment, which is indeed *aporewe* in Linear B = amphora.

Why then did Melena settle on this strange decipherment? The reason is self-apparent: he is

an academic. We academics in ancient linguistics are plagued by a regrettable penchant for seeking out decipherments or translations which are, in a word, academic. But the inherent fault-line in such an approach is that it is *invalid by its very nature*.

Criterion 2 incontestably bears repetition. We must rigorously apply the unequivocal principle that the Linear B scribes always resorted to supersyllabograms equivalent to determinative terminology which was invariably descriptive of a *major*, never a minor, aspect of the métiers, activities, commodities and end-products intrinsically proper to any of the four major sectors of the Minoan/Mycenaean economy, be it the military, vessels and pottery, textiles or agricultural sector. This is far and away the paramount consideration to be taken into account in the allocation of accurate terminology of Linear B vocabulary commensurate with the polysemiotic values of each respective supersyllabogram.

The problem with Melena's implausible decipherment of A = "wild olives" is that it does not in the least relate to the principle – and I emphatically repeat – that the Linear B scribes always deployed terminology equivalent to supersyllabograms which was invariably descriptive of a *major*, never a minor economic factor. Put another way, what we academics in historical linguistics frequently and so blithely neglect is the incontrovertible fact that the Linear B scribes were as far from being "academics" as the modern academic world is as far removed from their real word. There simply was no academia in the modern sense of the word in Minoan/Mycenaean society, let alone in any society in antiquity, even as late as Classical Greece and Rome. The language of the Mycenaean scribes was strictly that of accounting and inventory, and what is even more significant, it was invariably formulaic. Why so many academics fail to realize this basic fact is a mystery to me. Any translation of any supersyllabogram in Mycenaean Linear B must be an actual indicator of a *major* economic term in any of the four major sectors of the Minoan/Mycenaean economy — "major" repeated again for emphasis. Mycenaean tabular terminology has nothing to do with academic translations. Period.

The Linear B scribes were keepers of inventories, in other words, accountants, and nothing more. But accountants of what? Their inventories invariably turned on the four major sectors of the Minoan/Mycenaean economy, the military, the vessels and pottery, the textiles and above all else, the agricultural. The language they used to compile their inventories was completely standardized and strictly formulaic in the extreme. In spite of the great distances separating the major cities and economic centres of the Mycenaean economy, Knossos, Pylos, Mycenae, Thebes and so on, the Mycenaean Greek of the tablets, of which there are some 5,000 all told from all provenances, *does not vary one jot,* with the exception of some minor quirks of "style" of some of the scribes. In other words, the Mycenaean of the inventorial tablets is a totally *artificial construct*, entirely based on the necessity of compiling accurate, fully standardized inventories of the four major sectors of their economy. And this is precisely why so many historical philologists are entirely on the wrong track, Melena far from being the only one. All of this implies – just short of explicitly – that every last supersyllabogram must, by its very nature, be a major term in the Mycenaean economy. Otherwise, it is invalid by nature.

To illustrate my point even further, let us continue with our close examination of Melena's other decipherments, which equally stretch the bounds of credibility. While his interpretation of the SSYL TI = tithasos = "cultivated olives", does make eminent sense (scalar weight = 3), in spite of being derivative and unattested, I will leave it at that, given that here he has not allowed his academic prejudice to adversely colour his translation. But his decipherment of the supersyllabograms SI and WE begs credibility.

WE he unaccountably deciphers as, and I quote:... "The latter group has abbreviated accounting items by means of a pair of ligatured

ideograms (OLE + A and OLE + WE, standing acrophonically for *a-ro-pa* = ἄλείφα = Greek oil 81 and *we-ya-repe* = Φειαρήπες = oil respectively),..." Here again, reverting to the SSYL A, in flat out contradiction to his previous interpretation of Greek agrios "wild", he confers yet another sense on it, *aropa*, which he erroneously translates as "oil", rather than taking to its true meaning = "cream" or "ointment" as meaning agrios (Tselentis), and this after he had previously deciphered it as meaning *agrios* = ἄγριος = wild. He is grasping at straws. But you cannot have it both ways.

SI he unaccountably derives from Linear B *siaro* = Greek sialos = "pig", stretching that term to the point of absurdity by claiming it refers to "an ointment made from pig fat." But *siaro* does not mean "pig fat". It means "pig" and nothing else. So this one is truly beyond credibility. Who on earth would even remotely want to use an ointment of pig fat mixed with olive oil? But he has realized that SI is indicative of "abbreviated accounting". He at least nails that head on. In other words his translations, however inaccurate some of them are, are squarely set in the context of supersyllabograms as we now understand them.

Now SI almost certainly refers to Linear B *sito* = wheat.. It only takes a moment's consideration to realize that olive oil rolled into whole wheat and baked in a kiln yields olive oil bread, a staple of the ancient and modern Greek diet. And there you have it. In case anyone is wondering why SI is not *attributive*, I put it to you that wheat is *not necessarily* attributable to olive oil, but only associated as a crop. Now it just so happens that the Linear B scribes *never resorted to adjectives to describe* ***associative*** *supersyllabograms*, but always characterized them as nominative (i.e. nouns), given that no single associative supersyllabogram is necessarily related to another, with a strict emphasis on *necessarily*. It just so happens that the scribe has conjoined the SSYL SI with the ideogram for olive oil, simply because he *deliberately* intends to combine the two into a cohesive whole which, in this particular configuration, refers to whole wheat olive oil bread. At least that is my interpretation. And let us not fail to recall that all supersyllabograms must refer to major activities, commodities, production and produce. From this perspective, the production of olive oil bread makes eminent sense. So I believe we are in a pretty solid position to assign a scalar value of 3 to the combination SI *sitos* = wheat with the ideogram for olive oil.

CONCLUSIONS

Is this the last major frontier in the full decipherment of Mycenaean Linear B?

Supersyllabograms play such a critical rôle in the complete decipherment of Mycenaean Linear B that they cannot safely be ignored. They function in virtually the same way as modern signage, which makes use of graphic images consisting of a single letter signifying an action (verbal) function or locality (nominal). For instance, a white H in a blue square signifies "hospital" (locative), a white P in a blue square "parking", a black P crossed diagonally by a red stripe in a white circle "no parking" (nominative), red, yellow and green lights on a black background signifying "go", "prepare to stop" and "stop", and "speed limit" consisting of the limit in white on a blue square, "Do not exceed 50 kmh." (the last 2 being verbal).

Supersyllabograms in Mycenaean Linear B go even further. As we have seen from the supersyllabograms in each of the four major sectors of the Mycenaean economy, agricultural, military, vessels and pottery and textiles, their functionality considerably outstrips that of modern signage, insofar as they can and do signify not only simple concepts as seen in modern signage, but *are polysemiotic markers for (often highly) variable major concepts, often crossing* from one of the major sectors to another. For instance, we have KI for *kitimena*, which means "a plot of land" in the agricultural sector, but KI for *kito* = "a chiton" in the textiles sector; in the military sector QE for

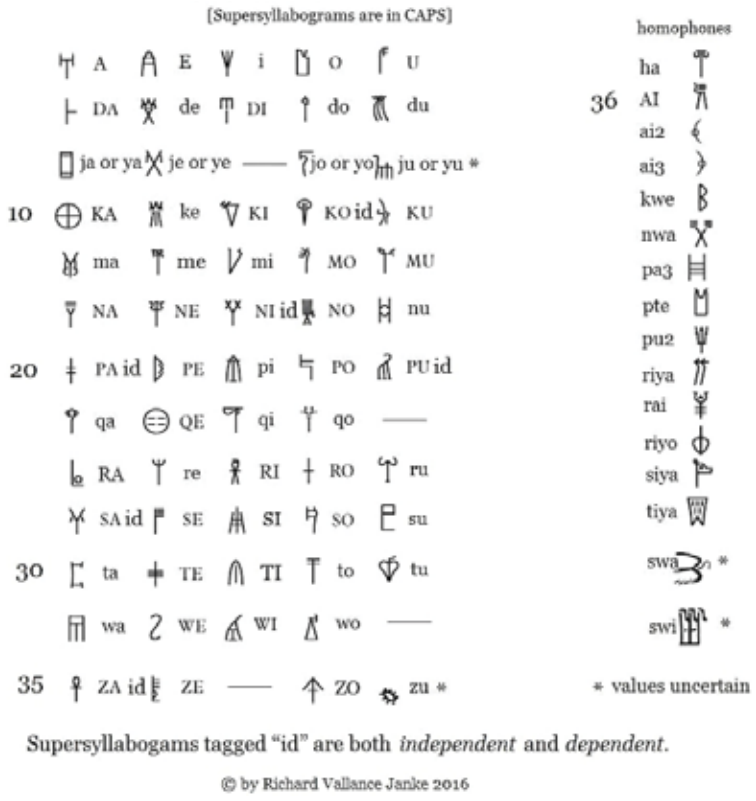


Table 8 – Table of supersyllabograms in Mycenaean Linear B.

*qeqinomeno f*or "made by twisting or winding", but QE *qero* = "a shield", and ZE *zeugesi* for "a pair of, a set of wheels on axle" and "a team of horses" (all of those under ZE being notable variants on one another); and finally in the textiles sector PA *pawea* for "textiles", referring to the textiles industry in general, whereas in the agricultural sector PA *pauro* = "small", apparently refers to lambs. The meanings of the same supersyllabograms across sectors are clearly distinct, hence polysemiotic. So while modern signage generally replaces simple concepts, supersyllabograms in Mycenaean Linear B very often signify much more complex economic activities and processes, as well as distinct commodities. While it is true that supersyllabograms are limited solely to the sphere of inventories in the four major economic sectors of the Minoan/Mycenaean economy, nevertheless within that ambit their polysemiotic symbolic functionality significantly exceeds that of modern signage.

But there is more. While graphic symbols in modern signage never represent more than one nominal concept or verbal activity, and are never used in combination with another such symbol, supersyllabograms are frequently *concatenated* with more than one ideogram (up to as many as five), especially in the agricultural sector. In such cases, both the multiple supersyllabograms and the ideograms with which they are coupled replace *complex textual strings of major economic terms* in Mycenaean Greek. For instance, the accumulative combinatory effect of the four concatenated supersyllabograms KI, PE, ZA and O on Linear B tablet KN 927 F s 01 goes much further in their polysemiotic functionality than any modern example of signage conceivably ever could. On this tablet alone, on which there appears *no text whatsoever*, the cumulative translation of these 4 concatenated supersyllabograms amounts to nothing short of this entire sentence, "100 ewes, 19 rams in a sheep pen, 30 rams from this year's flock on a plot of land and 31+ rams on a lease field." Astonishing! With all of this in mind, we at

last turn to the table of all 36 supersyllabograms in Mycenaean Linear B (Table 8).

It is imperative to stress that these 36 supersyllabograms account for **59%** of the 61 syllabograms + 1 homophone (AI) = 62 total in Mycenaean Linear B. That is a huge investment on the part of the Linear B scribes in the now complete (2016), versus previously partial decipherment of Linear B. Note that of the 36 supersyllabograms, only 7 are both independent *and* dependent supersyllabograms. All of the others are *dependent only*, i.e. fused with a correlative ideogram. Dependent supersyllabograms must always accompany an ideogram, either preceding or following it, if they are associative (at), or incharged inside it, if attributive (as). The independent supersyllabograms, on the other hand, function alone, not attached to any ideogram. These include the 5 city names on Heidelberg tablet Fl 1994 (Figure 4) and the two SSYLS NI and SA in the textiles sector in Table 4, which respectively symbolize "figs" and "flax" or "linen" respectively, for a total of 7 independent supersyllabograms. So if any Linear B philologist or researcher was not previously convinced that supersyllabograms proliferate in Mycenaean Linear B, I fail to see how he or she is not finally prevailed upon to be won over.

Moving on, we recall yet again the two major Criteria for the establishment of the validity of each and every supersyllabogram, **1.** supersyllabograms must be assigned a scalar weight in accordance to the level of validity they attain and **2.** (which is far more important) each and every supersyllabogram must be reflective of a *major* term in any of the four primary sectors of the Mycenaean economy. In light of the brilliant Prof. L. R. Palmer's insistence that the fewest number of criteria are required to account for any and all phenomena relative to the decipherment of Linear B, and I cite his eminently scientific principle, *the principle of economy* in full.[12] "The number of hypotheses set up to explain a given set of facts is an objective measure of the '*arbitrary*', and explanations can be graded *on a numerical scale*. A completely 'arbitrary' explanation is one which requires x hypotheses for x facts. It follows that the most 'economical' explanation is the least 'arbitrary'." (Palmer, L.R., 1963, pg. 34) [*italics mine*].

Take special note of his unequivocal reference to *the principle of economy,* the very same which I have implied over and over with reference to supersyllabograms. I have posited only **2** criteria to account for the validity of all 36 supersyllabograms in Mycenaean Linear B. This is in full accordance with Palmer's principle of economy. If I had had to resort to 3 or more criteria, the validity of my own criteria would have been more seriously undermined with the addition of each new criterion. But by adhering to Prof. Palmer's principle of economy, I have entirely skirted this unscientific pitfall, with the sole exception of scalar weights of 1 or 2 as a subset of Criterion 1 which I have been unable to escape the consequences of. Still, it would have been disingenuous of me to have classified supersyllabograms at levels 1 and 2 otherwise in accordance with that criterion.

Furthermore, we must always keep uppermost in mind that w*hen we change the context of the economic sector*, for instance from the agricultural to the military or the vessels sector, we *automatically change the meaning of the supersyllabogram,* with very few exceptions. The supersyllabogram NE (Linear B Latinized), invariably meaning *newo* (masc.) *newa* (fem.)(Linear B Latinized) = "new" which appears in the vessels and textiles sectors, is one of only 5 which convey the same meaning across economic sectors. The others are KI *kito* = chiton, KO *kowo* = fleece, RI *rino* = linen and WI *wirineo* = made of leather, all of which appear in the military and textiles sectors.

Now we arrive at the most significant conclusion of all. Whereas all supersyllabograms, which are intrinsically highly formulaic and fossilized, are representative of major (never minor) activities, processes and commodities of the Minoan/Mycenaean economy, they are nevertheless highly *flexible* and malleable, in light of the fact that when the scribes cross from one economic sector to the

next, practically all supersyllabograms, with very few exceptions (*see* immediately above) *change their meaning, and usually radically*. This striking feature of Mycenaean Linear B reveals yet another key characteristic of Linear B tablets which so frequently deploy supersyllabograms to replace Mycenaean words or phrases. Supersyllabograms in every single sector of the Minoan/Mycenaean economy effectively operate as *shorthand*. This startling discovery sets back the time frame for the first known use of shorthand some 3,300 years from the late nineteenth and early twentieth centuries. Once again, Mycenaean Linear B attains a high degree of versatility and sophistication virtually unknown to other contemporaneous scripts, hieroglyphic or syllabogrammatic.

Finally, we must never lose sight of the fact that any decipherment of Linear B in its totality which does not fully account for supersyllabograms is bound to be seriously compromised. We risk trammelling the complete decipherment of Linear B if we fail to take supersyllabograms fully into account. In light of the fact that some 800 (23 %) of 3,500 tablets and fragments from Knossos contain at least one supersyllabogram, any decipherment falling short of accounting for the critical rôle supersyllabograms is bound to run the real risk of being partially, though significantly, incomplete.

And with that, I rest my case.

ABBREVIATIONS

ANCL L'Antiquité classique
AS Archaeology and Science
CMLB Duhoux, Yves and Morpurgo Davies, Anna, eds. *A Companion to Linear B: Mycenaean Greek Texts and their World. Vol. I. Bibliothèque des Cahiers de l'Institut de Linguistique de Louvain 120)*. Louvaine-la-Neuve, France: Peeters, © 2014. 292 pp. ISBN 978-2-7584-0192-6 (France)
FAV Faventia: Revista de filologia clássica
KADM Kadmos: Zeitschrift für Vor- und Frühgriechische Epigraphik
KTMA KTEMA, civilisations de l'orient, de la Grèce et de Rome antique
MIN Minos: Revista de Filología Egea. ISSN: 0544-3733
MINR Minerva: Revista de Filología Clasíca
PALM Palmer, L. R. *The Interpretation of Mycenaean Texts.* Oxford: Oxford University Press. 1963. Special Edition for Sandpiper Books Ltd.,© 1998. xiii, 488 pp.
PASI Pasiphae: Rivista di filologia e antichità egee

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REZIME
DEŠIFROVANJE SUPERSILABOGRAMA U LINEARU B

KLJUČNE REČI: MIKENSKI LINEAR B, SUPERSILABOGRAMI, LINEAR B PLOČICE, DEŠIFROVANJE, PREVOD, EKONOMIJA.

U saradnji sa Asocijacijom za istorijske studije Koryvantes iz Atine, svoju pažnju smo usmerili na fenomen supersilabograma, koji nije valjano identifikovan još od početnog dešifrovanja Mikenskog Linear B pisma 1952. Supersilabogram je prvi silabogram, koji je u kombinaciji sa blisko povezanim ideogramom bio značajan u četiri ekonomska sektora mikenske privrede: poljoprivreda, vojska, tekstil i izrada keramičkog posuđa. Uz vrlo malo izuzetaka, promene u ekonomskom sektoru dovodile su do promena u značenju pojedinih supersilabograma. Od nekih 3500 pločica i fragmenata iz Knososa, oko 800, odnosno 23 % sadrže barem jedan supersilabogram, a ponekad čak četiri ili pet. Krajnji cilj supersilabograma je eliminisanje teksta na pločicama u najvećoj mogućoj meri. Supersilabogrami su služili da u znatnoj meri uštede dragoceni prostor na malim tablicama koje su bile namenjene za ispisivanje Lineara B. Kompletno dešifrovanje Lineara B mora u potpunosti da uključi supersilabograme kao jedinstveni fenomen, bez kojeg, nedvosmisleno, interpretacija Lineara B ne bi bila dovedena do kraja.

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ARCHAEOLOGICAL PARK OF VIMINACIUM: BEAUTIFYING A COMMUNITY WITH CULTURAL HERITAGE

ABSTRACT

It seems that besides huge ecological problems and the disappearance of arable land as a result of the spread of the mining industry in the area of Kostolac, the local community, with its relationship towards the environment and heritage, is the greatest barrier to the cultural and touristic development of the area.

Can we use the verb "to beautify" for any positive change within the community? The Viminacium management team has taken the lead in trying to make many changes that will bring that beauty.

KEYWORDS: VIMINACIUM, LOCAL COMMUNITY, CULTURAL HERITAGE, PLACE, IDENTITY, COMMITMENT, DEPENDENCE, KNOWLEDGE, TO BEAUTIFY, TO NEGLECT, TOURISM.

INTRODUCTION[1]

Although in 1949, the excavated sites of *Viminacium,* near the modern town of Kostolac, were protected by law (Rešenje 1949) and in 1979, *Viminacium* was determined as an immovable cultural property of exceptional importance, (Odluka 1979), illegal excavations in search of valuable goods that could be sold abroad and the distribution of all the ancient building material that could be obtained were the every day activities of local people until the beginning of this century and the introduction of physical protection at this archaeological site.

However, it was not only the physical protection that saved the site. Another, maybe even more important factor, were the people moving around the site every single day. Archaeologists were excavating and presenting their work, the visitors came and the area came to life. The result of this was that illegal excavations stopped and tourism started to develop. The Viminacium Archaeological Park was opened for visitors in 2006. In 2009, it was established as an official archaeological site with its boundaries and system of use and protection. (Одлука 2009)

Many young people from the surrounding area are now employed in Viminacium, with their monthly income dependant on the profit Park gen-

1 The article results from the project: *Viminacium, Roman city and military camp – research of material and non- material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalization and 3D visualization (no 47018)*, funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.

erates from tourists. The souvenirs on sale include items that they make. In the process of developing the infrastructure and building facilities, the participation of local companies is fostered. Members of the local community, a great majority of who are Roma people, participate in the archaeological excavations as labourers. They also work as Park staff in the service and maintenance sector. They no longer view Viminacium as a place for illegal excavations, but as a valuable piece of their own cultural heritage (Fig. 1).

The beginning of foreign tourist interest in the area is visible thanks to the promotion of the Viminacium Archaeological Park and the engagement of its management team. (Одлука 2012, 36) In 2006, on the bank of the Danube in Kostolac, a port for large passenger ships, carrying tourists from all around the world, was established. Along with presenting Viminacium, a modern supply infrastructure, along with complete signalization along important roads in the area were completed (Fig. 2). National exhibitions and opera, international conferences and meetings, concerts and movie making have now become common events in Viminacium (Fig. 3).

A variety of different cultures have been existed in the Kostolac region since the 8th millennium. One of the most famous is the Eneolithic "Kostolac culture", but also the Bronze Age culture that included the world famous figurine of the "Idol of Kličevac". (Спасић-Ђурић 2009, 15-17) In the 1st century AD, *Viminacium*, the capital of the Roman province of *Moesia Superior* was founded. The city and the important legionary fortress flourished during the following centuries, along the way suffering from destructions and conquests, and finally fell to the Slav attacks of the 7th century. (Mirković 1968, 63-73) On the hill above today's village, one of the most important Serbian lands of the Middle Ages was settled. (Шпехар 2007, 363) The miners in the village, considered as the instigators of the industrial age in Serbia, in 1870, formed the first mining colony there and, after the Second World War, their descendants founded the urban settlement of Kostolac. Underground mining stopped with the establishment of the first open pit coal mine (Вучетић 2010, 2, 14-18, 30), the basin of which today covers a huge exploitation area. The mine's power plants are responsible for a significant part of the entire electrical energy production in Serbia today. (Годишњи извештај 2014, 26-27) A large part of the rural area, which was once arable, with fields, vineyards and woods, (Mašinski fakultet 2010, 44) has disappeared due to the advancing surface mine, which occupies a lot of land and has destroyed the habitat of many species. (Локални план 2009, 39) The area today comprises the open pit with heavy machinery, partly re-cultivated land, the thermo power plant complex with coal deposits and infrastructure objects spread all over the fields, (Mašinski fakultet 2010, 44) but also the presented site of *Viminacium* with its contemporary tourist facilities.

With the exhaustion of the coal deposits, the lack of specialisation in agricultural production and with little arable land, in several decades, the problem of employment of the local inhabitants will emerge. After the closing of the old underground mine in the village of Kostolac, "the spirit of the colony... stepped back and floats over the area that we left to... whom?" (Вучетић 2010, 54) Or, as Felix Kanitz once wrote of the local people who used to ruin *Viminacium*; "will these people who inherited the ancient ground be able to build similar, artistically and technically *beautified* communities?" (Каниц 1989, 542) Is the verb *to beautify* connected only to the aesthetic or technical development, or can it be used for positive change of any kind within a community? If it can be, are the preservation and promotion of a rich cultural heritage those kind of changes and, consequently, a possible way to sustain the area and keep it alive?

Fig.1 Members of the local community working in the archaeological sites and park of Viminacium.
(From the photo documentation of Institute of Archaeology, project Viminacium)

Fig.2 Archaeological park of Viminacium.
(From the photo documentation of Institute of Archaeology, project Viminacium)

LOCAL COMMUNITY

The area of the City of Požarevac is among the most economically developed areas of Serbia. (РАПП 2009, 35) Unfortunately, a negative population growth and an unfavourable age structure of the people of the area, indicate a problem, which is one of the most important limitations in the socio-economical development of the whole area around the Viminacium Archaeological Park. (РАПП 2009, 25) The number of inhabitants in the whole region has been decreasing since 1991. (Одлука 2012, 13) The cause of this fact is the permanent migration of people within Serbia, and emigration, mostly from rural areas. (Одлука 2012, 62, 83) Census data shows that the rural population is in the deepest stages of demographic ageing. (Одлука 2012, 23)

Rural inhabitants of the area live in poor conditions, which are actually not always the result of poverty. Most of them live in modest houses, but also own the big luxury ones next to them, with shops and cafes in the basement areas. The big houses are rarely opened, mostly for family gatherings, or when family members temporarily working abroad come home for a vacation. (M.V. 2012, 11) Although some authors justify these acts of investing in the building of houses as the only way to save the earned capital from the work abroad, which was possible during the socialist period after the Second World War, when it was impossible to develop private enterprises and rationally invest the money, (Milosavljević 2010, 47-49) there are some records of the same behaviour even before this period. In 1928, the Serbian Ministry of Health determined that these people lived in shacks with no windows, and that there were a lot of rich people with houses and big estates that still slept on a straw floor because, as they put it, "they have learned so, and their ancestors lived like that, lacking nothing." (Milosavljević 2010, 47-49) Fortunately, the situation has slowly started to change during recent years. Many local people do not invest money in houses as before. They buy apartments for their children in Belgrade or other cities in Serbia where they intend them to be educated. Some buy properties abroad or build houses there. However, the wish for grandiosity has survived in all times. One local from the village in Požarevac area spent one million francs building a house in Switzerland. (M.V. 2012, 11)

In the Kostolac area, only 3.1% of the population is engaged with agriculture, while 48.4% is connected with the industrial activities of the mine. (Републички завод за статистику 2014, 174-175) That is the reason why the income per inhabitant in Kostolac is much above the national average, (РАПП 2009, 35), even though 41% of inhabitants of age fifteen and older in the area of Kostolac finished only primary school or are not educated at all. (Републички завод за статистику 2013, 82) According to the results of the census, the population here is ethnically diverse, but Serbs prevail with around 72%, while other ethnic groups are smaller, with the largest one being the Roma people, comprising around 19.50% of the population. (Републички завод за статистику 2012, 70-71)

NEGLECT OF HERITAGE BY THE COMMUNITY

The use of historic building material for contemporary purposes, throughout history, has existed in all cultures. (Rodwell 2007, 190) "Byzantine and Bulgarian fortresses, Serbian castles and churches" were built with building material originated from the *Viminacium* ruins. (Каниц 1989, 150-152, 165, 177-181) In a large number of houses in the nearby villages, one can see Roman bricks used as pavement for auxiliary agricultural facilities. The Austro-Hungarian travel writer and ethnologist, Felix Kanitz, noted in the 19th century that the ruins of luxurious *Viminacium* were used as "ordinary quarry" (Каниц 1989, 542), saying that all over the place huge amounts of unearthed building material were laying around

waiting to be removed and that the biggest square shaped bricks, called "Kostolac bricks", intended for yard paving, used to be sold in Požarevac. (Каниц 1989, 179) He also found a richly decorated Roman sarcophagus residing in a village yard with some pigs. (Каниц 1989, 181) A 19th century researcher of *Viminacium*, Mihailo Valtrović, a short time later, noted that local people were dragging around the remains of this Roman town, with two thousand carts full of bricks taken away, decorative stones broken down to be easier lifted, and two hundred graves opened and robbed. (Валтровић 1884a, 3)

It is important to respect the traditions of local communities and to understand its rituals, stories, behaviours and knowledge of the living environment (Mitchell, Buggey 2000, 44-45), so that it can be involved in the management of the place. (Jain 2008, 16) The whole region of Eastern Serbia is rich in various legends, among which are those regarding buried treasures, which almost all the locals search for during their lives, hoping it will bring them instant wealth. (Milosavljević 2010, 44) In Viminacium, there has been a story, told for a century, about "The Blue Tomb". It was closed and reburied after the archaeologist Miloje Vasić excavated it, and has never been found since. The story is about beautiful paintings in the tomb, depicting grapes and birds of blue colour. (Mikić 2003) This story can be the reason why today the underground hall in the Viminacium exhibition hall, whose ceiling and walls are decorated in blue mosaics, is referred to by some local people as "The Blue Tomb". The legend of a missing Roman "golden chariot" that passed through *Viminacium* as a gift from a Roman emperor to an Egyptian princess, is present in almost all villages of the region. (Lukić 2009)

Over time, these legends, together with accounts of the removal of ancient building material all over the area, and the trade of movable cultural property in and out of Serbia, actually criminal acts, emerged. Over time, accidental discoveries of treasure turned into targets for the search for archaeological remains. (Milosavljević 2010, 15-16) Official, but irregular archaeological excavations of Viminacium during the 20th century, with no protection of the sites, helped this situation develop. Until the excavations, local people thought that the only valuable goods were the gold ones. Archaeological results showed them the real value of other artefacts. (Milosavljević 2010, 15-16) The fact that this region of Serbia is very well connected to other parts of Europe, the invention of metal detectors in the 1970s, war in the 1990s in the region and widespread smuggling in Serbia, made illegal archaeological excavations in the area and the transfer of cultural property over the border larger and easier. This was especially happening in this part of Eastern Serbia, because a great number of the local inhabitants, after the fast industrialisation, the development of the mining and power sector in Serbia, the opening of many workplaces, and the consequent deagrarisation, were engaged in temporary work abroad for years. (Milosavljević 2010, 77) The good financial status of these locals, who have not been engaged in agriculture alone for decades, allowed them to hire labour for land cultivation, leaving them plenty of free time to try to make their "dreams of getting rich quickly" come true. (Milosavljević 2010, 77) During the 1990s, the police repeatedly detained residents of the nearby villages of Požarevac and the leaders of local communities. (Tasić, Dukić, 2005a) All of them owned ancient artefacts, but also a catalogues of finds, metal detectors, and purpose made special ploughs, that were able to plough to a depth of 80cm. (Milosavljević 2010, 34)

Today, the local communities live on land that was once inhabited by other people who are not their ancestors. These traces are still their history that they need to learn about, with pride and understanding, always having in mind that there are other people in this world who also have the right to know the same. (Parker Pearson, Ramilisonina 2004, 236-237) However, from the stories of peasants, one can conclude they are identified with the history of Middle Ages, but the period

Fig.3 Manifestations in Archaeological park of Viminacium.
(From the photo documentation of Institute of Archaeology, project Viminacium)

before that, actually the period of Roman empire in the case of this study, they experience as a period they do not belong to and with which they are not in any relationship. This is probably the cause of the fact that illegal excavations in the whole region have mostly been carried out on ancient and prehistoric sites. As a peasant from the wider area of this Serbian region said, who also committed these illegal activities, while talking about the nuns from the nearby monastery who, according to a local story, sold the crown of the Serbian prince Lazar and got a large amount of money to renovate the monastery, "eh, that, I could never, ever, do!" (Milosavljević 2010, 58)

Although the illegal excavation of *Viminacium* has been stopped since the beginning of the 2000s, permanent protection of the site was introduced, touristic development has been increasing and the local inhabitants have slowly become a part of that success, it is certain that there are a lot of people who used to commit the illegal acts in the past and still have the same desire and drive to become rich in this way. Felix Kanitz wrote that locals used to offer him coins, small bronze figurines, bracelets, needles and different dishes, but for such high prices that he could afford to buy only a few pieces. (Каниц 1989, 178) As long as there is a market for antiquities, members of local communities all around the world will try to increase their income by robbing unprotected areas, especially if they do not have any other possibility of ways of earning money and are not educated about the importance of cultural heritage protection. (Qin 2004, 298) "I do not have a job, and you can earn a lot doing this. The state is failing anyway, so who cares about those old trinkets. There are people who pay very well for this, and my children have to eat" (Tasić, Dukić, 2005b). This is just one of the statements given by locals of the villages near Viminacium in previous decades, and proves the thesis.

A great number of arable land plots in nearby villages are bought by the state for the purpose of coal exploitation, but also for the excavation and presentation of *Viminacium.* Nevertheless, the former owners are allowed to work the land and collect the produce until the archaeological excavations start. However, then a specific characteristic of this peasant is manifested. He thinks that the land he inherited and once worked is his forever, despite the fact that he sold it. Also, it is very often that in those fields forming the protected area of *Viminacium*, but still owned by the peasants, they plant those crops that are forbidden in the protected area, and whose deep roots destroy the historical layers, because it makes the land that will soon be bought more expensive. Sometimes, this leads to arguments in which it is necessary to involve the local judiciary. This can be connected to the fact that, in most Serbian villages, the state and its representatives, in this case the archaeologists, are perceived as the enemy. Also, among Serbian people, there is a widespread belief that the property that the state owns actually belongs to those who the state "seized it from" and the peasant often recognises himself as such. Damaging the state in all areas in periods of crisis is not seen as a special delict, because "the state seizes" by means of taxes and other obligatory provisions. (Milosavljević 2010, 80-82) Felix Kanitz noted this peasant feature when he wrote about a young priest in a village near Viminacium who was trying to assure him that the trade of antiquities had completely stopped and that he owned only a bag of worthless money, protesting that his village was destroyed and could not build its own church because of the low grain prices and increased taxes. (Каниц 1989, 181)

However, there is no initiative strong enough to ensure the cultural heritage of the area is preserved, even by the state. During the summer of 2011, the *IX Summit of Heads of State of South East Europe* was held in Viminacium. (UNESCO 2012) All the built structures visible from the approach roads were renovated, the infrastructure was repaired, illegal dumps were cleaned, and the Viminacium Archaeological Park was prepared for the meeting. The old earth road that was rarely used as a connection between the town of Kosto-

lac and the thermo power plant in the village was paved. The visitors to the summit did not use the road passing through the old mining colony, for many years inhabited by Roma people, which was, until that point, the only proper traffic route between the aforementioned places. They did not see the poor state of the important historic buildings and the living conditions of the Roma people. (Акциони план 2015, 46) The newly paved road was a good decision and made the everyday life of the workers easier, and could have been the catalyst for making a small tourist attraction of the industrial heritage of the old mining colony. With the resettlement of the Roma people, giving them some other place with better living conditions, and the reconstruction of the old buildings that represent the industrial heritage, the tourist development of this small zone would also be possible, owing to the fact that the old road is not used by workers anymore. Will it fall into ruin and be forgotten completely?

BEAUTIFYING THE COMMUNITY WITH HERITAGE

A population develops and changes its features under the direct or indirect influence of social development. It does not receive those influences passively, but consciously changes and transforms them into features and behaviour. (Devedžić 2007, 65) The result of social influence on demographic development depends on the way the population reacts to a certain situation, and the type of reaction depends on the structure and the features of the population. Norms dictated from outside and imposed by the global society are differently accepted by certain communities, especially in villages, and these differences are an expression of the cultural specificities of a millieu. (Milosavljević 2010, 11)

An important factor in the process of the participation of the local community in developing a cultural or historical place, that can be at odds with giving the space the universal value that is necessary for tourism, is the attitude of the community towards visitors, specifically those who visit from other communities and other areas. A common phenomenon called the "demonstration effect" (Ryan 2000, 140) happens when local people, by observing tourists, start to imitate their forms of behaviour. Factors that determine the intensity of these processes are numerous and include the strength of the local culture, its flexibility and possibility of receiving new influences, the homogeneity of the culture and its acceptance by all the community members, the gap between the cultures of the host and the guest, the circumstances of their mutual contact, the type of social connection that is made from the contact, the mutual relationship of the economical powers, the motivation of both sides, but also the level of reception of other influences by the local community (Ryan 2000, 140-141). This effect has a positive influence when an area, with the adoption of other ways of behaviour, advances by making more qualitative conditions of life. However, much more often its influence is negative, when the differences in behaviour, social and financial status and the way of life of the tourists and locals are expressed too much, leading to intolerance between those two groups of actors, but also between the members of the local community, between those who adopt the novelties and those who offend that. (Ryan 2000, 140-141)

A possible future demonstration effect that will have either a positive or negative influence on local people in the villages near Viminacium may occur as a result of the influence of foreign tourists, especially on the female population and young inhabitants. Women from western countries are mostly economically independent, and their behaviour can influence the expectations of young village girls, of which many of those aged fifteen or over have not even completed primary school. (Одлука 2012, 13) The demonstration effect had a very positive impact in these villages more than a century ago. Serbian miners in Kostolac lacked expertise and

experience and a lot of them were illiterate. Along with the fast development of the mine, which even participated in the *World Fair* in Paris in 1900, presented in the pavilion of the Kingdom of Serbia, interest in working in the mine started to grow. Besides the local people in the mine, experienced miners from Europe started to come, first among whom were newcomers from today's Czech Republic. Soon, the influence of these new miners was visible. It changed the way people considered their houses, their clothing and how they organised their free time, filled with music. (Вучетић 2010, 38-39) In the village, until then, peasants only knew about the accordion, Gipsy bass and violin, but the new miners introduced them to tamburitzas. (Вучетић 2010, 46) The initial distance and distrust of the poor Serbian farmers, who suddenly become miners, towards the newcomers, slowly disappeared; friendships were made and even family ties. All the newcomers brought their habits and customs with them, which slowly merged with the local ones. (Вучетић 2010, 46) This mining colony that was made from many nations disappeared, after the foundation of town of Kostolac, because most of the miners moved away to the town, which is today settled by a minimum of eighteen different ethnic groups. (Републички завод за статистику 2012, 70-71)

For a place to develop successfully, it is necessary that its inhabitants have a *sense of place* which consists of *identity,* a *belief* that the connection between themselves and the place exist; *commitment*, representing an *emotional* connection with the place; and *dependence,* that is the strength of *association* of personal behaviour with the place. (Jorgansen, Stedman 2001, 244) It can be differently described as a connection of emotions (excitement and feeling), cognition (opinion, knowledge and belief) and practice (action and behaviour). (Low, Artman 1992, 4-5) This sense of place as a synthesis of identity, commitment and dependence is hard to perceive in the villages of the area today, due to the great changes in the structure of the economy and the use of the physical space.

When we consider all the previously analysed relationships between the local inhabitants and other actors, it seems that the sense of place is here, limited only to dependence, and that identity and commitment have been lost over time, actually withdrawn as a result of different social processes. However, the return of a sense of place as a mentioned set that would influence the preservation of the cultural heritage and the environment itself can be justified. This is evidenced by the fact that a great number of peasants in the villages of the surrounding area that went through a similar social and economical processes through history as the Viminacium area, and that own equally valuable cultural treasures, emphasised in a scientific survey that "they are proud on the treasures their region has", but also that they regretted that state did not deal with this more seriously, giving more money for research and for securing the sites. (Milosavljević 2010, 68-70) According to them "it is a sin to take a cultural treasure, because it is from the people, and has to belong to the people, and that is the reason museums exist". (Milosavljević 2010, 68) When talking about incidental findings, most peasants regard them with approval and consider them a sort of award for those who find them. But, in case of illegal excavations, most of them think that offenders will get the punishment they deserve, "whether legal, or supreme". (Milosavljević 2010, 67) It is interesting that even the offenders that are not afraid of the law and the state punishment are afraid of God. One of them said that he did not "work" on Sundays and religious holidays because he was afraid of God's punishment. Another talked about his love of archaeology and history, which dated back to school days, and told that he collected the artefacts with love, and sold when he was in a difficult economical situation, but that later he had taken up the trade of cultural property as an occupation. (Milosavljević 2010, 55-58) One peasant from a village near Viminacium said that mostly young people committed the illegal activities, because the older generations knew it was

damnation to rob the graves, citing examples of people who had found gold and had subsequently become immobile or sick. (Mikić 2003)

Considering the fact that "our social interaction in a large part consists of telling others what is the correct opinion, putting the guilt on the wrong opinion", and that it is "the way we build institutions, *knead* ideas of the others and the way the others *knead* our ideas, until they get a common form" (Milosavljević 2010, 82-83), maybe the influence of those who "are proud of the treasures their region has" and those who think "it is a sin to take a cultural treasure", or the others who do not "work" on Sundays, can make the sense of a place being whole, return the emotions to all the inhabitants, deepen the cognition and direct the practice towards the preservation of the place. After restoring the holistic sense of a place, local inhabitants in the Viminacium area will not name the biggest Roman bricks "Kostolac bricks", and then sell them at the local market. This can be connected to the fact that a cultural and historic place can be developed by a community only if, along with the inherited cultural and acquired economical capital, it owns the social capital. For a description of the capability of the association of local people with the aim of preserving its history, culture and spirituality, another story serves well. In the building of a local church at the beginning of the 19th century, all the inhabitants helped, while the archaeologist and researcher of Viminacium, Miloje Vasić, worked on a design for the building. Bells with the names "faith", "love" and "hope" were gifted to the church by the authority of the mine. Next to the church, a mausoleum was built, where Serbian soldiers, who had died in a battle at this place, during the First World War, were buried. (Спасић 1995) (Fig 4)

Guilt for the lack of interest of the local people in cultural heritage partly lies in the relationship of most researchers towards this topic that has prevailed in recent decades. During archaeological research it is necessary to collaborate with the local community, not only employ them as workers. They have to be involved in forming the development goals of the area, as well as participate in public discussions. (Merriman 2004, 14) Viminacium Archaeological Park has started to develop this method of collaboration, but it is always necessary to work more on deepening the relationship. One of the biggest benefits archaeology can bring to local communities is the spread of experience and ideas. It can be one of the ways of removing cultural barriers between people, and developing their mutual connection with a common interest in the research of the past. The vision of culture held by archaeologists and the local community is different. Joint work can change that; it can form a common vision of a culture and the method of its maintenance and preservation. (Parker Pearson, Ramilisonina 2004, 236-237) Besides that, by volunteering, self confidence is built, and equality and rapprochement are promoted. (Palmer 2008, 9-10) A positive example of the relationship between professional archaeologists and the local community can be found in England, but that requires strong police control and a lawfully regulated state. There, in archaeological excavations of green-field locations, professional archaeologists work with local people, especially those that use metal detectors as a hobby. The volunteer work of metal detectorists and the work of other local people in the scope of measuring, geophysical research, excavation, cleaning and conservation of finds is being done under the control and with the advice of professional archaeologists. The use of metal detectors in England is not forbidden, but it is limited to places not protected by law, with no archaeological excavations going on, and for which there is the permission of the land owner. These detectorists are required to report gold and silver artefacts, as well as all prehistoric finds, together with all other artefacts they find next to them. The authorities know for sure that there will be those who will not report their finds, but that their criminal activity will be revealed in the course of the other illegal activities, and then they will be prosecuted. A large number of finds

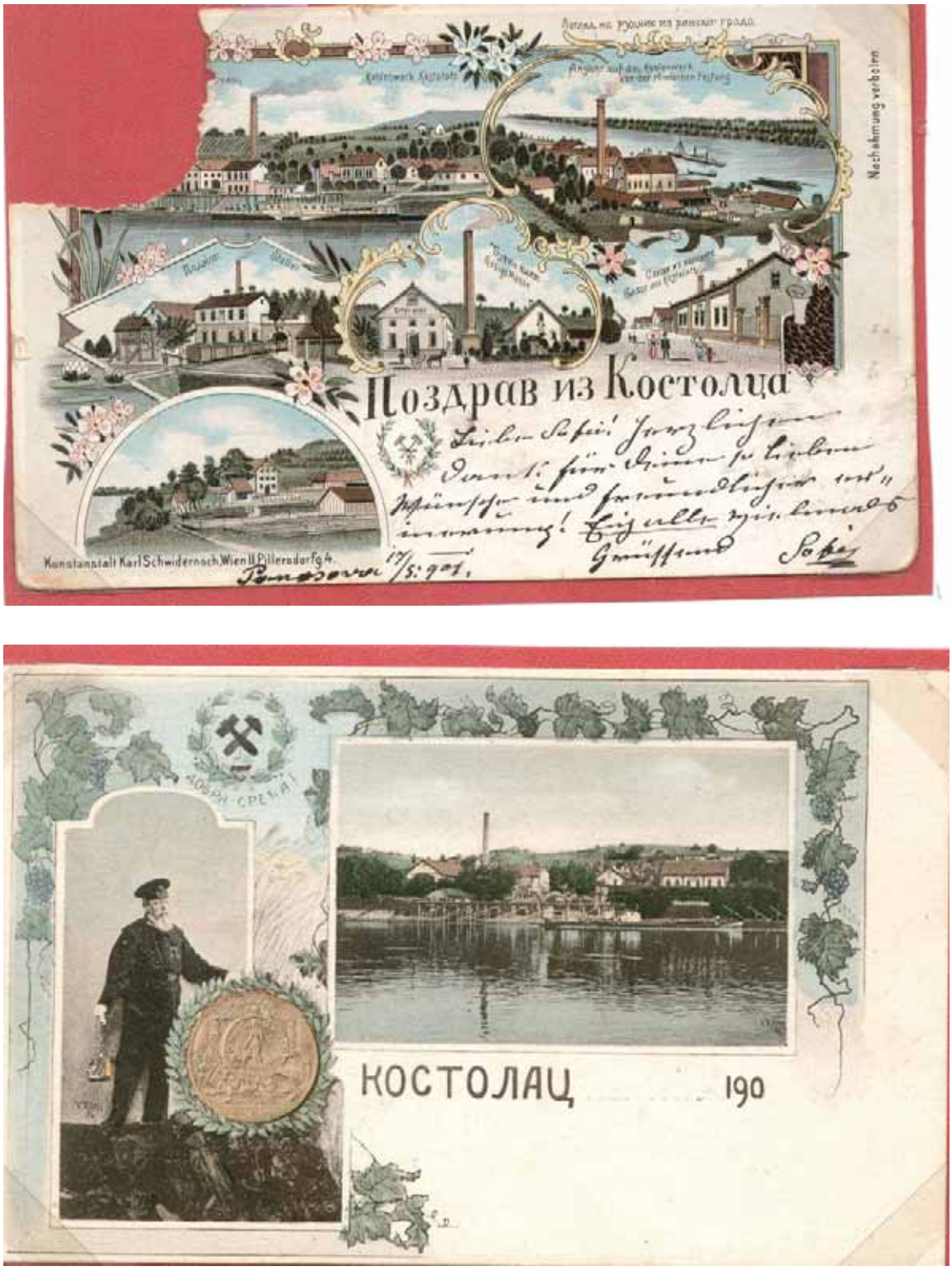

Fig. 4 Connection between the community and Viminacium is visible even on old postcards. Upper figure: a postcard showing the old town of Kostolac, with one of the paintings named "a view to the mine from the Roman city". Figure below: mining symbols are shown together with Viminacium coat of arms in a golden emblem; today, emblem of the new town of Kostolac also contains the representation of Viminacium. (From: "Istorija", Ogranak TE-KO Kostolac. O nama, http://www.te-ko.rs/o-nama/istorija; accessed September, 26th 2016).

uncovered by metal detectors originate from already cultivated land, with disturbed chronological layers, so in this way they help to prevent the destruction of artefacts, something which is inevitable in agricultural work. Following the volunteer research, the archaeologists organise exhibitions, meetings and discussions, where the local community can learn the methods of archaeology and about their cultural heritage. Additionally, the detectorists are shown ways of preserving layers during the excavations and the importance of reporting finds to the authorities. (Macnab 2004, 272-291) Mihailo Valtrović, more than a century ago, did something similar during the first official excavations of Viminacium. He let peasants take bricks and stones from the graves he had already researched. *"My disapproval would not keep the Kostolac people from excavating those graves, which I would, after surveying and describing, bury again. With my approval, I gained their trust, so they used to bring me the finds they had already found before, told me where there were more of them and who owned them, and called me to dig on their fields too, assuring me that there would be an abundance of graves and antiquities."* (Валтровић 1884b, 52)

CONCLUSION

Socio-economical development under the influence of tourism is very specific, because of the great number of changes that happen, but also because of "the planetary dimensions" of tourism. (Devedžić 2007, 65) Tourism develops complementary activities, increases employment, has an influence on the bigger engagement of women, and causes the transition from primary to tertiary activities. (Devedžić 2007, 70) Sustainable tourist development is that which can make the quality of life of the local communities better, gives the visitors a superior experience, preserves the quality of the environment and culture of the local community, but also creates a balance between the host, the guest and the environment. (Moscardo 2003, 3-4) This is the way the Kostolac area can survive after the end of its mining industry. The aforementioned large economical capital of the peasants that work abroad can be preserved by investing money in tourist development of the area. This can be the reason for young people to stay in their birth place, be educated in fields other than mining and energy, and become capable of leading future development. It is necessary to increase information about cultural heritage, to raise awareness about the importance of cultural heritage, to encourage local people to actively participate in the process of decision making about its development (Одлука 2012, 81, 152), always keeping in mind that the development has to be planned on the basis of every specific village, its tradition, culture, customs and people. (Dragićević-Šešić 1991, 45) In that way they will take responsibility for future processes in the area. (Palmer 2008, 9-10)

As part of the rich antique heritage of the Republic of Serbia and as the initiator of future plans to connect the Roman sites in the national and international cultural and tourist route, *Itinerarium Romanum Serbiae,* (Korać et al. 2009, Maksin et al. 2011, 316-327) Viminacium inspires an awareness of cherishing the heritage, reminds us of the international importance of local cultural heritage, and demonstrates the possibility of sustainable development and the prosperity of local communities through archaeological tourism. (Одлука 2009) In such a way, peasants can earn from their land whilst still preserving its rich cultural and historical heritage. The appropriation of a historic place does not mean the illegal usurpation of cultural properties; instead it can represent care for the place, a feeling of joy when it progresses and sorrow when it falls. The value of an area can not be found only in its physical elements, it is a place where the process of building the identity of a region is initiated. (Röhring 2011, 1)

It is said that geo-tourism "can help *to beautify* ugly places and enrich poor places." (Tourtellot 2009, 6) In a North Carolina town, in the USA,

"a group of volunteers got together *to beautify* … and protect the environment" as "an effort to raise awareness and show residents how easy it can be to take care of the environment". (Beairshelle 2016) The Georgetown Heritage Society in Georgetown, Texas, was formed "to assist in the preservation of buildings… historical sites, works of art… records and writings… to perpetuate those customs … and traditions and folklore which seem *to beautify* and enrich the community life." (The Georgetown Heritage Society) The Historical Society of Marine City in Michigan, USA "is sponsoring an event to raise funds to help *beautify* local neighbourhoods" because "when you see an older home with some of the gingerbread trim, it gives you pride in your city." (Packer 2016) An organisation from the USA, named *Beautify Earth,* "creates public and private art projects…for the purpose of instilling community pride in impoverished or neglected communities". (Beautify Earth)

So, the verb *to beautify* does not only refer to aesthetics or technical development. In the case of Viminacium, and the surrounding rural area, it is obvious that culture and tourism have to take a role in the education of the local community as a way of *beautifying* it, making it able to further *beautify* their living space. *To beautify* does mean to give *beauty* - to make nice houses, green lawns and clean streets in the area, but what is equally important, to create a community that is built on the pride, strength and power originating from its cultural and historical heritage.

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REZIME
ARHEOLOŠKI PARK VIMINACIJUM: KULTURNO NASLEĐE I LEPOTA ZAJEDNICE

KLJUČNE REČI: VIMINACIJUM, LOKALNA ZAJEDNICA, KULTURNO NASLEĐE, MESTO, IDENTITET, ODANOST, ZAVISNOST, ZNANJE, ULEPŠATI, ZANEMARITI, TURIZAM.

Za proučavanje odnosa lokalne zajednice prema kulturnom nasleđu u procesu napretka jedne teritorije izabrano je arheološko nalazište Viminacijum, koje svoj dosadašnji razvoj malo duguje samoj zajednici. Naprotiv. Sve do početka XXI veka, uvođenja stalne zaštite lokaliteta i oživljavanja mesta pristizanjem turista, prekopavanje antičkog Viminacijuma je bila svakodnevica meštana okolnih sela. Ako lepotom nazovemo sve pozitivne osobine jedne zajednice koje čine da u očima posetilaca ona izgleda kao domaćin koji čuva i brine o svojoj okolini i kulturnom nasleđu, onda lepota lokalne zajednice okoline Viminacijuma već dugo u velikoj meri zavisi od razvoja samog arheološkog nalazišta. Danas je arheološko nalazište Viminacijum savremeni arheološki park čiji je razvoj doneo uređenje prostora i komunikacija na široj teritoriji i u kome je zaposleno lokalno stanovništvo.

Razvoj jednog prostora se uvek mora planirati na osnovu tradicije i običaja ljudi koji u njemu žive i oni moraju aktivno biti uključeni u proces odlučivanja, Međutim, navike jedne zajednice, njena svest o sebi i njen odnos prema okruženju i nasleđu su najveća prepreka ne samo u turističkom razvoju predela, već i u razumevanju potrebe za ovakvim razvojem. Zajednica mora verovati u vezu između sebe i mesta na kome živi, biti ponosna na nju i ta veza se mora stalno nadgrađivati, delovanjem na njihova osećanja, znanja i ponašanja. Zato je neophodno shvatiti da je socijalni razvoj i edukacija zajednice u oblasti očuvanja i prezentacije kulturnog nasleđa jedna od najvažnijih obaveza onih koji upravljaju jednom oblasti.

Priroda i obradivo zemljište na prostoru oko arheološkog nalazišta Viminacijum polako kroz decenije postaju industrijsko okruženje i vekovna ljudska delatnost poljoprivrede polako zamire. Nakon završetka industrijskih aktivnosti, turizam može biti jedna od najvažnijih privrednih grana koja će pomoći u razvoju ove teritorije.

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THERMOPYLAE REVISITED

ABSTRACT

The battle which defined our understanding of the Greco-Persian wars and classical warfare has numerous hidden or obscure issues, which escape standard scholarship and may be enlightened by careful observation, reading and deduction. Who really were Leonidas' 300? The Phocian wall is usually thought to cut the passage of Thermopylae. However, this would have cut the best commercial road. Most probably it was nearby, an open circuit stemming from the rock, not cutting off the traffic but allowing control and perhaps interdiction by missiles.

The Persians, after being victorious, never passed through the pass but chose another route making the reason of the battle obscure; it was more a show of prowess than a real operational need. The Greek tactics mentioned by Herodotus imply both a universal drill in hoplite armies of passing units through each other's lines and also a Spartan darting tactic, more or less similar to Ekdromi attested later by Xenophon (Hellenika Book IV.5), although executed in inversed spatial terms. Last, but not least, Herodotus' day politics most probably do not allow neither the Spartans to speak of the night raiding in the Persian camp, mentioned by Diodorus, nor himself to state that the true reason of the Phocian contingent failure to keep their position was that once caught unawares they preferred to cover the passage to Phocis, their homeland, than the rear of Leonidas.

KEYWORDS: THERMOPYLAE, LEONIDAS, SPARTA, ANCIENT GREEK TACTICS, SPECIAL OPERATIONS.

INTRODUCTION

Thermopylae is the battle of redefinition of the Greek-Persian military balance, as its outcome defined the subsequent Persian moves. The Greek hoplite infantry was pitted for the first time successfully against a royal Persian army-or even line infantry. Up to that point, the 2 only Greek land victories, had been the result of surprise. The first was an ambush near Pedasa at c 496 BC by the Carian rebel forces of the Ionian Revolution; there, a Persian army was annihilated at a night action (Her V.121). The second was in an unorthodox, though open combat: a more or less

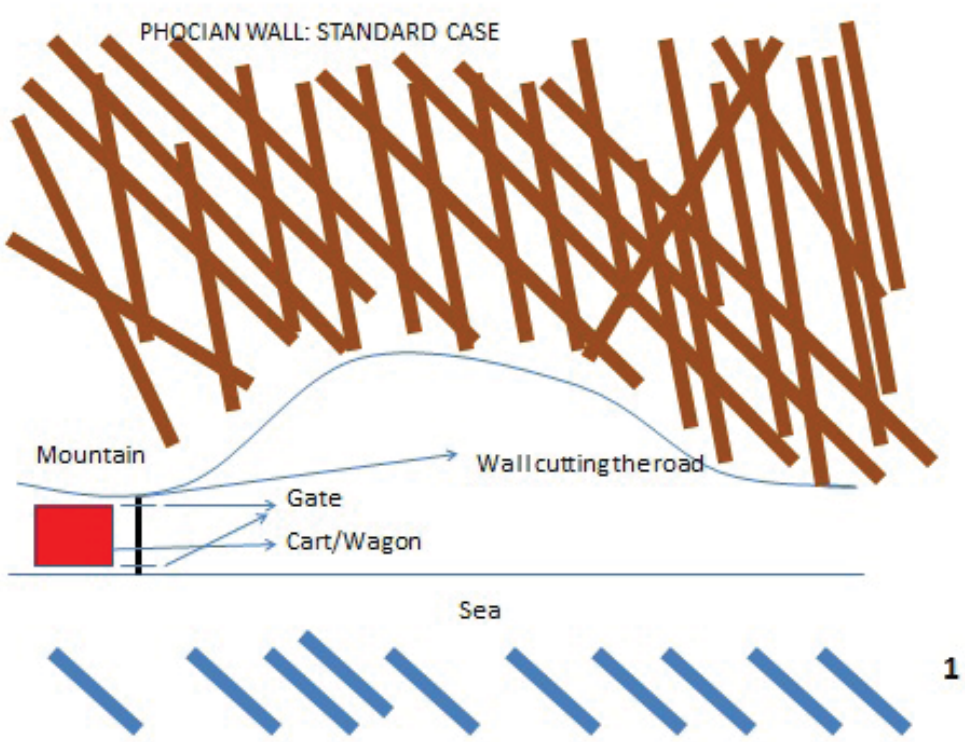


Fig. 1 The wall of the Phocians- standard view. The Diateichismos cuts the traffic. At the narrowest, only one cartwagon can be accommodated, thus the gate must be that wide at least, to allow peacetime traffic, travel and commerce, leaving little room for actual wall. In less narrow positions, the whole idea becomes nullified.

sudden (maybe not surprise) attack, and the tactical novelty of a storming charge combined with differential pressure to isolate and then encircle/flank Persian line infantry. This victory, scored at Marathon, in 490 BC (Her VI.112-115) was most decisive but also indicative of tactical flair from the more robust mainlanders, where the Persian threat had been expected for the last 30 years and basic measures taken in the form of athletic training and tactical dispositions. In a pitched format, without imaginative tactics and surprise, a draw was the best result, scored at Malene, 493 BC, till the Persian cavalry tipped the scales (Her VI.29).

MAIN UNSETTLED ISSUES:

I) Opposing armies

A crushing show of force, combined with the ambition to conquer Europe (Her VII.8,3), implies a vast royal army, definitely twice or thrice the size of the Greeks united. The numbers of the latter must not be dismissed with only three score city-states rallying to defend the motherland, in Plataea, in 479 BC more than 30.000 hoplites were present, and a total of 100.000 battle-ready troops (Her IX.30).MedisingGreeks were not to be excluded, as potential enemies, since Greeks had a name for untrustworthiness towards the Persian throne (Athenians 510 BC, Ionians 500 BC etc).

This royal army moves in mainland routes- one or more- leaving the coastal areas to the amphibious component of the royal fleet. From Therme it advances through the mountains, circumventing the first Greek defense in Tempe, then follows the easy coastal road from Thessaly to Malis (Her VII.196-201).

The Greek contingent comprised two elements: the local and neighboring communities sending their entire forces -more or less- and the expeditionary forces sent as reinforcements for

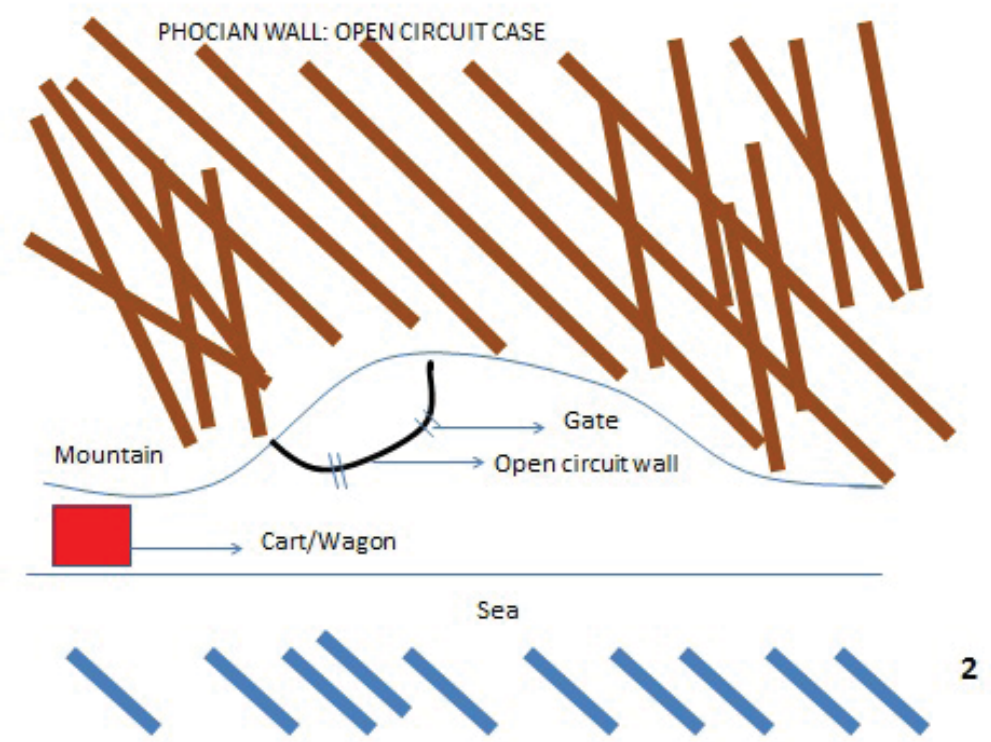


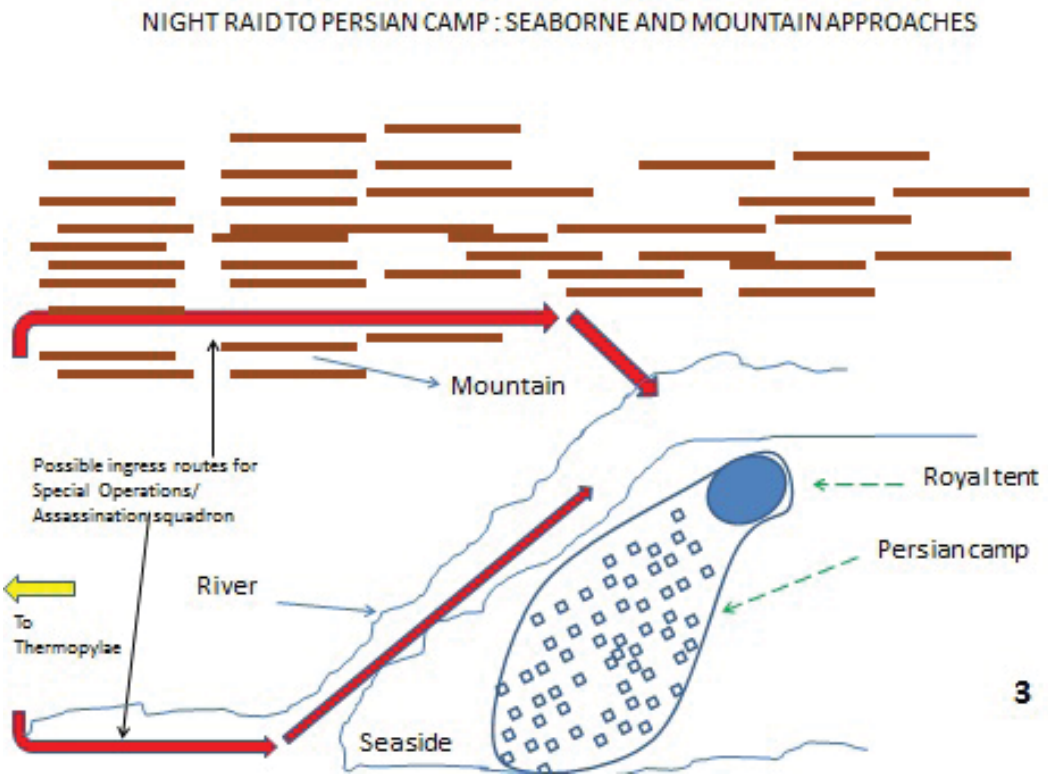
Fig. 2 The wall of the Phocians: open circuit. The wall stems from the sheer rock, allows control of the road by missiles from its top and sallies from the gates. Peacetime traffic is unhindered.

the projection of advanced defense by distant southern Greek states. The latter were more or less token forces, according to politics. A strong commitment implied tactical levies, a half-hearted one was obvious by sending small, standing units (brotherhoods-in-arms) of the respective poleis, similar to the 300 Spartan Hippeis. Thus, instead of some thousands, the medizing Thebans dispatched 400 (Her VII.202), possibly a special unit ancestral to the Sacred Band (Plut Pelopidas XVIII.1). This is very likely as their commanding officer is the father of the commander of another 400-strong Theban unit which, in 431BC, infiltrated in pure Special Operations mission to occupy Plataea (Her VII.233).

The stout Thespians, of the very few Boeotians not to medize, sent 700 troops (Her VII.202), which might have been their entire hoplite army (perhaps at 2/3, expeditionary strength). Still, in later action, in Plataea, 479 BC the city is mentioned as having no hoplites due to their annihilation at Thermopylae (Her IX.30), so 700 must have been the entire hoplite levy.[1] The Phocians sent an expeditionary force of 1000 Hoplites, the Locrians their whole army (Her VII.203), which was a meager 1000 hoplites (Diod XI.4, 7).

The Spartans were in the middle. Herodotus mentions only the 300 crack Spartan troops (Her VII.202). These are easily identified as the Hippeis/Knights (Thuc V.72,4), drafted in a yearly basis by three appointed officers, the Hippagretae, also of yearly commission (Xen Lak Polit IV.3), each Hippagretas drafting 100 adolescents, obviously from each of the 3 Dorian tribes. But Herodotus also mentions Lakedaimonians when narrating the battle (i.e. Her VII.208, 211), a far wider term historically encompassing Spartans and Perieoi. He also makes clear that the Spartans, not, stayed to die with the King (Her VII.220); so the survivors of the rest of the Lakedaimonians were

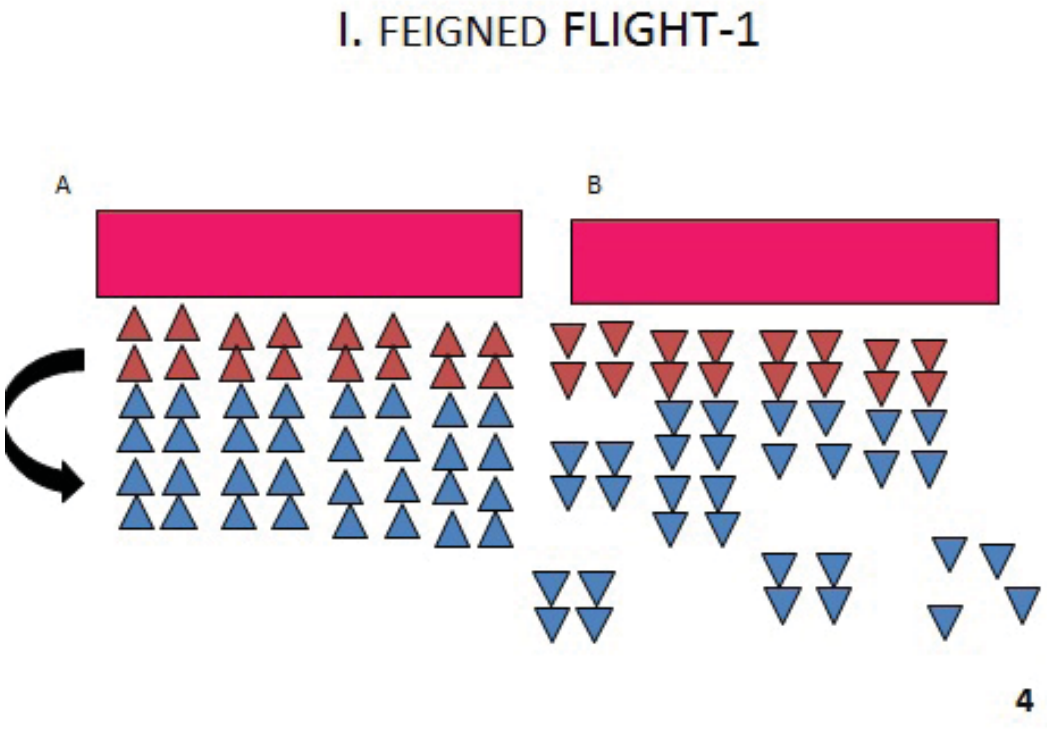
1 Herodotus in IX.30 counts them as combat troops, not logistics personnel and explicitly states they had no hopla, thus making obvious the origin of the word Hoplite, contrary to the beliefs of many modern scholars as Lazanby- and Whitehead, 1996.



Fig, 3 The routes for a Special Operations squadron sent to assassinate Xerxes. The sea-river route is longer and takes the party in front of the whole camp. The mountain route allows better cover and access near the Royal Tent.

sent back, probably as the only Laconian troopers with live experience of the Persian war making. Diodorus directly enumerates a thousand Lakedaimonians and 300 Spartans (Diod XI.4, 5), but the Greek is unclear and may be translated as both "and" or "including". The latter is preferable; a bit previously (Diod XI.4, 2)the full strength of the force, has been set to 1000, as correctly noticed by Flower, 1998. Should 1000 be the total, the 700 missing in Herodotus' account might have been another Laconian unit mobilized and deployed, most probably not comprised (entirely) of Peers. This leads to a division-size (Mora) unit of 1000, standard in most of Greece. A Mora situated or stationed north of Sparta, mobilized at short notice and manned to 2/3, the standard expeditionary strength as Thucidydes says of the Peloponnesian armies invading Attica (II.10,2) fills the bill. This 1000-man total strength is much more than for Morae in the age of Xenophon and as described by him (Xen Hell IV.5), but consistent with Greek practice and Spartan population abundance before the catastrophic earthquake of 464 BC. As Plutarch points out, the strength of Morae is mentioned as anything between 600 and 1000 men (Pelopidas, XVII) and such differences might stem from different manning /mobilization levels or different ceilings in different times/ generations. A 1000-strong territorial division is perfectly compatible with the Spartan army of the period. This line of thought can be expanded to identify this Mora as the Skiritae, renown to later military authors for their prowess in security, irregular warfare, and reconnaissance (Xen Lac Pol XII.3 & XIII.6). If such practice can be retro-projected, Skiritae, who are Lakedaimonians but not Spartans, nimble and good on mountain warfare were an excellent choice both for the terrain in Thermopylae and for the Special Operations undertaken (see below).

On the other hand for such a forced march and in view of the terrain and the nature of the fight-



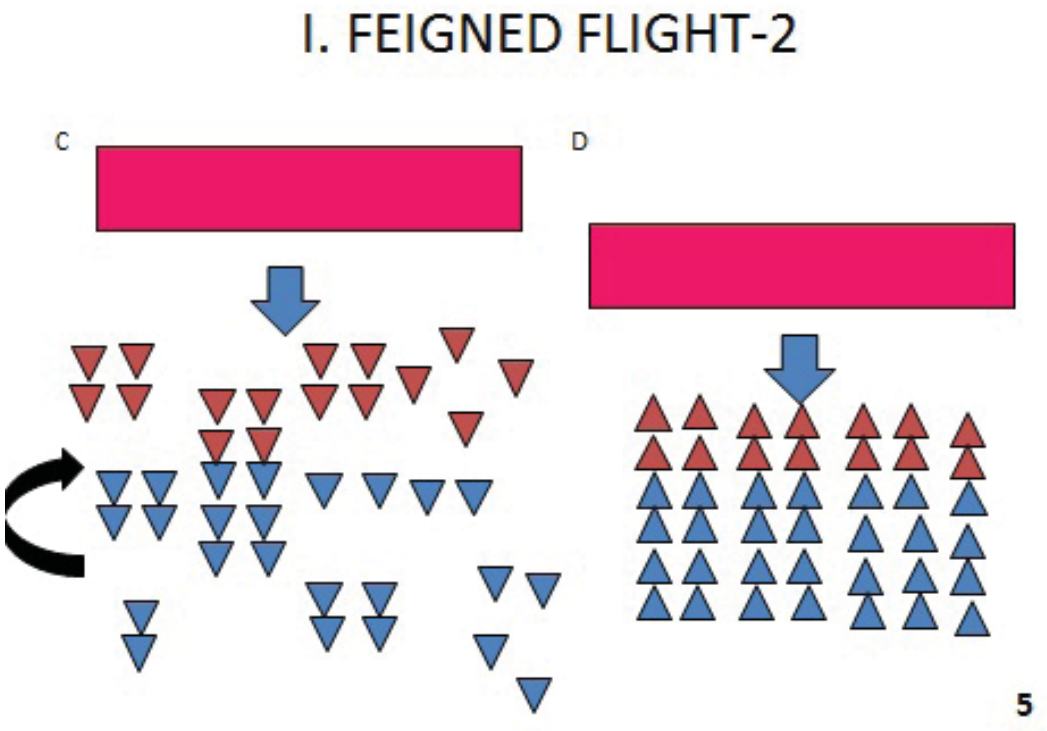


Fig. 4-5 Feigned flight, standard execution.
All phalanx troops turn on their heels where they stand (A) and flee in full face and proximity of the enemy (B) with the rear ranks –usually veterans-slowing down the front ones, usually faster and younger in age. Even if they make good their escape, they have the enemy at their heels (C) and about-facing, regrouping and dressing the line (D) almost simultaneously, to shove the enemy off is extremely difficult

ing, Leonidas might have taken with him a unit of 1,000 young troops from the whole realm. These troops may be the ones sent as advance-guard to Megara in 479 BC while the rest of the Spartan-and Allied- Army were stationed in Isthmus (Her IX.14), and the ones executing the bait-retreat plan in the battle of Platea (Her IX.57, IX.85). They should have been the youngest, and Plutarch (Apoph. 225e) mentions unmarried youngsters sent home by Leonidas as couriers to the Ephors. Althoughfor this campaign Leonidas had enrolled fathers of male kids to ensure the survival of the bloodlines (Her VII.205), Spartans married young and were encouraged, if not pushed, to sire just as young (Xenophon Lac Pol I.6) but exceptions would always present, especially in a territorial division and/or a young age-class.

Practically, the usual Greek expeditionary drafting practice seems to fall under three possible mobilization quota:

1. The dispatch of the standing armies, elite groups of different stock and origin in each city-state, usually called "Logades" by Herodotus (IX.21), to indicate they were under oath. Such groups were of standard strength for each city-state, but standardization did not occur among different states. This corresponds well with the renowned "Sacred Band" of Thebes (Plut Pelopidas XVIII.1) through the expanded similar corps of late 5th-early 4th centuries ("Logades" of Argos in Thuc V.67,2;"Epilektoi" (Elites of Phliousin Xen Hellenica VII.2,10; "Epilektoi" of Arcadia Diod XV.67,2 & XV.62,2); it also links with the past, as the Trojan War was possible due to the suitors' oath before Helen's choice of Menelaus.

2. The mobilization of their whole levy (Pandemei) for short duration and, preferably, with the opponent nearby (Her VII. 206, Diod XI. 4, 4).Thespiae clearly implemented this quotum, as did other states as the Locrians (Her VII. 203).

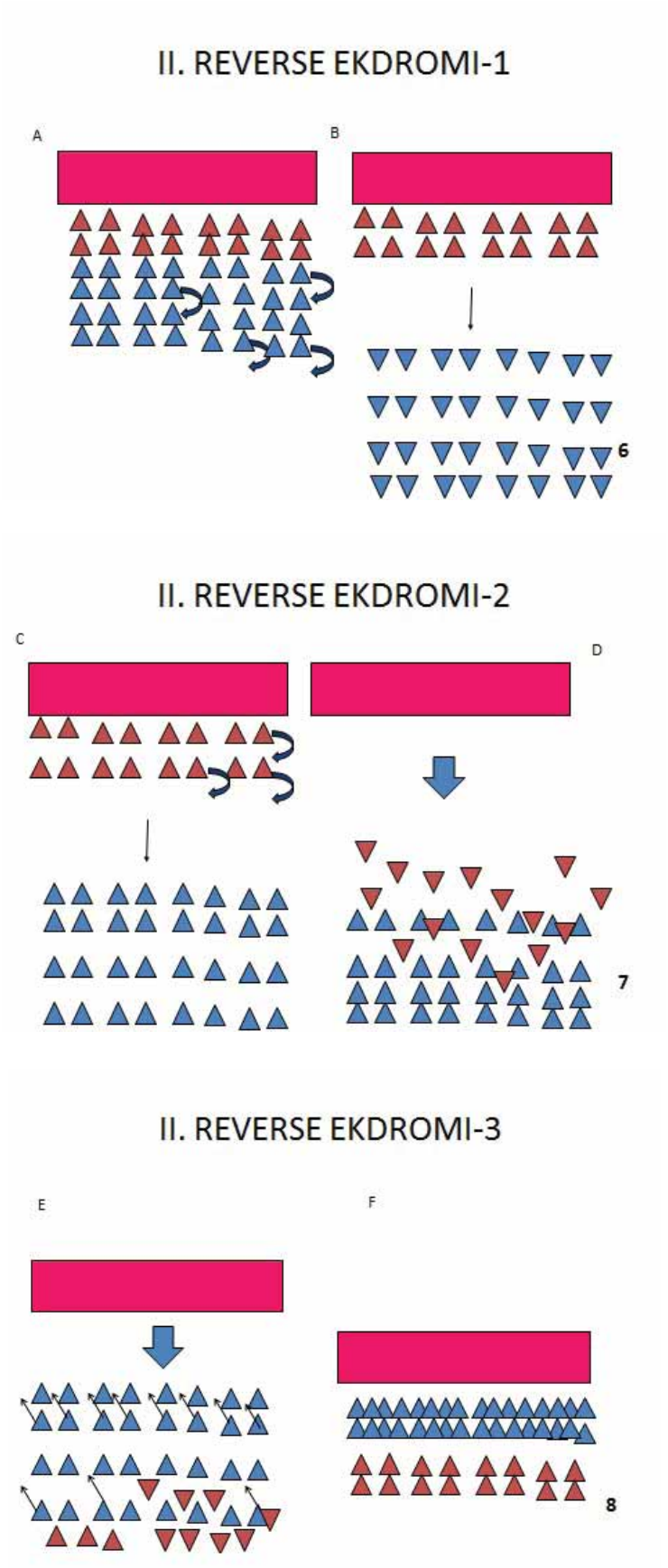
3. The draft of the majority of the full levy, by age criteria (Her IX. 12). This most probably was following a 2/3 ratio for the expeditionary force (ThucII.10, 2). Multiple expeditions were not very common at the era, and thus we cannot deduce if the sum of the expeditionary forces was following the 2/3 rule or other arrangements were made, as in imperial Athens (Thuc I.105, 3-4) and 4th century Sparta (Xen Hellenica VI.4).

Herodotus never mentions the 2/3 rule -but he also fails to mention that the 300 Spartans are Knights/Hippeis; arguably, this rule seems valid: the Spartan Peers are 8000 according to Demaratos (Her VII. 234) and at Plataea the expeditionary force has a core of 5.000 Peers (Her VIII. 10), a 0.62 compared to the 0.66 which equals the 2/3.

It is possible that the implementation of case 1 instead of 3 by the Spartan state was causing consternation to allies and allowed to Thebes to reciprocate by sending 400 men. Spartans served from 20 to 60 years of age, and the ones from 20 to 30 were permanently on alert, sleeping in barracks (Plut Lycurgus XV. 4 & XXV. 1). Their number adjusted for the total levy is 2000, coincidentally the number of the expedited reinforcements to Marathon in 490 BC (Her VI.120). By comparison, the Athenian naval contingent in Artemisium was 120 triremes (Her VIII.1) with no less than 170 sailors, oarsmen and marines for a total of almost 20000, a 2/3 rate at the very least.

II) Battlefield-fortifications

The straight of Thermopylae is one of a system of 3 straights leading from Malis to southern Greece proper. The position taken by Leonidas cuts the coastal road along the Euboan Gulf, a route ill suited for a massive army as far as provisions are concerned, but rather smooth. After a distance and deep in Epiknemidian Lokrian territory, the road branched to the coastal way proper and to a SE-direction, the main route into Boeotia through Elateia, and, along the Kephisusriver, to Thebes. It was a logical choice. Moreover, it was useful for combined army-navy operations, and if followed throughout its length by coast (the Persians used parallel routes of advance) allowed



6-7-8. Feigned flight, executed as Reverse Ekdromi.
Slower, veteran troops of the rear ranks turn in their heels (A) and retire (B) as fast as possible unnoticed by the enemy as the front ranks, with the youngest and fleetest troops stand fast and obstruct the view. Having thus gained a distance, the veterans turn and reform while the front ranks suddenly break and run at full speed, unhindered by rear ranks (C). After a moment's startle, the enemy follow hot at their heels, without making visual contact with the regrouped veterans. The fleeing youngsters retire among the veterans' files (D). With the breathless youngsters to their rear, the veterans close ranks (E) to face the pursuing, disorganized enemy with dressed line and compact, dense formation. Having caught their breath (F) the younger hoplites regroup and join the files of the veterans to reinforce the phalanx and add momentum to the shove.

to support the fleet from ambushes with missile weapons in a steadily narrowing environment, near the straits of Eurippus, as Xerxes guides would have let him know.

The second approach was the Asopos gorge following the Anopaia pathway and branching to Phocis and back at the coastal road, behind Thermopylae and Leonidas' rear, a very steep road and utterly unsuitable for alarge army and its transports (Her VII.216). The third road, starts again from the Asopos gorge near Trachis, but cuts south through Doris and then offers three choices: Phocis to Boeotia (Her VII.199 and VIII.31-33), the way Xerxes did select to move, or west to Delphi, or South to Amphisa in Ozolian Lokris and at the north coast of the Gulf of Korinth. It was at first steep road through ravines, possibly unsuitable for a large army's transports, but leading promptly to friendly and well-provisioned, hospitable Boeotia, after a brief incursion to the heart of Greece-orultimately to the north of the Gulf of Korinth. The same network was used later by the warring factions ofGreek civil wars (Xen-HellenikaVI.4; Paus Boeotika XV.2) and by the Romans (Paus Achaika XV.3) in their expeditions between Southern and central Greece.

The area Leonidas occupied was something of a tourist attraction (Her VII.176). It is difficult to envisage the terrain: the narrowest (only onecar-wagons wide: Her VII.200), even if as narrow as Herodotus states, is unclear in nature. One side is a steep rock face of the mountain. What is there from the other side? Most probably the sea. This might be non-negotiable for commercial traffic, but assault infantry would have negotiated a detour by plunging up to the chest in the sea to outflank an enemy, as happened some months later in Potidaea (Her VIII.129). No such issue, no similar action has been described. Thus one has to understand that at the time the road is considerably higher than the sea level, so as not to permit flanking, and rather precipitous: troops fallen to the sea are mentioned as fatalities (Her VII.223).

The Phocian fortification repaired, rebuilt, reconditioned and used (Her VII.176) is usually thought of as a vertical wall sealing off the road, something very like the doors or Mordor in The Lord of the Rings. Indeed such works were used by the Greeks to cut off enemy forts and cities situated on promontories and were called Diateichismoi. The fortification in Isthmus, progressing in the earnest at the same time (Her.VIII.71 & IX.8-9) and performed both before, by the Myceneansunder Atreus, and after, during Epameinondas' incursions (Diod XV.68,3) had been such cases. But there is absolutely no need toenvision it thus, as there would have been very little room for pillars and a door capacious enough to allow a laden chart to pass (for peaceful times), plus parapets for an adequate defense force. It may very well have been an open circuit, both edgesattached on the sheer rock of the mountain, allowing the stationing of a friendly garrison. This garrison may attempt pitched battle cutting off the road in the face of the enemy, then fall back through the gates of the circuit, and continue to gravely harass the enemy by missiles from the wall. Both Xerxes' and ancient Thessalians' cavalry and any transportation using draught animals would have been unable to pass, even if competent infantry might do using skillfully their shields.

Herodotus writes-and presents in ominous times, when Athens and Sparta are already at loggerheads, although not in the deadly entanglement of the Great Peloponnesian War. Phocians are allies to Athens (Thuc I. 107,2), and Thessalians are traitorous enemies (Thuc I. 107,7). Thus he remains very considerate towards the former. The little plateau entrusted to them, more than any way to the rear of Leonidas, offers an inroad to Phocis. By being at that point the Phocian contingent protects both the rear of the defenders of Thermopylae and the approach to the motherland. Once taken by surprise they do not take a last stand position under panic, but form their phalanx at the point which allows interdiction to any move towards Phocis. Only under this light is understandable the absurd notion of the Persian task force

not engaging them and they being steady at their position (Her VII.217): the Phocians do not endanger their primary mission, the defense of their territory by engaging away from their commanding position (the hill they assembled on, after two or more days of inspecting the surroundings, had they to do so. And the Persians, seeing them out of position and defending another branch of the crossroads, simply bypass to their mission as well.

THE UNEASY QUESTIONS

The Persian army emerged from east-north east having skirted the west coast of the Pagasitic gulf southwards, a rather easy landscape, and then turned westwards to skirt the Malaic gulf to the plain and valley of Spercheios. This area is *Hellas* proper (in Homeric geography – Iliad II. 681-5). Since Leonidas had been there first, so as to repair the fortification and establish acenter of support operations (Her VII. 176), an incursion to the Malian Plain, in order to deprive the invader of food, shelter and fodder was the most logical thing to do (Green, 1970), and easily doable by an army only marginally short of 10,000 (Her VII. 202-3). The mention of Polyaenus (I.32, 3) of an incursion carried out with extreme efficiency and skill by Leonidas most probably refers to this operation in the eve of the Battle of Thermopylae.

The questions start from the moment Xerxes arrives and encamps. Why waiting for some four days (Her VII. 210) and does not engage at once, to startle opponents up to this point elusive and otherwise unwilling to engage, as demonstrated in the thessalian-macedonian border at Tempe where they promptly retreated before any action had started (Her VII.173)? Moreover, why to engage them and not bypass them through the other straight, to Doris as he eventually did? After all, once the battle was done and he emerged victorious, he never led his army through the conquered pass. He went through the gorges to Doris straight south (Her VIII.31). So, why had he not done it inthe first place and engaged in a stupidly bloody action? Additionally why did he not do it after the first two days, when direct assault seemed a complete failure and a thrust to this direction would have broken the deadlock? It would have been bad for his army's morale, but there was no reason to get despaired-or even frustrated- as Herodotus says (and has been told by the Greeks of his court, or rather their descendants, interviewed by him). Could there be a strong and determined garrison at this point also, which Herodotus knows/says nothing about, and most probably coming from a native population not very friendly to the Athenians in Herodotus' days? May it be the Malians, prominent as 1000 troops in Diodorus (Diod XI.4,7) but missing in Herodotus account (Her VII.203), either for the above reasons or because they were posted far from the Thermopylae position? Both Green, 1970 and Bradford, 1980 support such an eventuality.

OPPOSING MOTIVES-PLANS

The Greek plan should have been a war of attrition. Killing enough opponents would not have been a viable option, but straining the logistics and draining the supplies of a vast army boxed among mountains was another thing altogether. The Troizen-decree (Jameson, 1960- EM 13330, Epigraphical Museum, Athens) reveals that the real intension of the abandonment of Athens, a meticulously preplanned massive operation was to entrap the huge Persian army in Attica and destroy its fleet, thus aggravating a supply problem forecasted months before by Artabanos (Her VII. 49). In this light the campaign at Thermopylae aimed at boxing the Persian Army away from the supplies of the fleet to wear it down, if not to stop it altogether. It was a different plan from the purely interceptive campaign at Tempe, a land campaign were the Greek fleet was a mere means of transportation (Her VII. 173). In Thermopylae

9. Territorial map of the area of operations in Thermopylae by Map_greek_sanctuaries-en.svg: Marsyas, available at: https://commons.wikimedia.org/wiki/File:Ancient_Regions_Mainland_Greece.png.

it was a predominantly naval campaign[2], as the expeditionary land force was a mere 4,000 (Her VII. 202 & Diod. XI. 4,5) compared to 10,000 at Tempe (Her VII.173).

The same is true for sapping the morale of the enemy, especially the non-Persian subject troops. Some bloody failures and their fragile morale, rooted on idolizing the King of Kings' power, military prowess and diplomatic efficiency (Polyaen VII. 15,1) would be undermined, and the same goes with the authority of the King of Kings figure, an almost divine one.

Still, given enough time the positions may be breached, either by sheer exchange rate of casualties, or by flanking, thus three successive ones were selected: Tempe, Thermopylae and Isthmus. After all, despite at some points being a one-sided carnage, the battle, fought undermost favor-

2 The Spartan reservations, due to the danger of both operational (by secondary routes and alternate passes) and strategic (by deep sea raids at the rear) flanking dictated the commitment of limited forces, and this agreed with Themistocles' wish, and need to use the navy he created (Her VII.144) as the primary arm against the Persians, committing thus most of the full manpower of Athens (38,000 out of perhaps 40-42,000) against the enemy, instead of the 20-25% which were the Hoplites (10,000).

10. Perhaps the best geophysical map of the Central Greece comes from P. Connolly's "Greece and Rome at War" London: Greenhill.

able terms for the Greeks, had a 5:1 exchange rate, with some 20000 Persian versus 4000-odd Greek fatalities (Her VIII.24-5); such rate was unsustainable for the long haul and far below the 30:1 in Marathon (Her VI.117). But time was of essence. Leonidas' was really a holding force, to be reinforced as required but the main forces kept to the extreme rear, to guard against insurrections and also flanking, as the bitter lesson in Tempe had shown the Persians capable of. At this stage the main arm was the navy. If the imperial navy could be kept out of reach of the army resupply would be a vital issue. The navy had no unlimited supplies, it was vulnerable to storms and to

surprise attacks in unknown coastlines. Practically, the Greeks had to intercept one of the two branches of the Persian War machine to win. If the Greek fleet kept its own, the Persian could not outflank Thermopylae. If Thermopylae held, the royal army could not threaten Euboea and the mooring base of the Greek fleet. Moreover, the Greek fleet of some 270 vessels (Her VIII.2) could easily embark the whole of Leonidas' army of 7000 (Her VII. 202-3) by adding 25 men in each vessel, and land them near the Persian mooring, thus eliminating the fleet at the beach, before the Persians establish communication between army and navy. This is why Xerxes attacked. He simply did not want the Greeks there. The passage was of little consequence. The comparative positions and forces though made the mix extremely flammable. Waiting for 4 days (Her VII. 210) was not just to muster his lumbering, gigantic army, which took days to concentrate to a position. He was also waiting for his fleet. Not seeing it rang a bell and the assault to eliminate the land element of the Greek resistance was a reflex reaction from the Persian High Command. Still, their instincts were true. With Leonidas gone, the whole defense plan was shattered: the Greek navy with drew, the Persian navy made contact with the army normalizing supplies and the pass to Doris was free.

TACTICS

The Greek tactics mentioned by Herodotus imply a universal drill in hoplite armies of passing units through each other's lines in order to rotate them in combat (Her VII. 212). This is easily done in exercise and is the logical solution for such problems since the invention of trained infantry. But it establishes that the Hoplite infantry of many Greek states, not only Sparta, had the ability of drilling -and under pressure at that. Not only they were able to execute under pressure, but paired to other similar troops, with whom they had never trained before.

More impressive is the "feigned flight"of the Spartans (Her VII. 211). Contrary to the Herodotus account, it should have been, more or less, similar to *Ekdromi* attested much later by Xenophon (Hellenika Book IV.5), although executed in inversed spatial terms. The engaged line cannot retreat in the face of the enemy-especially of a more numerous and lightly clad enemy- en bloc without suffering casualties. Thus the less fleet portion, the veterans, posted in the rear ranks, retreat first, at a double, unnoticed by the enemy and reform at a distance but promptly. In such cases the original battle order cannot be recreated and one should fight next to any random comrade, something that "only troops drilled under Lycurgus' laws can do" (Xen Lac Polit IX.7). Subsequently, the fleetest troops, who must have remained engaged with the enemy, must brake at once and gain some strides-four to six- while their opponents are startled. After that, since they were not facing missile troops but shock infantry, they must keep and even open the distance and cover their back with the shield for fear of the occasional javelin or stone. Bringing on the enemy hot on their heels, they cannot instantly regroup and turn, even if perfectly trained. It is much more likely to retire through the files of a line formed by the ones who retired first and are unnoticed by the pursuers. After they pass through the spaces between files, the line will be sealed in less than 3 seconds, the running troops regroup and catch a breath behind the last rank of the line and then join the files to reinforce it.

Herodotus has no idea of Special Operation sand cannot even imagine them. He is narrow-minded. Speaking of the diver Skyllias, he disapproves of the lore of him swimming a great distance without coming to surface as impossible (Her VIII.8). He never wonders if a very human device, like a combination of straw (as snorkel) and stones (as weights) might make him stay undersea, without being seen, which was the meaning of the lore: nobody counted his breaths. They simply had not been able to spot him on the sur-

face. In such a set of mind, the notion of Skyllias-cutting the anchor ropes of the Persian fleet and thus maximizing the disastrous effect of the storm (Paus Phocika XIX. 2), is unthinkable.

It is no great wonder then that he says nothing on the assassination attempt mentioned by other historians (i.e. Diodorus XI.10). It was very Spartan, and very possible to try such an act; it was also Spartan not to talk about it (Thuc V.68,2), especially at a time when previous friends became mortal enemies and any detailed account for past battles might be used to deduce their current operating procedures and *modus operandi*. Assassinations and Special Operations were an integral part of ancient Greek politics. Trained professionals were available, although not in abundance. Especially the Spartans had a name for such attempts and skills due to Krypteia (Plutarch Lycurgus XXVIII.1), in some cases even involving the kings themselves as operators (Paus Messeniaka IV.3). Flower, 1998 noticed the Krypteia connection but fails to mention that the 300 Knights in this season are older, more experienced and perhaps selected with this chapter of their CV in mind, as well. But the story of Diodorus (XI.10) is not satisfactory. The tent of the king would have been as far as possible from the line of access of the enemy. The two armies were distant enough for the sentries to detect a massive approach, even as clandestine as Diodorus tries to make it (Diod XI.10, 1). The version of the crack unit sent, not led, by Leonidas, is a much better bet-and here Diodorus (in XI. 9,2) might have had it right, concerning the number of raiders involved: 500. The lore3wants it to swim from the Greek position, from someplace with smooth shoreline so as to enter with the necessary gear, walk-swim the distance to the river, then upriver to the tent of the King. Still, although clandestine enough, the distance and time start to become an uneasy factor, and the task force has to move upriver throughout the Persian camp, as the king's tent is always upriver, to water with clear and pure water.

As it is a clandestine operation and the instigator perished, we may never learn the exact facts, but it is very conceivable that the lore is somewhat distorted. A just as clandestine and faster approach, straight to the tent of the king, would have been by marching the opposite way than that of the flanking force of the Persians (Her VII.215-21). In the dead of night the two groups might have lost each other easily-or rather the Persians the sneaky Greeks, especially if the latter are acknowledged "Special Operators", as Skiritai might have already been (Xen XII.3 & XIII.6; Thuc V. 67,1) or members or Krypteia surely were (Plut Lycurgus XXVIII.1). This version explains very well why Leonidas did not try to intercept the flanking force, although he was informed early enough (Her VII. 219). He did not want to have any noise or commotion in that area, so as to keep the guard of the Persian camp down. The attempt was made and had some Persian officials killed, such as the two brothers of Xerxes (HerVII.224), who cannot be explained as casualties in any other way. Neither the attrition approachnor the assault attempts of the Persian army included risking higher officials, much less princes. The late time of the assault of Xerxes at the pass (Her VII.223) the third day implies that the camp was in an uproar which delayed the usual early dawn onset of hostilities by the Persians. Otherwise he would have attacked as early as possible to pin the Greeks and make retreat impossible, and also to take their attention away from the flanking force. Leonidas advance in the open (Her VII.223), might thus be explained as trying to give a final blow to the Persians, in case the King had been incapacitated, and once that failed, he fell back. But this is hardly believable: in such a case he would have covered his rear with the rest of the army guarding the narrowest part inversed, to pin the flanking force, and he would have thrust his meager force in deep and compact formation to pierce as deep as possible into the Persian camp and lines. But Herodo-

3 P. Green in Xerxes at Salamis 1970; but previously, the movie "The 300 Spartans" of 1962 shows a seaborne night raid.

tus, explicitly states that he had his line extended (Her VII. 223) and sent the rest of the army away (Her VII. 222). The latter might have been desertion. The key factor, though, that weighs against desertion is the deployment to an extended line. This serves one purpose only, to expose as many troops to enemy contact so as to maximize enemy engagement and casualties in shock action. This assassination attempt, along with the carnage and consternation of the two previous days, the loss of his relatives and the old case of murder of the Persian embassy (Her VII.133) allowed, or imposed to Xerxes the ill-treatment to the corps of Leonidas (Her VII.238), considered at the same time sacrilegious, criminal and blasphemer to Gods and Humans.

There is also another issue, little noticed but of paramount importance: the method of command. It is often discussed but rarely, if ever, well understood in technicality and detail and compared to later and modern practice. The Greek way was to lead, and the commander, once the order was set and the missions delegated (if any) took his position in the line to fight. In some cases, as in Marathon and Plataea, a degree of overview and control was secured by the Commander-in-Chief in order to intervene and orchestrate more elaborate actions, and in Thermopylae the exchange of detachments (Her VII. 212) show such a Command and Control function properly exercised by Leonidas.

But what about the Persians? They are often ridiculed for ERECTING, manning and operating a lavish observation platform, at a proper, commanding feature of the landscape, for Xerxes (the Commander-in Chief), with every possible comfort and luxury as mentioned for both Thermopylae and Salamis (Her VII. 212 and VIII. 90 respectively). There are royal scribes, taking notes (Her VIII. 90). Really, one can wonder what difference is there between Xerxes establishment and 19th century observation position for commanders and staff, or even 20th century. Is there a conceptual difference to the Persian establishment and the well provided, guarded, conditioned ad even cozy American Headquarters (especially General Headquarters, like of Eisenhower)? Moreover, no such establishments are mentioned for any subordinate commanders, who also take part in the battle; Datis and Artaphrenes are shown in PoikileStoa in Athens engaged in Combat, Mardonios was Killed-in-Action in Plataea (Her IX. 64) as were other Persian commanders in Mycale (Her IX.102) and Admirals in Salamis (Her VIII. 89). Thus there simply was one more level of Command in the Persian structure, reserved for the King-of-Kings. This might be the true meaning of Xerxes thinking that his troops in Artemisium fared ill due to the lack of his presence (Her VIII. 69). It may have been not just the watchful eye of the King, to deal rewards and punishments (Diod XI. 8,1), but also of the High-Command, to direct the battle against a sneaky enemy. This of course meant that the Greeks did not need to fool the Persians; it was enough to fool Xerxes, as supposedly happened in Salamis (Her VIII. 75).

In Thermopylae, this concept is obvious: The Persian High Command, despite the dismal battlefield performance, never lose control of their troops and the battle. Always at the ready, reserves lined up and sent as required (Diod XI.7,2), retreat allowed (Diod XI. 7,4) or denied (Diod XI. 8,3), panic waves contained (Her VII.212) and, most of all, adaptability: from the decision to attack with the elite troops in the first day (Her VII. 211), to take defenders unawares, to the change of method. The storm tactics of the first day (more than one- Her VII. 211) to the attrition attempt of the second day (Her VII. 212) to the holding action and flanking of the third (Her VII.213 & 223).

Xerxes throne and observation post in Thermopylae should have combined view of the prospective battlefield with security and safety. One could thus deduce that it should have been posted over the first gate, high up for better view but not on the main ridge; should the main ridge were attainable by that position, his troops would have flanked the position of the Greeks.

OPERATIONS

The Persian army was able to divide and follow parallel routes. After crossing at Europe in the Hellespont, but definitively from the muster and inventory count at Doriskos all the way to the Chalcidian peninsula,it is explicitly stated that it advanced in three routes (Her VII.121), although there is enough uncertainty as to these itineraries, as Herodotus is not very clear. From Therme, present day Thessaloniki the army follows, up to Thermopylae, one route and this route is always away from the sea (Her VII.131 and VII. 196-198). The army is not moving along the coast for mutual support with the fleet, a fact unforeseen by the Greek army of 10.000 who tried to intercept it before it enters into Thessaly, at Tempe (Her VII.173). Very probably it enjoys fleet transportation for replenishing provisions.

The expeditionary Standard Operating Procedure is for the fleet to subdue the coastal areas by landing infantry and cavalry parties (Her VIII.23) and the army to strike inland. Rendez-vous points are established for provisioning, in a way very similar to the operation planning of Alexander the great 1.5 centuries later in which case two possible meeting areas are obvious from special and remporal parameters, Alos in Pagasetic Gulf and the Maliac Gulf. Thus the Persians did not follow the coastal routes neither to enter Thessaly from Northern Greece, nor after Thermopylae to enter southern Greece (Her VIII.31). These areas, along with the island of Euboea and the east and south coastline of Attica were delegated to the fleet which carried a landing force of more than 40.000 troops (1200 capital vessels with 40 marines per ship –Her VII.184- as this was the number encountered and impressing the Persians in the naval battle of Lade in 494 BC in the Chiantriremes – Her VI.15).

After Thermopylae, the Persian army was really vast for the mission at hand. It was a waste of resources and a bad practice logistics-wise not to put this numerical superiority, and the high moral after the victory, to good effect and expand the occupation footprint. The western Greece, west of Pindus, was not into the operational planning of the Persians, although it was important enough a front in the Peloponnesian War. It is plausible that operations in that area were meant to take place after the subjugation of Peloponnesus, with the fleet moving northwards into the Ionian Sea. The Persian high command knew the geography of Greece due to the expatriates, and most of all due to Demaratos of Sparta (Her VII.209). This one must surely have informed Xerxes that his own ancestors, the Dorians, failed to invade Peloponnesus through the heavily fortified Isthmus (Her IX.26), but succeeded by emerging at the north of the Gulf of Patras and crossing at Rio, by ships built in Naupaktos, nearby (Paus Phocika XL-VIII.10). Given that this area, NW Peloponnesus (Achaea) was medizing heavily (Paus Achaika VI.3), it was natural to attempt a crossing there, especially after the varnage at Thermopylae, which could get worse at Isthmus. Thus, the Persian army once in Boeotia should have sent a division of some strength south-westto subjugate western Phocis and Aetolia and cross into Peloponnesus with ships to friendly territory, thus flanking the defenses at Isthmus. The rest of the army could advance to Athens to deliver punishment.

Although we do not fully appreciate it, this is exactly what happened! The abortive Persian raid to Delphimight have not been a plundering operation, as Herodotus thought. Plunder was within the scope, but not really the objective: Herodotus states that at Panopeus, a crossroad, the army divided in two, and the larger part continued to Boeotia and Attica, and the lesser part towards Delphi (Her VIII.35). Thus the two parts were unequal, but not vastly. It is not a group or some units dispatched, it is a hefty part of the army. This, according to previous practice means following two itineraries, with two separate objectives. The second force, moving westwards through, and not to, Delphi, intended to crossto Peloponnesus in Achaia, thus outman oeuvring the Greek army

at Isthmus, as had happened in Tempe and eventually at Thermopylae.This course of action may have been decided after Thermopylae, at the staff meeting (Her VII.234-235) where Demaratus proposed landing at Kythera. So, a change of plans is possible after Thermopylae: south through Asopos gorge to Doris and Phocis, with the main body turning SE to Boeotia and Attica and another body dispatched to a western campaign. Other combinations of itineraries were possible, but the route chosen offered the best combination of security for the whole army, the least warning for the Greek high command and an easy access to Attica for the main body of the Army.

Themiracles at Delphi (Herod VIII. 38), which demoralized and pushed back this force to the rest of the army, did not just save the temple, but actually won the campaign. This corps after Delphi would have emerged to the north shore of the gulf of Korinth, easily occupying the coastal towns and commandeering vessels to cross to Peloponnesus in Rio, a replay of the invasion of the Dorians, with no Greek fleet to counter, nor any hostile coastal state to resista disembarkation as in Marathon.

This prospect coming to null, Xerxes had to opt either for an assault in Isthmus, or for a naval victory to be able to cross by sea to Eastern Peloponnesus, where Argos, bitterly hostile to Sparta, offered a safe bridgehead (Her VII.149). The terrible carnage in Thermopylae took a toll in Xerxes' psyche and decided not to seek land battle in straights, especially if augmented by defensive works, against massive Greek hoplite infantry. Thus he played the naval card at Salamis, at an inopportune moment: the time for naval operations in Greek waters was running thin and autumn gales might at any time exact even heavier casualties from his fleet than before, off Pelion (Her. VII.190) and destroy amphibious attempts. Once this card was burnt, he never contemplated that a ground assault in Isthmus would turn the tide and retreated his royal person to Persia (Her VIII.115), to prepare for possible retaliatory invasions, leaving a much decreased, but fully capable occupation army way back, in Thessaly (Her VIII.113), north of Thermopylae, to re-establish the imperium to the areas he had retreated from. The invasion of Peloponnesus was not forthcoming-and history proved him right. Thermopylae and Delphi won the war for the Greeks long before rams and oars got blooded in Salamis.

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REZIME
PONOVO O TERMOPILIMA

KLJUČNE REČI: TERMOPILI, LEONIDA, SPARTA, STARA GRČKA, RATNA TAKTIKA, SPECIJALNE OPERACIJE.

Bitka koja je presudno uticala na naše poimanje grčko-persijskih ratova i antičkog vojevanja još uvek sa sobom nosi brojne skrivene ili nerazjašnjene podatke. Oni se ne uklapaju u domen uobičajenih tumačenja, a mogu se objasniti samo nakon pažljivog posmatranja, čitanja i zaključivanja. Ko su zaista bili Leonidini vojnici, njih 300? Uobičajeno je mišljenje da je Fokidski zid pregrađivao Termopilski klanac. Međutim, on bi ujedno presecao i najbolju moguću saobraćajnu komunikaciju. Najverovatnije je da se nalazio u blizini, otvoren kružni put koji se spušta sa stena, ne ometa saobraćaj, ali omogućava kontrolu i možda presretanje projektila.

Persijanci nakon pobede nikad više nisu prošli ovim klancem, već su birali druge pravce, što se kosi sa logikom izbora za mesto bitke; izgleda da je ona pre bila demonstracija moći, nego istinska potreba u sastavu ratne operacije. Grčka taktika, o kojoj piše Herodot, ukazuje kako na uobičajenu vežbu hoplitskih jedinica, a koja se sastojala od njihovog jedinica kroz bojne redove, kao i na spartanski taktiku bacanja projektila, manje ili više sličnu Ekdromiju, o kojem je kasnije pisao Ksenofon (Hellenika, knj. IV, 5), doduše izvedenu obrnutim redosledom. Na kraju, politika iz vremena Herodota svakako nije dopuštala da se govori o noćnom napadu Spartanaca na persijski logor, o kojem je kasnije pisao Diodor, niti o pravim razlozima zbog kojih fokidske jedinice nisu uspele da zadrže svoje položaje. Zatečeni, oni su radije birali da prepreče Persijancima put ka Fokidi, njihovoj domovini, nego ka Leonidi i njegovoj vojsci.

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GRECO-MACEDONIAN INFLUENCES IN THE MANIPULAR LEGION SYSTEM

ABSTRACT

Since ancient times the Roman military system of the late third and second centuries BC as described by Polybius was considered a vastly different evolution, almost a revolutionary departure from the hoplite battle practice and definitely alien to the Macedonian phalanx. All our main sources, writing under the Roman Occupation regime (Plutarch, Polybius), or being outright Romans (Livius) have projected and imposed this view. Though, the manipular system if properly scrutinized shows many common features with the Spartan system of the era and even with the Macedonian one, features possibly imported in Italy by the campaigns of such war-leaders as Archidamus and Alexander of Hepirus. The incorporation of these approaches in a selective base and their integration with materiel, policy and even tactics, technique and procedure (TTP) of local peculiarities produced the Republican roman military system.

KEYWORDS: MANIPULAR LEGION, SPARTAN MORA, MACEDONIAN PHALANX, RECRUITMENT, MANEUVERING.

INTRODUCTION

The adoption of the long convex scutum in place of the round clipeus may be dated either to Servius Tullius sometime after 575 BC (Liv. I.43,1) or to c. 400 BC, when the soldiers received regular pay (Liv VIII. 43,3) while Sallust (Sal. Cat, LI) echoing a generally held opinion, believe that the Romans borrowed the scutum and the pilum from the Samnites during their bitter struggles. The looser manipular system may have been introduced during the siege of Veii in 396 B.C.E. (an operation for which the older phalanx formation was not suited), but if so it did not prove effective at Allia in 387 BC. The manipular formation is mentioned at the mobilisation of 340 BC (Liv. VIII.8,1-17) , but since another rival tradition cited by Plutarch (Plut. Camill, XL 3-4) regards Camillus as an important military reformer, it is possible that the system was designed by Camillus against the Gauls. Livy assigns two centuries of engineers to the army sometime during

VI century BC (Liv. I.42,5-43,10) as does also Dionysius (D.H. IV, 16-18) though it seems that their personnel were weapons-makers, carpenters, wood workers, ironsmiths and other technicians, supporting the army units.

Apart from these considerations, open-order fighting was characteristic of Greek IV century BC warfare. It is more than possible that the new Roman manipular formation was based on Greek precedents, as the old one had been. Xenophon's men had opened ranks to let the enemy's scythe-wheel chariots pass harmlessly through (Xen. Anab. I.8,20); Timoleon's men decided the outcome of the battle of Crimissus in 340 BC against the Carthagenians by superior swordmanship (Plut. Timol. XXVIII) a feature witherto considered a roman prerogative (Polybius, Histories XVIII.28) and hoplite units were surging to attack in deep formation without forming a line in uneven ground (Xen. Anab. IV.2,11). Camillus was aware of the Greek world and the Greek world was aware of him, since he had dedicated a golden bowl to Apollo at Delphi and contemporary Greek writers refer to him (Plut. Cam 22.2-3, Plin. Nat. III. 5,57).

An important parameter is the existence of military teachers all through the earlier ages of Greece, since their names are mentioned occasionally though their writings – if any, have disappeared. The first established real military writers and Camillus' contemporaries were Xenophon, writing on horsemanship and on managing a cavalry squadron, outlining the duties of a cavalry officer and Aeneas Tacticus (from Stymphalus in Arcadia) who wrote a number of treatises concerning siegecraft and tactics (Oliver 1993: 657-669).

Last but not the least, the first half of the IV century BC was marked by the amazing career of Iphicrates, a general who addressed successfully the problems of flexibility and mobility through a series of reforms so that he could make up for the rigidity of the hoplite phalanx. Indeed when asked whether he valued more the horsemen, the footmen, the archers or the shield-bearers, he answered that he preferred one who understood how to command all the above combining their advantages (Plut. De Virt. Mor. 187b) and his heavy influence is well attested on his successors. During the same era Dionysius the Elder devised a system of coordinating with devastating effects various and completely different arms such as cavalry, light troops, mercenaries, heavy infantry, elite units, catapult detachments of engineers and siege machinery (Diod. XIV.41-43 & 47,7).

THE BASICS OF THE MANIPULAR LEGION

The republican roman legionary system before Marius was characterized by a number of important technicalities in organization, structure and drill. These are mostly considered as effected by Camillus, but there is important evidence of similar practices in Greek armies since the 4th century BC, and even since the 5th, while the Romans are mentioned implementing them in the 3rd c BC. Spartan influence might have been transferred due to Archidamus expedition in mid-4th century (c 345 BC) in southern Italy (Ath. 12.51, Diod. XVI.63,1), while Macedonian influence might be traced to the campaigns of Alexander of Hepirus and of Pyrros of Hepirus (Plut. Pyrrh. 15-18) or even to the Roman embassy to Alexander (Plin. Nat. III.5,57).

SUCH ROMAN-DEFINING IMPLEMENTATIONS ARE:

1. A standardized division of yearly draftees to two different camps each under one yearly elected official (consul) (Plb. VI.26).
2. Each camp holds 2 expeditionary units, the legions, each (a) with full autonomy in combat, combat support and logistical support units of all arms and services and (b) without residence limitations in the selection of recruits, at least at the times of Polybius (Plb. VI.20).

3. The standardized division of each legio to 10 subunits (cohorts) deployed in line abreast and of full depth which can be dispatched individually and redirected (Plb. VI.24; XVIII.32,11 & XV.8).
4. The formal division of the legion (and its cohorts) to three age echelons (maniples) with two subunits each (centuries). This division was in a standardized manner, where the first two age-classes were equal in strength and the third was kept absolutely steady and to half the nominal strength of each of the other two (Plb. VI.24).
5. The ability to interchange the three lines (Zhmodikov. 2000: 70).
6. The practice of having the two centuries of each maniple in both line ahead and line abreast formats.
7. The first cohort being of double size compared to the others of the legion (Breeze. 1969: 50)
8. The main offensive arm was the straight sword, not the spear or the javelin (Plb. VI.23).

LAKONIAN AFTERTASTES

Polybius (Plb. VI,11) flatly states that the roman constitution is very similar to the original, Lycourgian of Sparta. The implementations 1 and 2 were definitely present in Spartan Morai which were units of expeditionary autonomy at least from the end of 5th century as described by Xenophon (Xen. Const. Lac. XI.4) and manned by draftees from all the territory. The granting of leave on religious grounds (Festivity of Yakintheia) to all troops residing in one locality (Amyclae) dispersed within the whole army (Xen. Hell. IV.5,11) in 396 BC show the non-territorial conscription-at least of that time. This was in stark contrast to the usual practice of territorial or tribal conscription such as the Athenian Phylai and Taxeis which were tribal units (Aristot. Ath. Pol. LXI.3-5), Boetian contingents, Argive Lochoi, Macedonian Taxeis and Ilae which were territorial units (Arr. An. II.9,3 , Diod. XVII.57,2). Constitutionally, the two Spartan war kings shared the command when campaigning with full force and commanded each half the army in battle, before changing this in 492 BC, allowing only one king per campaign. Still, in 479 BC, two separate campaigns were pursued, one under a king and one under the other minor king's chamberlain, but the division of the army was not in half (Hdt. VIII.131 & IX.10-11); moreover the same happened, much to the dismay of one of the opponents (Phliasians) who considered this unlikely, in 385 BC (Xen. Hell. V.3,10).

The existence of cavalry Morai as described by Xenophon (Xen. Const. Lac. XI.4) indicates the multi-arm nature of the lakonian Mora, as a direct analogue of roman cavalry turmae; the stationing of Morai to different outposts (Xen. Hell. V.I,29) shows their expeditionary nature and self-containment in services and arms. It is not known whether morai possessed an organic light-troop component as did the legions with their velites, but as they were stationed independently abroad in many cases, they should have under command a light-armed component-which would merge into the light infantry screen of the whole army for a pitched battle, under separate command. For the Battle of Plataea, Herodotus provides some interesting pieces of information: 5000 Peers are the main expeditionary force, and they are supported by an equal number of Periekoi (Hdt. IX.10-11). They emerge in two separate waves, and in battle they stand side by side and not intermingled in any way. Each body have an assigned support of light troops; but the ones assigned to the Spartans were many more and better equipped for battle (Hdt. IX.29) giving the impression that they were fighters, whereas the other light troops were manservants of the hoplites and occasionally did some fighting. This reminds the Roman system of citizen/allied legions (Plb. X.16). In Thucydides (Thuc. V.68,3) one can have no concrete idea on Spartan war machine of the late 5th century, but the binary system of the early 4th century described by Xenophon (Xen. Const. Lac. XI.4), with 4 Lochoi per Mora begs the question of paired Peer/

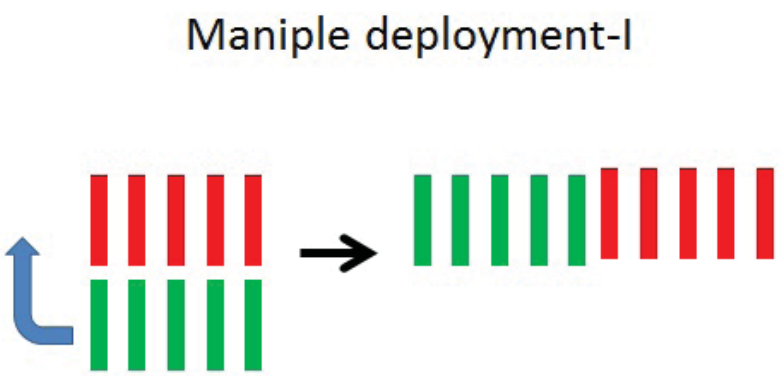

Fig. 1 Deployment by units. The posterior century deploys at the side of the Prior, similar to the Spartan Anastrophe. By finishing themaniple covers twice the original front and acquires contact with the next maniple at its left.

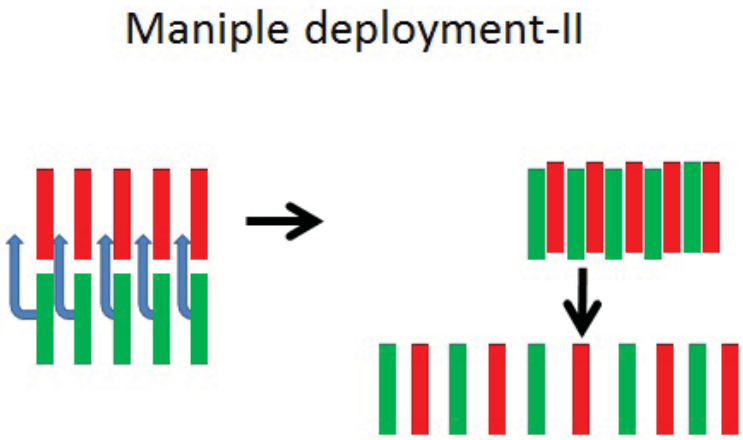

Fig. 2 Deployment by files. The files of the posterior century each advances to the left of the prior respective file of the Orior century. Similar to Greek Paragoge. After the deployment, the files but the rightmost move lateraly to the left to cover the space up to the next maniple.

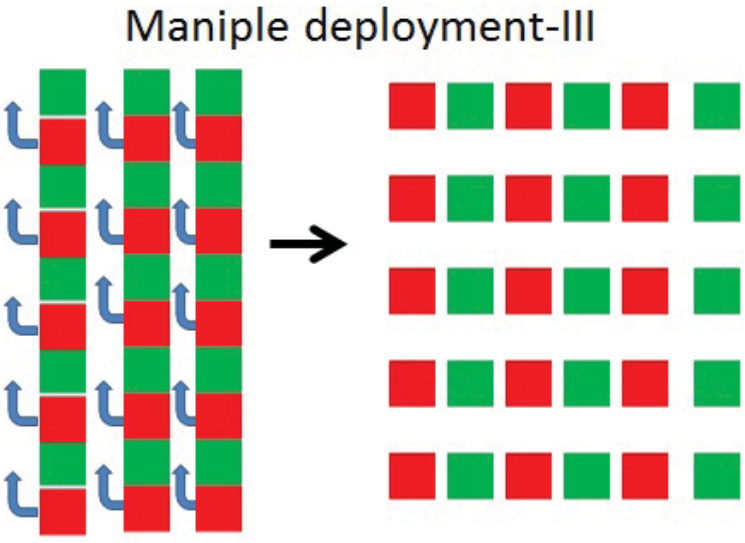

Fig. 3 Individual deployment. Every second number in a file advances forward, at the left side of the trooper in front of him. Similar to the Greek Paragogekat' Epistate. After the deployment, the files but the rightmost move lateraly to the left to cover the space up to the next maniple.

Periekoi Lochoi in each mora under a taxiarch or any other command echelon between Polemarch and Lochagos. In Herodotus time this would have been simple enough; but in Xenophon's time, the scarcity of Spartan Peers due to socioeconomic issues might indicate that in the Spartan Lochoi of the Morai, Hypomeiones, Mothakes and other disenfranchised citizens might have fought along with the Peers.

The Roman implementation 3 is nothing new if compared with the Spartan Army of early 4th century. Each mora had a standard structure which Xenophon details (Xen. Const. Lac. XI.4), (although he might have missed an echelon) with full-depth units and subunits in a binary manner, more or less. It is very interesting that the mora and the legion, despite their vast manning difference top strength of 800 or 1000 before Sparta's decline compared to 4-5000 during the republican apex) have the same number-three- of subordinate levels: 4 Lochoi-2 Pentekosteis-2 Enomoteiai to 10 Cohorts-3 maniples- 2 centuries. Even before Xenophon, in 418 BC, Spartan generals could reorient whole major units off their line and into other parts of the front. Such an order was issued in Mantineia, 418 BC by the king to 2 lochos-commanders (Polemarchoi) according to Thucidydes who may have erred the name of the Spartan divisions (Thuc.V.71,3) ; he calls them Lochoi, but although he mentions the rank of Lochagoi, at the description of the action mentions as their commanders Polemarchs, the rank which takes command of a mora later on. If the Polemarchs command Lochoi, there is no room for Lochagoi.

Xenophon also describes the Spartan order of march, with cavalry, infantry scouts (Sciritai) (Xen. Const. Lac. XIII.6.3) and picked troops (Agema, which might, or might not contain the Hippeis) (Xen. Const. Lac. XIII.6.4) , directly reminiscent of Roman extraordinarii (Plb. VI.26; VI.30;VI.40). Spartan Morai had an age division rather horizontal, which makes them similar to legions as far as Implementation 4 is concerned, as well. In some outposts substandard Morai are mentioned stationing (Xen. Hell. V.1,29) and the balance are sent to reinforce (Xen. Hell. VI.4,17) , and this applies even BEFORE the term Morai is introduced by Xenophon; such is the case with the Spartan army in the first battle of Madinaea in 418 BC (Thuc. V.72,3) when the second Spartan king is sent with reinforcements consisting of the most young and elder (Thuc. V.75,1).

Some 20 years later, in 394 BC, one and half mora were sent to reinforce Agesilaus returning army before the battle of Coronea (Xen. Hell. IV.3) . This half is definitely different than half the subunits (2 lochoi) and must mean all subunits (4 lochoi) half-manned in age groups, for extended service; in Leuctra, 371 BC the Morae participating in the battle were manned with 35 age-classes and another 5 were mobilized for reinforcements after the defeat (Xen. Hell. VI.4.17). Similar tactical disposition is attested by Xenophon for the allied army of Agesilaus in Asia, in cases were a portion of the phalanx, with the younger hoplites, charged on (Xen. Hell. I.31) while the rest were brought up as fast as possible at a trot, being the elder troopers. In 390 BC, similarly, 10 and then 15 age-classes of a Mora at Lechaeon spring forward for pursuit of enemy peltasts (Xen. Hell. IV.5,15) , after a previous success in such an endeavor (Xen. Hell. IV.4,16). Last, in defending Sparta from the Thebans, Agesilaus has 300 younger hoplites in ambush (Xen. Hell. VI.6,31) without any elders nearby, indicating they could act as an autonomous unit.

But the army of Alexander had it even more prominently. In Arrian many times Alexander forms flying columns and details parts of the phalanx in these. In some cases, singular divisions (Taxeis) are mentioned (Arr. An. VI.6, 1), especially the one of Koinos. But in other cases Arrian mentions the fleetest and lightest armed from the phalanx (Arr. An. III, 23, 3). This is not a faulty, nor implicated reference to certain taxeis, but speaks of a category of phalangitai from all taxeis. It is very similar, if put into context, with the Spartan Ekdromoi (Xen. Hell. IV.5,16) and the

younger hoplites of the Myrioi (Xen. Ages. I.31) charging at the double from the whole phalanx and being followed by the second, more elderly part. On the other hand, Diodorus (Diod. XVII.26,1-2) specifically mentions, when describing the events in Miletus, phalanx veterans, not participating in siege action, guard and latrine duty and skirmishing and only taking the field for pitched action and in great emergencies. Such practice, if not a projection by Diodorus of roman practices to Macedonian times, reminds the proverbial context of Triarii in the Roman system (*res ad triarios venit*), while Thucidydes (Thuc V.72,3) implies a reserve of battle-worthy Lacedaimonian elders behind the line and being roughly handled by the enemy 1,000 elite troops having burst through the pro-Spartan phalanx.

THE MACEDONIAN CONNECTION

The Macedonian system may have been familiar to the Romans either by the invasion of Alexander of Hepirus, (cousin and contemporary of Alexander III the Great), who might well have introduced into his army the newest developments. Not only this explains well the hepeirot success under Pyrrus, but is logical due to the low budget needed for the initial adoption of such developments. On the other hand, some of the issues at hand may well have evolved independently in the two military systems, as they consist converging evolution and provide answers to the same problems.

Both Arrian and Diodorus, the most important Alexander historians, describe the Macedonian phalanx out of Thebes deployed in three lines, each consisting of different divisions. This is of course different from the roman 3-line system, but in this engagement the Macedonians are clearly mentioned to interchange lines. Diodorus mentions 2 changes (Diod. VII.12,2), Arrian only one (Arr. An. I.8,3-5) and this rather receiving the fugitives of a previous class than a proper change) which refers to Implementation 5. The obvious drill is to have open phalanx and once the fleeing troops have retired, to transform to close order either by "Paragogi", bringing the hind halves of the rows near to their front halves, or 'Paragogi kat' epistati", with every second man (epistati) of the row pacing left and forward, at the left of his previous number (protostati) to result in half depth, double frontal density phalanx. This practice might well have been used earlier. At least since 415 BC as Thucydides (Thuc.VI.69,2) speaks of light troops engaging between the two deployed heavy infantry phalanxes and then retiring-obviously not around the flanks, but through the lines. Though, even the Ekdromi, the dashing out of younger hoplites to pursue enemy light infantry might have been executed in this manner, although this is not a concrete assumption; alternatives are just as possible for the use of Ekdromoi.

Regarding the implementation 7, in Alexander's army, both the King's cavalry squadron and the Hypaspists units, the elite and standing part of the army, might have been double-strength compared to other divisions. It is not possible to extend this observation to other Greek states elite (Epilektoi/Logades) units, as the Theban Sacred Band the Phliasian Epilektoi or the Hippeis of Sparta, all three of which were 300-strong (Plut. Pel. XVIII.1, Xen. Hell. V.3,22, Thuc. V.72,4). In the case of infantry things are solidly attested and straightforward. The 3 chiliarchiai (Arr. An. V.23,7) of the Macedonian Hypaspist Corps are double the 1500 of ordinary infantry taxeis, and their subdivisions of 500 are half the strength of hypaspists chiliarchy. Moreover, the deployment at Pelion of the Macedonian Phalanx at a depth of 120 men (Arr. An. V. I.6,1) shows that there was indeed an echelon of the regular line infantry with such strength; these units in the abovementioned instance were deployed in single file.

Some extrapolation is needed for the cavalry. The 1:10 cavalry/heavy infantry ratio of the Greek armies (Plut. Aem. XIII), (followed by the Macedonian army in its entity, as attested in Chaeronia)

meant that the royal ila should be 300 horse-strong and ordinary ones 150-strong. The latter is attested by Arrian (Arr. An. II.9.3-4) , mentioning that Alexander before launching the charge at Issus left 2 Ilai, in all 300 cavalry, to fend off a Persian flanking movement. The elite Macedonian units (the Hypaspists) were stationed to the right (Arr. An. II.8,3 & III.11,9 , Diod. XVI.86,1) as did the First Cohort in roman legions (although the stationing of elite troops to the right is attested much earlier for hoplite armies) (Hdt. IX.28) . The double standard in the Army of Alexander was discontinued early after Gaugamela, when massive reinforcements (Curt. V.1,40) inflated the strength of line units to 2000 in infantry and to 200 for cavalry, creating the need for an intermediate level of command in both cases-chiliarchies (Curt. V.2, 3-5) and cavalry lochoi (Arr. An. III.6, 11) respectively, while the elite units were not affected.

In some incidents Roman Consuls/Proconsuls are escorted by an elite body of troops 1,000-strong (Plb. X.15); similar bodies tend to assume special missions as in 146 BC in the battle of Corinth (Paus. XVI.3). It is very tempting to connect them with the Epilektoi/Logades units of 1,000 or so that became prominent in Greece at the last quarter of the 5th century (Thuc. V.67); it is also tempting to identify these troops with the First Cohort of the senior Roman legion of the respective expeditionary forces; else either a non-standard Elite unit should be identified, or the Extraordinarii, as these operations take place out of the standard order of battle.

The most perplexing issue is Implementation 6. The binary system lies in the heart of ancient greek military systems, contrary to the Persian decimal one. Before the campaign of 334 BC the Macedonian system was binary, with 2 lochoi forming one taxis and similar cavalry units (perhaps called *tetrarchiai*) forming one Ile, perhaps following Athenian standards introduced in Macedon by Iphicrates during the kingship of Amyntas III or by Philip II (Nep. Iph. 3). In Pelion, 335 BC, 2 macedonian Ilae counted for 200 cavalry, each of 100 (Hammond 1974 :82 , Arr. An. I.6,1). A third unit was evidently added to the Macedonian formations for the Persian campaign, ALLOWING AN UNPRECEDENTED DEGREE of tactical flexibility, with two echelons in triangular formation (center projected or denied). Once major field encounters were deemed over, after Gaugamela, the army bounced back to binary, although now having a much stronger capital unit: the new taxeis were 2,000 strong, in two chiliarchies of 1,000- the standard strength of Greek taxeis and of Macedonian before the triangular system. Thus, a Greek formation having its two units in line abreast was the standard practice (Xen. Const. Lac. XI.4, Xen. Anab. III.4,21-22). The Roman system was less streamlined, having two centuries in a maniple, 3 maniples in a cohort, ten cohorts in a legion, two legions under a consul and two consular armies under a dictator-or under the supreme command of the Senate. The legion had a shadow allied unit of the same strength (Plb. X.16). All these units were posted line abreast, as the greek units- but for the maniples, which were posted in successive echelons, though non-linearly (Plb. XV.8). The real question is how exactly were posted the two centuries of a maniple and how they deployed from line ahead to line abreast in the field so as to form a solid line.

The Roman deployment in quincunx fashion (Plb. XV.8) puts a standard density in units arranged in fixed distances. This is different to the Greek *Taktike* (Tactics) where the front had to be evenly covered in density if not in depth also. If a unit –the maniple-is posted in a front line and covers a given part of it, by doubling the files (halving the ranks) it should cover double the distance, or achieve double density. Hoplites did either. It is a question if legionaries did it too. The rear century may perform *Paragogi* and its files proceed between the files of the front century. This doubles the density, and then it is easy to spread to cover the uncovered area. To move the whole rear unit near the front half is the way we understand it up to this day, but it is more prone to pitfalls as a whole

unit must make fit, instead of a line at a time. In reverse, to change the two centuries from line abreast to line ahead (nothing more complicated than the *Anastrophe* of the Spartan army, executed in army scale (Xen. Hell. VI.5,19) to shorted the line out of an enfilade) (Xen. Hell. VI.2, 21) in the heat of the battle, so as to interchange lines, it is impossible to call back every second unit in the face of the enemy and not to have some remaining units enveloped –or flanked-and broken. Centurions are far from each other, both when abreast and ahead. Even executing *Paragogi* and *Epagogi* by file in the heat of battle might prove challenging; though, it surely decreases the density to half, so as to have the second line go through the files of the first in order to relieve it. The two centurions fight next to each other when the maniple is deployed, but are afar when the two centuries are in tandem. And there is the third option the second century is NOT behind the first, but inside it. Every second man belongs to the second century, and the two centurions fight one in front of the other. If the maniple is deployed, then each second man does *Paragogi kat' epistati* and moves front and left, to cover the space at the left of his front number. Thus the two centurions fight side-by-side and the opening and closing of the ranks is performed in seconds, just enough to allow a replacement line to emerge and take the fight.

Both the quincunx posting and the two centurions argue against the third option. In Macedonian Hellenistic armies it must have had been so. This way, in open order the file leader and the half-file leader form the two first lines of the phalanx; the best warriors and the best weapons to the cutting edge. If deployment is needed, they will fight side by side, the best warriors and weapons posted in the first line of the phalanx. But with the possible exception of decturion, we lack any clue to the roman organization under the century, in stark contrast to the Greek and Macedonian files. The beauty of the third system is that once deployed, the line has enough space between successive ranks to allow lateral moves. A whole maniple may slide into its next, to form a corridor for charging chariots or elephants.

The second option, on the other hand, is favored by historical ecidence and has a closer resemblance to Spartan practices, possibly transmitted as said before with the campaign of Archidamus (Ath. 12.51). Xenophon declares that the Myrioi organised *ad hoc* six 100-strong Lochoi, each divided to *Pentekostyes* and *Enomoties* (Xen. Anab. III.4,21) clearly following the Spartan standard, as the force included a whole Spartan regular regiment (Xen. Anab. I.4,3) ; thus each echelon should have two lower ones (Xen. Const. Lac. XI.4). Moreover, he exlicitly states that these Lochoi could be formed up, according to the tactical situation, by lochoi proper in straits, by penetkostys in wider areas and by enomotia in open terrain (Xen. Anab. III.4,22). As each echelon comprises two of the lower ones, if all the enomotiae are in line abreast the formation is "by enomotiae". If the two enomotiae of each Pentekostys are in line ahead but the pentekostyes of a Lochos in line abreast, it must be "by pentekostyes", and if all enomotiae are in line ahead, it must be "by Lochos". The term "*Lochoi orthioi*" (Xen. Anab. IV.3,17) meaning "batallions in column" most probably implies the last of the above deployments. Most probably with the enomotiae deployed at their maximun width and minimun depth. A Roman manipular Legion only differs in that the Cohort had three, not two subunits (maniples) in line ahead and was thus able to deploy the second one out of line, producing the characteristic quincunx of the Roman army.

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REZIME
GRČKO-MAKEDONSKI UTICAJI NA MANIPULARNI SISTEM LEGIJE

KLJUČNE REČI: MANIPULARNI SISTEM LEGIJE, SPARTANSKA MORA, MAKEDONSKE FALANGE, REGRUTOVANJE, MANEVAR.

Još u antičko vreme smatralo se da je rimski vojni sistem krajem III i tokom II veka stare ere, kako je opisano kod Polibija, doživeo znatnu evoluciju, gotovo revolucionarno odvajanje od hoplitskog načina ratovanja, stranog makedonskim falangama. Svi najvažniji grčki izvori, pisani u vreme rimske dominacije (Plutarh, Polibije) ili rimski (Livije) govore u prilog ovakavom stavu. Mada manipularni sistem ako se podrobnije ispita pokazuje mnoge zajedničke karakteristike sa spartanskim sistemom ratovanja, ili čak sa makedonskim, verovatno da je donet u Italiju nakon vojnih pohoda nekih od vojskovođa poput Arhidama ili Aleksandra od Epira. Selektivno unošenje nekih od elemenata i njihova integracija sa materijalnim, političkim, čak i taktičkim lokalnim specifičnostima, stvorile su rimski republikanski vojni sistem.

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RESULTS OF ARCHAEOLOGICAL-ANTHROPOLOGICAL STUDIES OF MASS BURIALS IN VIMINACIUM – GRAVE G-769 / THE PEĆINE NECROPOLIS

ABSTRACT

This paper is the third of its kind, about the archaeological-anthropological analyses of mass burials excavated in Viminacium during the 20th century. It includes burials in the grave G-769, defined as a mass grave and containing a secondary burial of 25 skulls. During the anthropological analysis of these 25 skulls, other human skeletal remains were also defined. All individuals were male and were buried in their primary graves. At some point during the refurbishment of the necropolis, their skulls were taken from their original graves and buried together in a mass grave. Due to the lack of chronologically sensitive archaeological material (grave-goods), their dating was made by comparing with neighbouring graves. It was concluded that they were not younger than the middle of the 3rd century A.D.

KEYWORDS: VIMINACIUM, NECROPOLIS, GRAVE, MASS BURIAL, SKULLS.

During spring campaign of 1981, at the site of Pećine (Map. 1), in the northern part of trench 185, a group of human and animal bones was examined and conditionally marked as grave G-769 (Fig. 1)[1]. The bones were discovered at a depth of 0.50 m down to a depth of 0.90 m. They covered an area of 2 m2 that was inclined from the east to the west. There were 25 human skulls all together, partially fragmented and deformed, due soil settling. The skulls were marked with the letters A, B, C, D, E, F, G, H, I, J, K, L, LJ, M, N, O, P, R, S, T, U, V, W, X and Y. Three mandibles were discovered and a larger number of skull fragments. Apart from the skulls, there were about thirty fragments of long bones. Among the animal bones, there were 17 horse long bones, 12 cattle bones and a dog's skull. In the eastern part of the area, apart from the bones, there were also brick and stone fragments and pottery shards.[2]

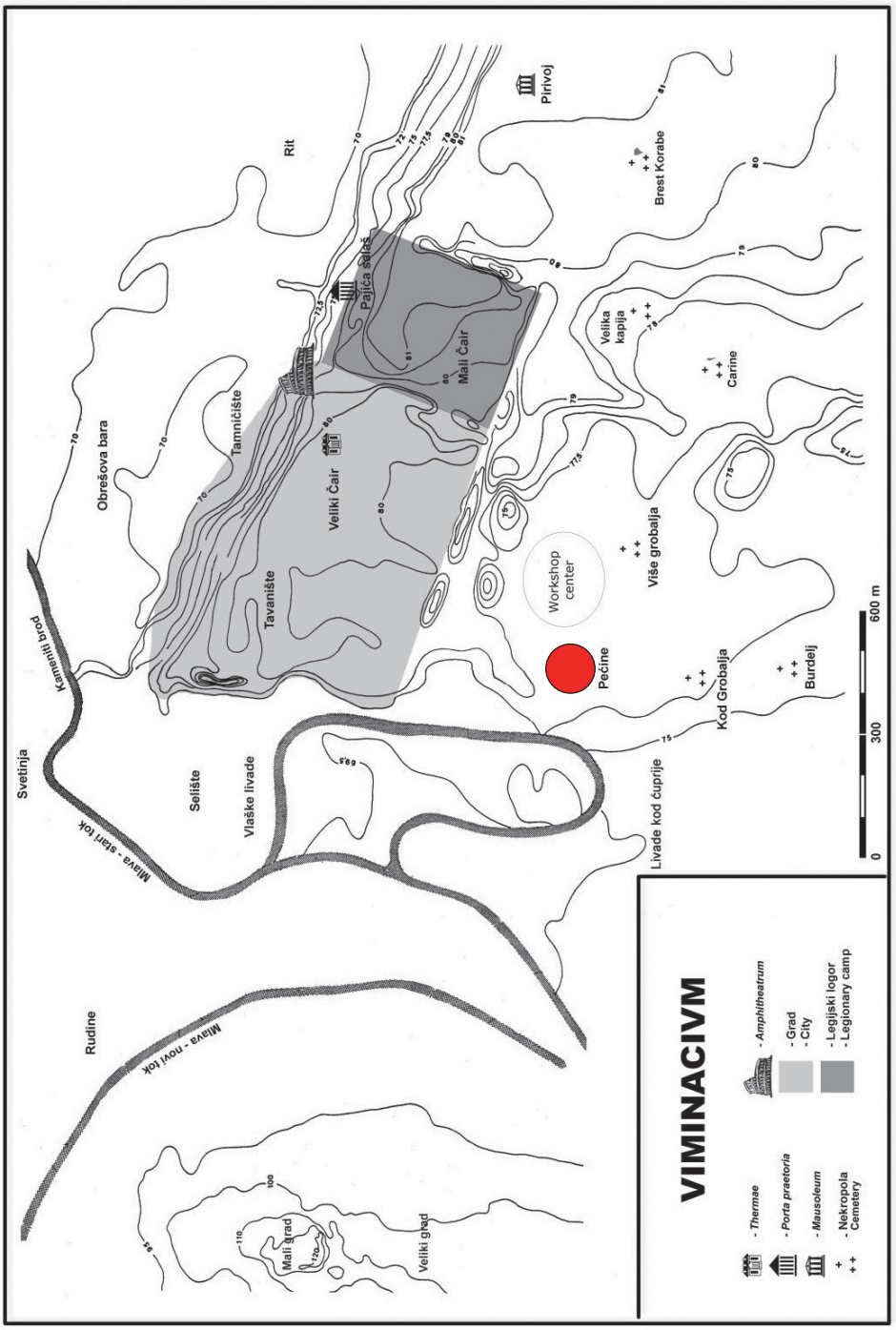
ANTHROPOLOGICAL FINDS AND PROCESSING METHOD

Defined as a mass grave, G-769 contained a secondary burial of 25 skulls. During anthropological research of these 25 skulls, some human osteological material was also separated. These

1 The article results from the project: Viminacium, Roman city and military camp – research of material and non- material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalization and 3D visualization (no 47018), funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.

* This paper is the third of its kind, about archaeological-anthropological analyses of mass burials excavated in Viminacium during the 20th century.

2 Archaeological field diary, pp. 987 - 988, from May 26th 1981.



Map. 1 Pećine necropolis at Viminacium site

were fragments of skulls and mandibles from the agglomeration marked from A to Y. There is the possible presence of at least two other individuals, with at least four fragmented mandibles. However, during archaeological excavations, these fragmented human remains were not connected to the anthropological content of grave G-769, but were identified during anthropologic research. Nevertheless, in the field diary, fragmented parts of skulls and long bones are mentioned.

Generally, along with 25 reliably distinguished human skulls, there are remains of at least two other individuals. However, a question arises as to whether these remains can be connected with the previ-

SKULL MARK	NUMBER	GENDER	INDIVIDUAL AGE
A	1	male	between 40 and 50 years
B	2	male	between 30 and 40 years
C	3	male	between 40 and 50 years
D	4	male	between 30 and 40 years
E	5	male	between 30 and 40 years
F	6	male	over 50 years
G	7	male	between 30 and 40 years
H	8	male	between 40 and 50 years
I	9	male	between 20 and 30 years
J	10	male	between 40 and 50 years
K	11	male	between 40 and 50 years
L	12	male	between 30 and 40 years
LJ	13	male	between 30 and 40 years
M	14	male	adult
N	15	male	adult
O	16	male	adult
P	17	male	adult
R	18	male	adult
S	19	male	adult
T	20	male	adult
U	21	male	between 40 and 50 years
V	22	male	up to 25 years
W	23	male	between 40 and 60 years
X	24	male	adult
Y	25	male	between 50 and 60 years

TABLE I: Viminacium/Pećine – G-769 – gender and age
Addendum tab. 1:
I – in the secondary position, the remains of at least two further male individuals were discovered;
II – fragments of at least four further mandibles have been identified, all of them male;
III – according to tooth abrasion in mandible fragments, the individual's age was between 20/25 and 45 years.

SKULL MARK	A	B	C	D	E	F	G	H	I	J	K	L
GL-OP	186	182	188	194	185	182	180	183	180	197	190	183
EU-EU	140	146	142	139	143	144	142	146	(140)	142	144	143
FT-FT	102	98	104	99	101	97	99	100	97	98	94	100
BA-B	120	122	119	122	124	126	-	130	-	124	126	130
PO-B	112	116	112	114	112	101	-	115	-	108	112	109
ZY-ZY	132	133	134	134	-	-	-	136	132	-	-	-
N-PR	68	66	68	67	-	-	-	65	68	-	-	-
MF-EK	36	37	37	37	-	-	-	38	36	-	-	-
height of the eye-socket	34	35	33	32	-	-	-	36	34	-	-	-
width of the nose-socket	24	26	22	-	-	-	-	25	24	-	-	-
N-NS	56	55	54	-	-	-	-	53	54	-	-	-
GO-GO	-	-	106	-	-	-	-	(108)	(102)	-	-	-

TABLE A II: Viminacium/Pećine – G-769 – primary skull measurements
( ) – denotes anthropological measurement obtained through reconstruction

ously mentioned 25 skulls or not. Basically, due to the poor and incomplete state of preservation, researchers were not able to establish reliable data.

Where the method of anthropological research is concerned, the same methodological principle was applied as when other mass graves from Viminacium were examined (Golubović, Mikić 2011: 173-184; Golubović, Mikić 2014: 163-184). Such citing avoids unnecessary repetition of the already established methodological elements and criteria, already quoted in this periodical.

RESULTS OF THE ANTHROPOLOGICAL RESEARCH

At the beginning of the anthropological research, it was easily noticed that the skulls from the upper layer, marked from A to L, were much better preserved and it was possible to make a standardised anthropological projection and to illustrate them (Fig. 2 - 5). This includes their osteometric processing, including primary skull measurements. The skulls marked from LJ to Y were not so well preserved and it was not possible to bring them into anatomic contexts through reconstruction. Only their paleo-demographic elements were obtained. As shown in the tables, the results are as follows: Table I shows the paleo-demographic elements for all 25 skulls. Table II shows the primary measurements for the 12 best preserved skulls.

During the early 1980s, in Serbia, there were no possibilities to analyse skeletons in any way other than using the classical anthropologic and morphologic-morphometric methods. According to this, also considering the poor state of preservation of finds from this grave with secondary skull burials, we were able to rely only on the classification of anthropological-statistics. For example, the basic skull index was calculated (length-width), in order to roughly examine the inner structure of the deceased from this Viminacium grave. Results of the length-width index of the cerebral skull part and its anthropologic classification are shown in table III:

According to the anthropological data obtained, it was possible to tell that the mass grave number 769 from Pećine contained 25 or even 27 male skulls, deposited as a secondary burial (Table I). The individual age of the deceased was between 20 and about 60 years of age. According to the prima-

INDEX VALUE	SKULL MARK	ANTHROPOLOGIC CATEGORY
71.64	D	DOLICHOCRANIC PART (70.00 – 74.90)
72.08	J	
75.27	A	MESO-DOLICHOCRANIC PART (75.00 – 79.90)
75.53	C	
75.79	K	
77.30	E	
(77.78)	I	
77.89	G	
78.14	L	
79.12	F	
79.78	H	
80.22	B	BRACHYCRANIC PART (80.00 – 84.90)

TABLE III: Viminacium/Pećine – G-769 – overview of gradual growth of length-width index value, including its anthropologic classification:
( ) – denotes anthropological measurement obtained through reconstruction

ry skull measurements of the twelve best preserved skulls (Tables I – IV), the available osteometric diameters were obtained (Table II). The categorisation of the basic (length-width) index of the cerebral skull part indicates that they belonged to all of the morphologic categories (Table III). According to the only possible criteria of morphologic categorisation, the skulls showed less heterogeneity.

In 1993, Ž. Mikić published an overview of the Roman mass burials from Viminacium (Mikić 1993: 197-207), aiming to show their specificities and problems, since approximately one third of the inhabitants (out of 3,240 anthropologically examined skeletons) were buried in mass graves (548 graves: 1,411 skeletons). The grave G-769, from Pećine, was not included in this overview since, by 1990, it had not been anthropologically examined, due to the ongoing archaeological excavation. However, in this primarily statistical analysis, he did not separate primary from secondary burials, or partial ones from full ones. This is acceptable, since it would involve huge analysis, and a synthesis of all the specificities of ancient Viminacium would also be necessary. However, as experts continued to work on this topic, it was obvious that mass burials were not practiced only in graves in the shape of wells (Golubović, 2009), but there were also other forms of such graves, starting with two and with even up to 153 skulls (Mikić 1988a, 19-34; Mikić 1988b, 121-145). This paper represents a continuation of the research, since detailed archaeological and an-

Fig. 1 Mass grave G-769.

thropological documentation about mass graves in Viminacium is available.

The case of the human bone material from grave G 769 at Pećine could lead to the same conclusion as grave G 4924 (Mikić 1988b, 143). In fact, individuals, in this case all of them male, possessed their primary graves, but then, at a certain point during the rearrangement of the necropolis, their skulls and some other parts of the post-cranial skeletons were taken out and buried together in a mass grave. Due to the lack of chronologically sensitive material (grave-goods), dating was obtained according to the neighbouring graves and it was concluded that they were not younger than the middle of the 3rd century A.D. The fact is that the inhabitants from that period still respected the deceased, and the marking and respect of their new, secondary graves, could be accepted as a part of an already existing and developed post-funerary practice.

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REZIME
REZULTATI ARHEOLOŠKO-ANTROPOLOŠKIH STUDIJA O GRUPNOM SAHRANJIVANJU U VIMINACIJUMU – GROB G-769/ NEKROPOLA PEĆINE

KLJUČNE REČI: VIMINACIJUM, NEKROPOLA, GROB, GRUPNO SAHRANJIVANJE, LOBANJE.

Rad predstavlja treći u nizu arheološko-antropoloških analiza grupnih grobova istraženih na Viminacijumu tokom XX veka i obradjuje sekundarnu sahranu u grupnom grobu.

Definisan kao grupni grob, G-769, sadržavao je sekundarnu sahranu 25 lobanja. Iz dobijenih antropoloških rezultata moglo se videti da je ovaj grob sadržavao 25, ili čak 27 muških lobanja zatečenih posle njihove sekundarne sahrane (tabela I). Individualna starost sahranjenih se kretala od oko 20 do oko 60 godina života. Sudeći prema primarnim lobanjskim merama 12 najbolje očuvanih lobanja (table I – IV), dobijeni su i raspoloživi osteometrijski dijametri (tabela II). Kategorisanje osnovnog (dužinsko-širinskog) indeksa cerebralnog dela lobanja pokazuje da su one pripadale svim morfološkim kategorijama (tabela III). Sudeći prema ovom, jedino mogućem kriterijumu morfološke kategorizacije, lobanje su ispoljile manju heterogenost.

Na slučaj obrađenog humanog materijala iz groba G-769 sa Pećina, mogao bi se primeniti zaključak koji se odnosio i na G-4924 sa iste nekropole (Mikić 1988b, 143). Naime, individue, u ovom slučaju sve muškog pola, su imale svoje primarne grobove, a zatim su u nekom trenutku preuređenja nekropole, njihove lobanje i još neki delovi postkranijalnog skeleta uzeti iz primarnih i svi sahranjeni u masovni grob. Usled nedostatka hronološki osetljivog arheološkog materijala iz groba, datovanje je izvršeno prema odnosu sa susednim grobovima tako da je zaključeno da nisu mlađi od sredine III veka nove ere. Naravno i tumačenje da tadašnje stanovništvo i dalje poštuje pokojne srodnike, odnosno obeležava i poštuje njihove nove, sekundarne grobove može se prihvatiti kao deo već prihvaćene postfunerarne prakse.

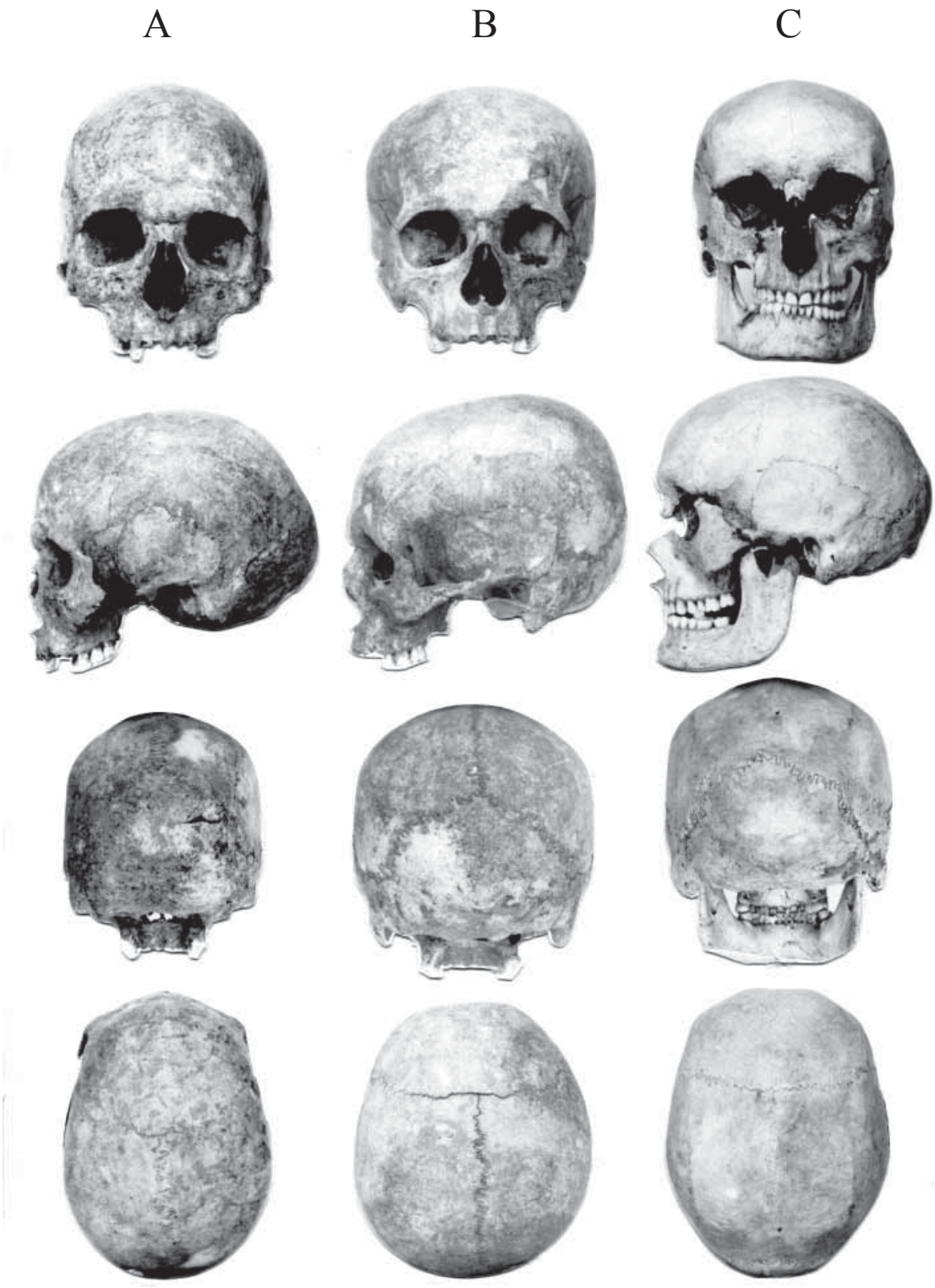

Fig. 2 Standardised anthropologic projection of skulls marked as A, B and C from grave G-769.

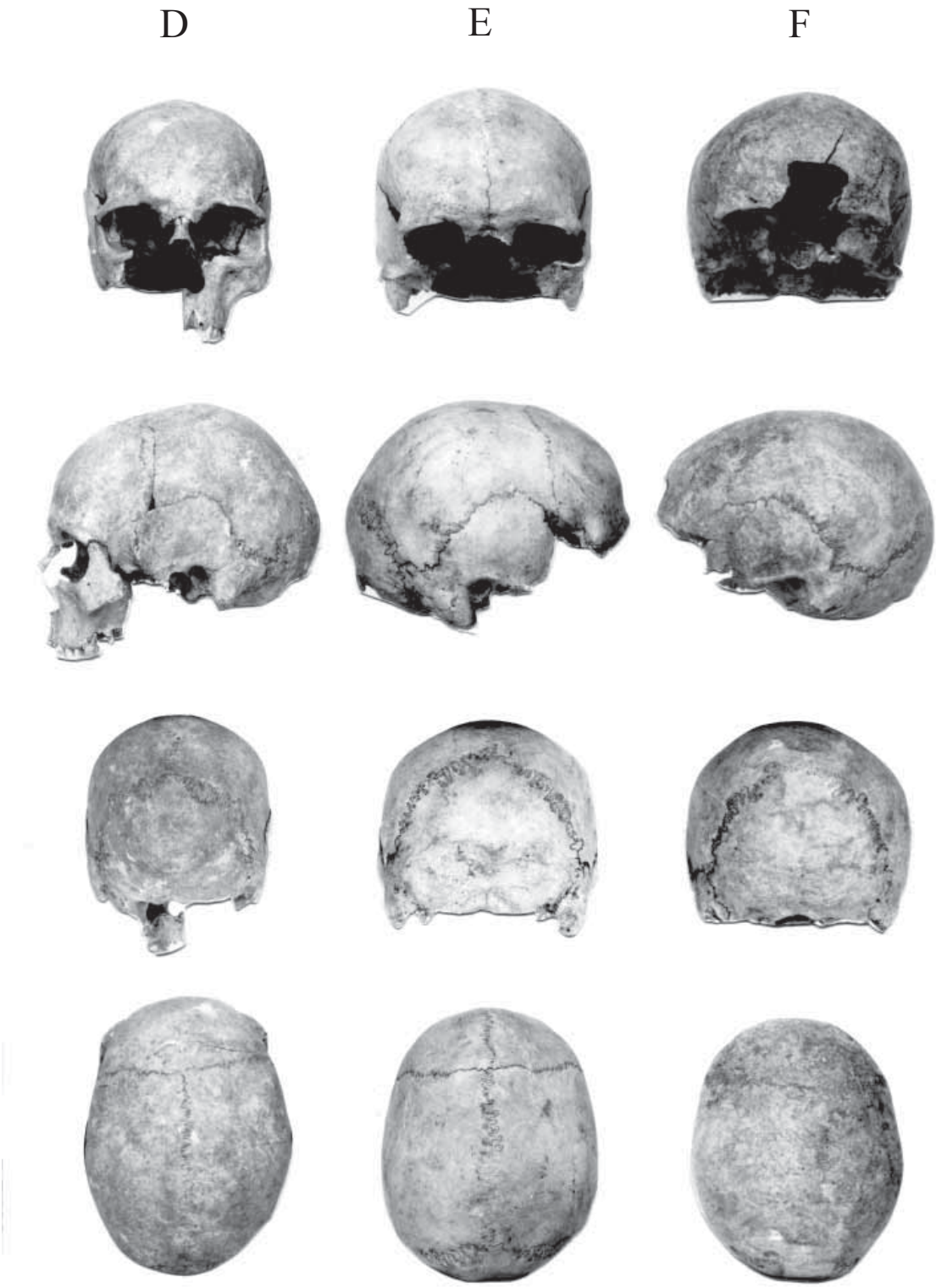

Fig. 3 Standardised anthropologic projection of skulls marked as D, E and F from grave G-769.

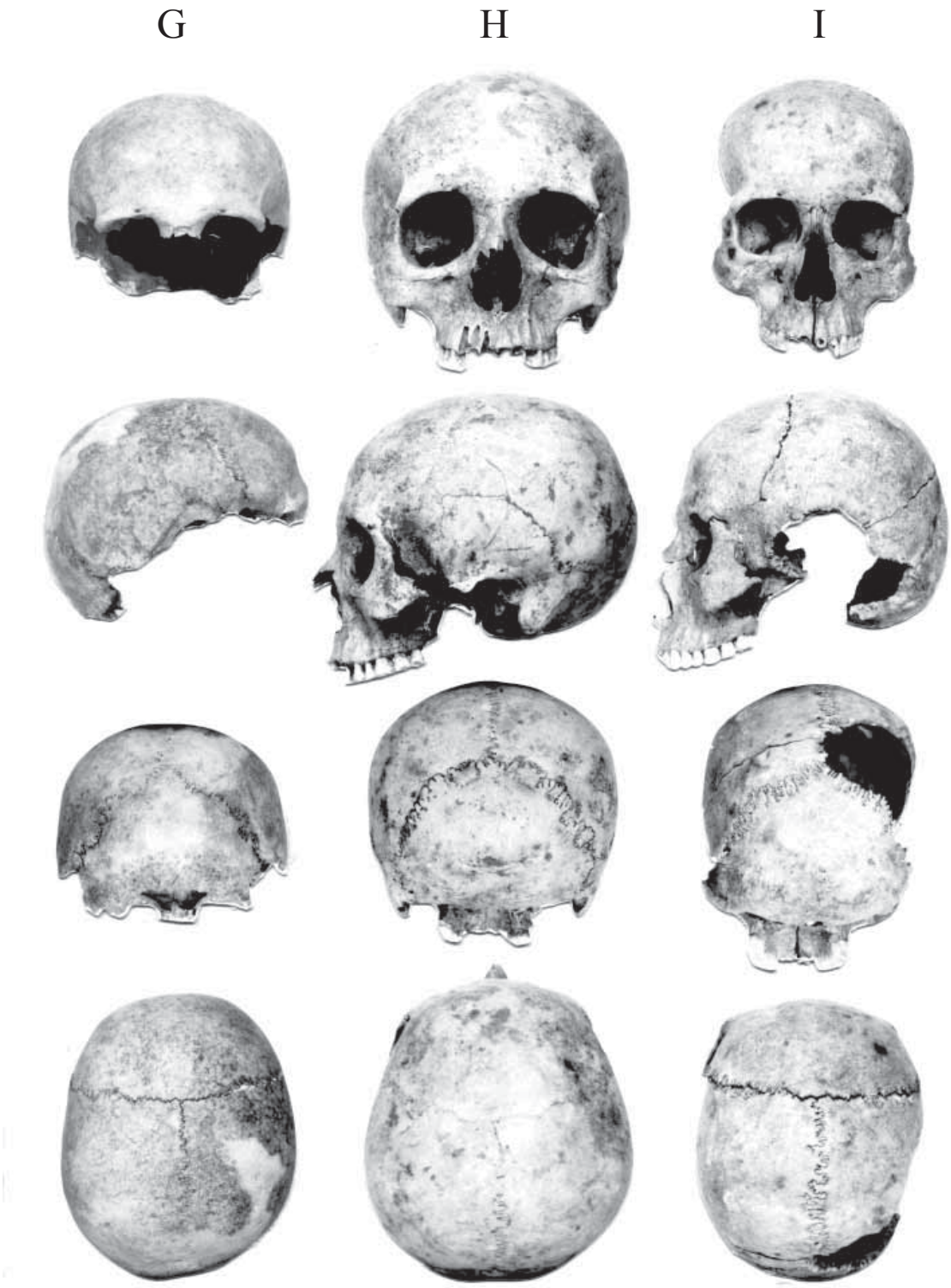

Fig. 4 Standardised anthropologic projection of skulls marked as G, H and I from grave G-769.

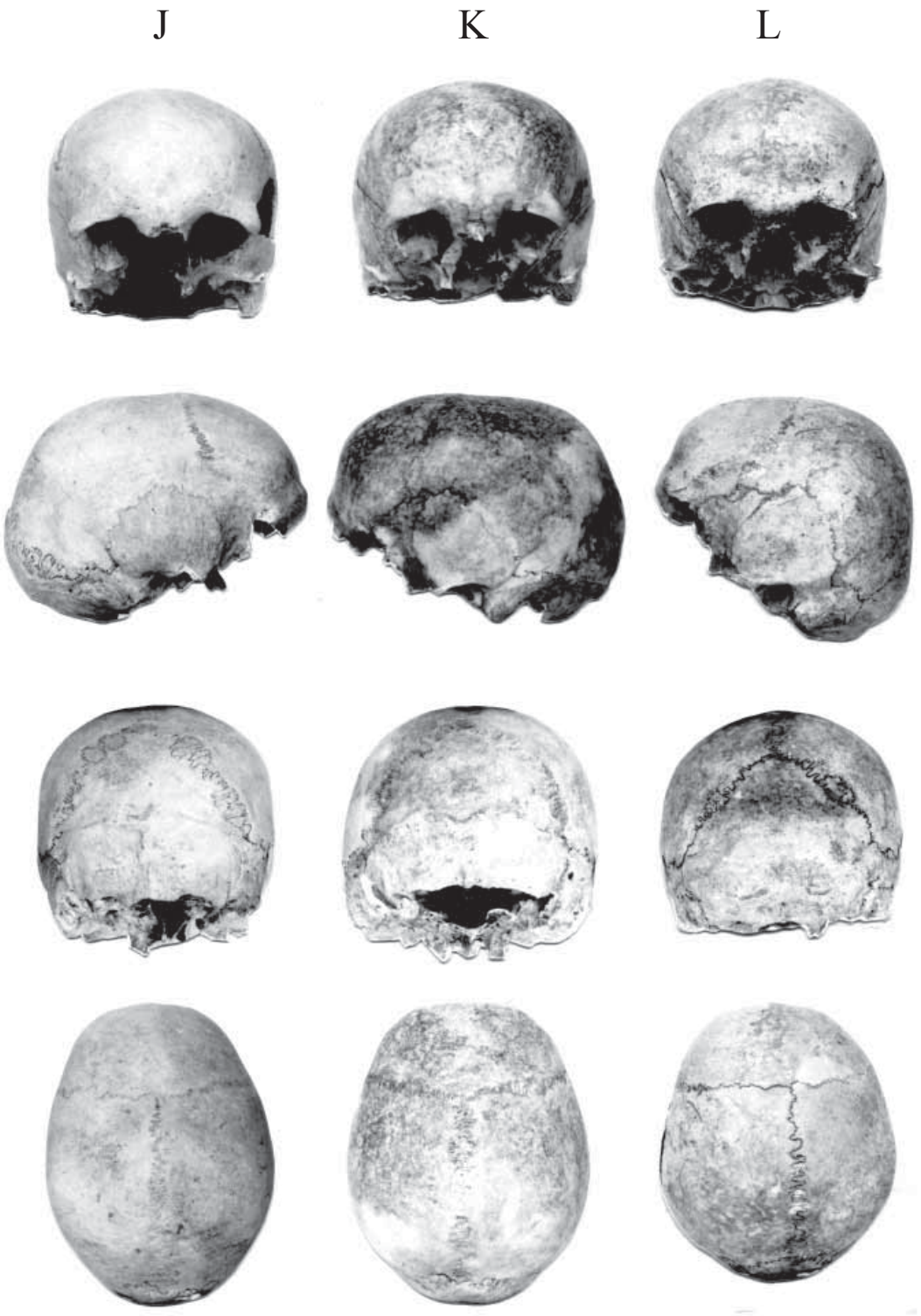

Fig. 5 Standardised anthropologic projection of skulls marked as J, K and L from grave G-769.

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A PALEODEMOGRAPHIC / MORTUARY STUDY OF GRAVES FROM THE EASTERN NECROPOLI AT ROMAN VIMINACIUM

ABSTRACT

This article presents an overview of paleodemographic data obtained from six field seasons of osteological research at Viminacium – provincial city on the Danubian frontier of the Roman Empire. Skeletal remains from 254 graves – representing 297 individuals – excavated from four cemeteries situated about the eastern perimeter of the ancient city were analyzed for the study. Results suggest that the skeletal sample examined may be considered generally representative of the ancient mortality profile from the population as a whole. Key demographic details emerging from the research include a persistent preponderance of males within the population of Viminacium throughout its existence, albeit accompanied by evidence for considerably greater survivorship among females at most ages. Some interesting mortuary findings also emerge from the study, such as a trend in declining use of wooden coffins in the last century of occupation and disproportionate investment in burial treatment for certain females.

KEYWORDS: ROMAN PALEODEMOGRAPHY, MORTUARY ANALYSIS, PROVINCIAL ROMAN SOCIAL STRATIFICATION, EXCESS MALE MORTALITY IN ANTIQUITY, ROMAN FRONTIER URBANISM

The ancient settlement of Viminacium had its origins as a military outpost on the Danube frontier of the Roman Empire in the 1st Century AD (Fig. 1). Fortifications at Viminacium were established at sometime around 60 or 70 CE with the arrival of the legion *VII Claudia* from the Dalmatian coast far to the southwest (Radojčić and Vasić 2003:114). As was common on the frontiers of the empire (Woolf 1998, Wells 1999), a civilian community soon sprang up in association with the military installation that consisted of merchants and local traders servicing the outpost. In the case of Viminacium, this settlement eventually coalesced into a heterogeneous urban center that expanded to some 220 densely settled hectares with a dispersed peripheral occupation sprawling to perhaps twice that. It is said to have been one of the largest cities on the lower Danube during Late Antiquity, with an estimated population of some 30,000 persons based upon acreage and capacity of the aqueducts supplying water to the town (Mócsy 1974; Spasić-Durić 2002). Viminacium had a long political ascendancy as part of the Emipre (Mirković 1968). Having become the effective capital of the province of Moesia at the beginning of the 2nd Century AD, it was awarded the formal title of *municipium* during the reign of Hadrian (AD 117-138), and eventually earned even greater status as *colonia* in the time of Gordian III (AD 238-244). In achieving this, Viminacium had reached the highest formal political rank afforded to a provincial city of the Roman Empire and served as the capital of the province of Upper Moesia well into the 4th century as the Empire

Fig. 1 Location of Viminacium within the Roman Balkans (modified from Syme 1999).

was restructured. The settlement appears to have been abandoned fairly rapidly after depredations by the Huns at around AD 441.

As was the case at virtually all Roman settlements, tradition—and probably law as well—mandated that all remains of the deceased at Viminacium were to be disposed of *extra muros*, or outside the city walls. The city therefore eventually became encircled by tens of thousands of graves organized into more than half a dozen cemeteries (Zotović and Jordović 1990). At least 13,000 individuals have been exhumed from these areas since 1972 as a result of construction and operation of a large thermo-electrical plant and its accompanying coal strip-mine between the towns of Kostolac and Drmno in eastern Serbia. Virtually all the burials encountered at Viminacium, with the exception of some from the very late 4th Century or possibly other periods of major external threat, were recovered from outside the settlement's ancient fortifications. Previous osteological and mortuary work at the site has resulted in description of many of these graves and their contents, which date to between the 1st and 5th Century AD (Zotović and Jordović 1990; Korać and Golubović 2009), and presented analyses of some select aspects of the skeletal remains, such as medical and culturally aesthetic modifications to the skull (Jovanovic 1984; Mikic 1994, 1996, 2006). Most of the site remains as a protected archaeological park today (Fig. 2).

SAMPLE DESCRIPTION

The collection of skeletal remains examined for this study consisted of 297 individuals from 254 graves more recently excavated from four more or less distinct cemeteries situated about the perimeter of the ancient city. This sample must be considered, for the most part, opportunistic. While every attempt was made to make use of graves from the most spatially disparate locations representing all time periods and burial form, this effort was necessarily restricted by access to only those remains recovered from salvage excavations undertaken between 2001 and 2008. Only those available remains sufficiently preserved to yield age at death data beyond an adult/subadult distinction were analyzed. Many excavated

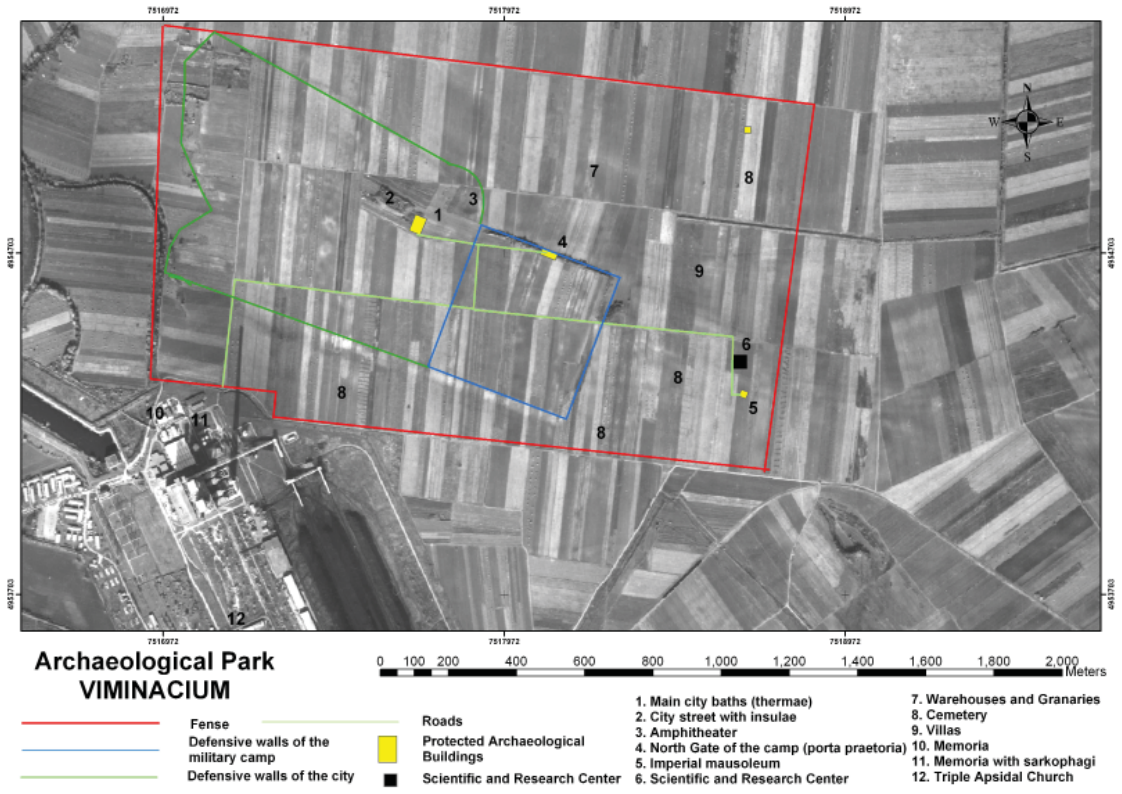

Fig. 2 Satellite view of modern Viminacium Archaeological Park and key associated features (Courtesy of Miško Korać at the Archaeological Institute of Belgrade). Danube River is located to the north and northwest of photo.

graves were therefore rejected for this study as a result – including virtually all cremations, which are very common at the site – composing perhaps 40 to 50% of the total burials from the graveyards involved. For this reason, it was necessary from the outset to test the hypothesis that the available skeletal assemblage could be considered representative of the ancient mortality profile. Much of the remainder of this paper will be devoted to evaluating that supposition. In the end it was determined that, despite the limitations of the sample, its demographic composition and similarity to that described from other previously excavated cemeteries at Viminacium support the hypothesis that the collection analyzed reflects a reasonably representative subset of the mortality assemblage from the ancient city as a whole.

Cemeteries contributing to the skeletal sample examined include Kod Koraba (n=60), lying to the southwest of the city at some distance, Pirivoj (n=226), a broad expanse of graves beginning just outside the eastern gate of the legionary fort or *castrum*, Rit (n=5), situated down on the Danube River floodplain to the northeast, and Pećine (n=6), lying to the southeast of the city itself (Fig. 3). Forms of interment observed in the present sample range from individuals buried in crypts or sarcophagi (n=46), to those placed in simple brick or tile lined graves (n=41), to those placed in wooden coffins as evidenced by a series of nails around the perimeter of the grave (n=73), to those interred with no encasement whatsoever (n=127). While specific temporal information is lacking for many if not most of the graves—pending completion of ceramic analyses—indications are that the sample consists of more or less proportional representation from most periods of the full breadth of the city's occupation. They consist of relatively equal numbers of late 1st Century to 2nd Century (n=28), 3rd Century (n=24), and 4th Century

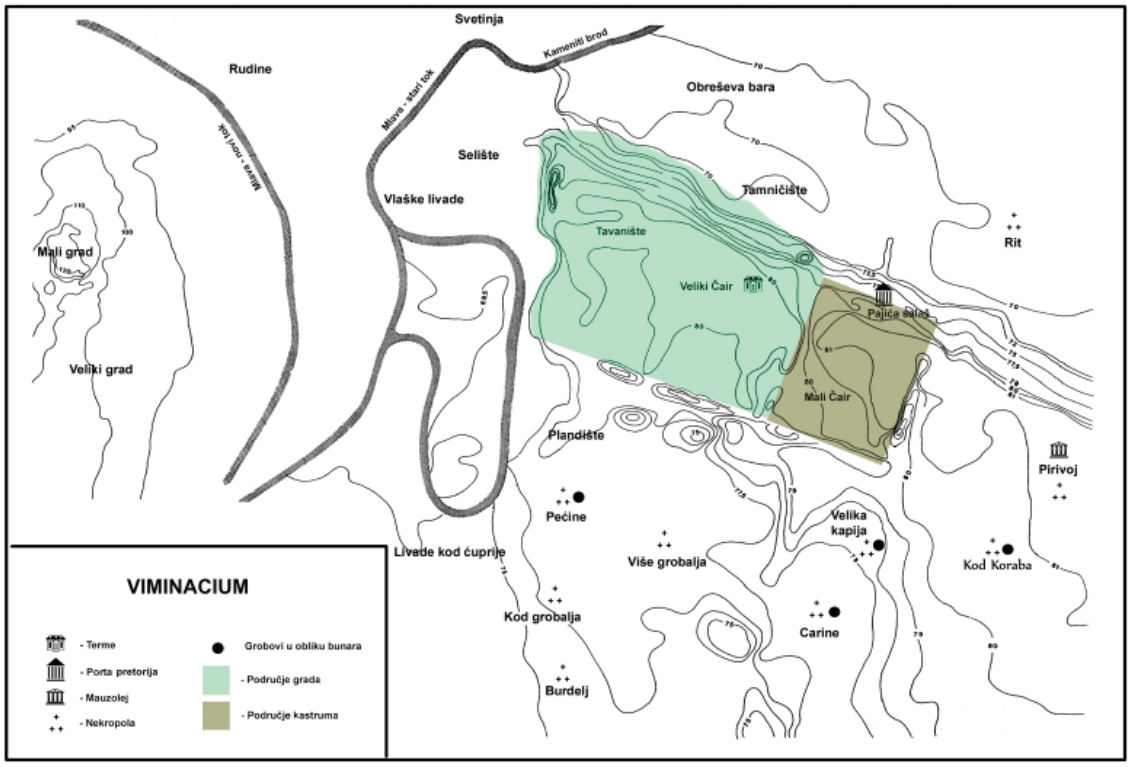

Fig. 3 Location of known cemeteries relative to ancient site of Viminacium (Courtesy of Miško Korać at the Archaeological Institute of Belgrade).

(n=43) burials. Missing from the skeletal sample are remains from the earliest and latest periods of occupation at Viminacium. This is probably more of an advantage than liability to the study though, as processes surrounding the formation and demise of a settlement are expected to be highly erratic and unstable, and therefore do not well represent the demographic forces acting within the population over the greater part of its existence.

ATTRIBUTION OF SEX

The biological sex of each individual was estimated through examination of both cranial and pelvic morphology, as available. Different weights were assigned to individual attributes based upon their established reliability. Pelvic indicators were considered most reliable, and those characteristics most heavily weighted include presence of a ventral arc, subpubic concavity, and thickness of the medial aspect of the ischiopubic ramus (Phenice 1969), presence of auricular elevation, shapes of the pelvic inlet, sacrum, ilium and pubis (Bass 2005), the presence and morphology of a preauricular sulcus, and the contour of the greater sciatic notch (Buikstra and Ubelaker 1994). Also taken into account were the contour of the iliac crest, the arcuate line, and the iliac fossa (Workshop of European Archaeologists 1980). Cranial morphology was considered in the assessment of sex, but was given less weight in the final attribution. Characteristics examined include size and mass of the mastoid processes, prominence of glabella and the mental eminence, nuchal relief, and sharpness of the supraorbital margins (Buikstra and Ubelaker 1994) slope of the forehead, frontal bossing, and the gonial angle and gonial flare of the mandible (Krogman 1962), and the overall shape of the chin in superior view (Bass 2005). While data regarded by certain researchers as indicative of sex in subadults was collected (Schutkowski 1993), it

Time Period	1st -2nd Cent	3rd Century	4th Century	Total
Male	11	11	14	36
Female	4	5	10	19
Sex Ratio	2.75	2.2	1.4	

Table 1: Sex Ratio by Time Period at Viminacium

was not deemed internally consistent or reliable enough for inclusion here and the sex of pre-adolescent individuals is considered indeterminate for purposes of this study.

Analysis resulted in determined sex for 166 individuals – 52 clearly female, 12 probable females, 14 probable males, and 88 clearly male. Combining 'probables' with 'definites' yields an overall sex ratio of 1.59, which suggests that the aggregate population of Viminacium consisted of about 1.6 males to every female. This predominance of males was not unexpected given that the settlement was originally founded as a military outpost, and that this function remained as a core socio-economic influence on the community throughout its existence. One could make the argument that the present sample may be biased toward this military element of the past population given the physical proximity of the cemeteries best represented to the legionary *castrum* immediately to the east of the city itself. Yet the descriptive results of other skeletal series from Viminacium, such as that recovered from excavations directly south of the city walls at a cemetery known as Više Grobalja (Zotović and Jordović 1990:114), present a nearly identical sex ratio of 1.54 (n=241 determined individuals). This tends to confirm the representativeness of the present sample towards the ancient population as a whole, at least with regard to sex, and suggests that the cemeteries surrounding Viminacium may have been quite heterogeneous in socio-economic composition and not strongly segregated with regard to service in or relationship to the military legions.

It is also possible to examine changes in population structure through time with regard to sex. Though much temporal information was not available to the author at the time of analysis—making sample sizes of determined sex for each individual time period unduly small (n=55)—preliminary analysis suggests an extraordinarily high sex ratio in the earliest periods followed by a decreasing disparity through time (Table 1). This is as would be expected given that civilian elements of the city would only slowly grow to rival the military aspect of the founding population in size. Even in the 4th Century, however, the population of Viminacium appears to have been predominantly male. This finding tends to confirm the propositions of some scholars that pre-Industrial cities were generally perceived as dangerous, dirty, unhealthy, and undesirable places that tended to be predominantly the domain of males (Wrigley 1967; Fenner 1970; Cohen 1989; Storey 2006). Again, the sample sizes are too small to conclusively test this as a hypothesis, but initial results tend to support the idea. Viminacium appears to have been a predominantly male settlement throughout its existence, albeit decreasingly so through time.

AGE AT DEATH ASSESSMENT

Age-at-death information was obtained from the skeletons using both traditional means of age assessment and several newly developed techniques that facilitate demographic analysis. In order to maintain comparability with other skeletal series, standard aging techniques well-established in the literature were employed as a baseline. These traditional methods included dental eruption and formation (Ubelaker 1989; Hillson 2005), epiphyseal union (Buikstra and Ubelaker 1994), and long bone length regression (Bass

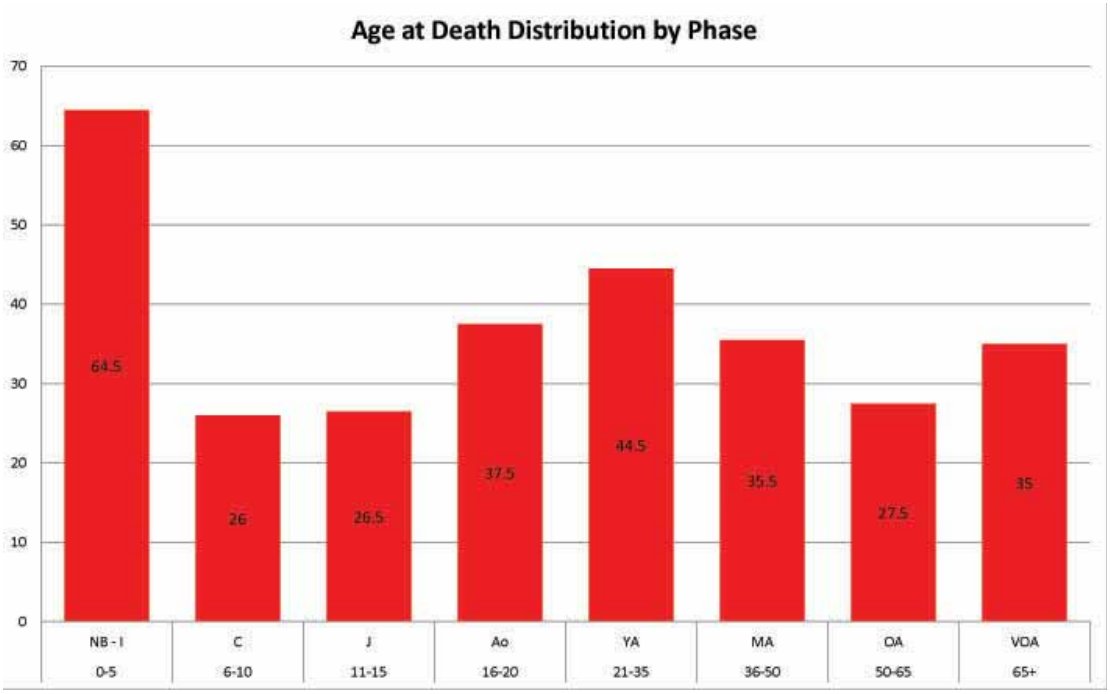

Fig. 4 Raw Counts (y-axis) of Skeletal Individuals by Age Phase in Present Study. Non-whole numbers represent individuals grouped across phases and allocated proportionally. (Age phase: NB = newborn, I = Infant, C = child, j = juvenile, Ao = adolescent, YA = young adult, MA = middle adult, OA = old adult, VOA = very old adult).

2005) for sub-adults. For adults, they consisted of assessment of developmental changes in the pubic symphysis (Todd 1920; Brooks and Suchey 1990), the auricular surfaces (Lovejoy *et al.* 1985; Buckberry and Chamberlain 2002), and the sternal ends of the ribs (Iscan *et al.* 1984, 1985; Iscan and Loth 1986). Each skeleton was placed into an age category based upon the results in order to obtain a general idea of the individual's age at death, as well as to compile a raw assessment of the overall age at death distribution of the skeletal sample. The results of the overall age at death distribution assessment based upon traditional methods of estimation are presented as Fig. 4.

While crude constructs such as raw age at death distributions by lumped osteological age phase tell us relatively little about ancient demographic processes, they do allow for some potentially useful comparative assessments with other relevant archaeological skeletal assemblages. For instance, the ratio of children (<21) to adult (>20) skeletons in the present assemblage can be calculated at 0.65. This is not substantially different from the same ratio (0.59, n= 383) obtainable from descriptive information published from the cemetery at Više Grobalja (Zotović and Jordović 1990:114), located to the south of the city walls. Though these statistics are lacking in sophistication, the results again suggest that the cemeteries located to the east of the *castrum* do not differ meaningfully in demographic composition from those elsewhere around the city. If anything, there were proportionally more children recovered from the eastern graveyards closer to the legionary fort examined by the present study.

A major methodological advantage of the current study was its use of more sophisticated and precise techniques of estimating age-at-death from human remains. Paleodemography has suffered a long series of critiques that bemoan the vulnerabilities of the discipline to various biases, statistical difficulties, and problematic unknowns (Bocquet-Appel and Masset 1982; Sattenspiel and Harpending 1983; Bocquet-Appel 1985; Buikstra *et al.* 1985). The recently developed Boldsen-Milner "transition analysis" approach to skeletal ag-

ing, in an attempt to resolve some of these issues, modifies previous techniques of scoring the pubic symphysis, auricular surface, and cranial suture closure by examining individual changes within each morphological system and providing an integrated result (Boldsen 1997, *et al.* 2002). Rather than lumping these results into age phases on the basis of overall morphology, the computational method yields a point estimate for the age-at-death of each individual based upon Bayesian maximum likelihood techniques, as well as a statistically determined confidence interval for the range of error. Approaches to aging using the sternal rib ends can also be modified to yield an age point estimate using multiple scores obtained from the same individual (Yoder *et al.* 2001; Speal 2008). These new techniques have the decided advantage of resulting in a statistically determined point estimate for the age-at-death for each individual. While the likelihood of each point estimate actually representing the age-at-death for any given individual is extremely small, if the error produced by the estimates can be assumed to be random and more or less normally distributed then this measure of central tendency can be used in more powerful techniques of demographic analysis when a large number of individual cases are available.

MORTALITY PROFILE

The age-at-death data obtained through the above described techniques were analyzed and processed using an event history approach to survival analysis with the help of applications of the statistical computer program STATA, developed by researchers at Texas A&M University (Cleves *et al.* 2008). Age-at-death point estimates derived from transition analysis maximum likelihood calculations, sternal rib end phase composites, and subadult period midpoints were used to calculate single year hazards of mortality for the skeletal sample. In the case of adults with both sternal rib data and transition analysis markers in the cranial and pelvic region, the point estimates were combined using a mean weighted by the number of markers present. For example, an individual with sternal rib data, pubic symphysis, and auricular surface information would be weighted two-thirds transition analysis point estimate and one-third rib score phase midpoint estimate. An individual with only auricular surface and sternal rib information would be weighted one-half transition analysis and one-half sternal rib point estimate.

In order to eliminate the statistical noise associated with single year age at death point estimates in moderate-sized samples, the mortality hazards were combined into five-year brackets and subjected to a smoothing process using STATA's default kernel-weighted local polynomial regression method. This process produces in a much more realistic distribution of the risk of death with less interference from random error associated with sampling methods and the imprecision of skeletal aging methods. However, as the smoothing process eliminates important information from the very front end of the graph related to infant mortality, the initial value on the smoothed graph was replaced with the raw hazard score as initially calculated. The result can be seen as Figure 5.

The resulting estimated mortality profile quite strikingly exhibits all the characteristics one expects from a pre-Industrial human death assemblage. Its slightly left-dipped U-shape resembles mortality curves obtained from medieval European death records as well as developing non-industrial regions of the modern world (Howell 2000; Chamberlain 2006). Moreover, it also manifests details known to characterize historic human populations but entirely unexpected to be so evident in a skeletal sample. The pronounced rise in risk of death, for instance, at around 20 years of age is likely a product of the 'adolescent mortality hump'—a widely recognized phenomenon attributed to risky behavior undertaken by those approaching adulthood, especially young males (Wilson and Daly 1985; Gardner 1993). Its existence at Viminacium is not at all surprising, given

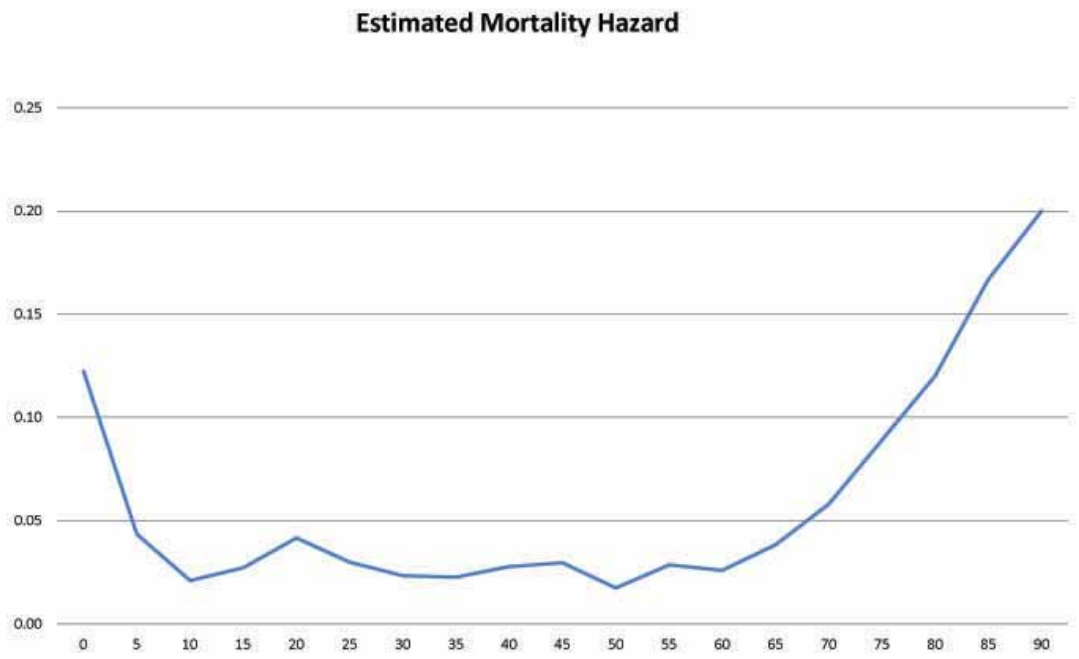

Fig. 5 Estimated Mortality Curve for the Composite Ancient Population of Viminacium. The risk of death is shown vertically along the left edge for each age group presented horizontally along the bottom.

the predominance of males evident in the skeletal assemblage and the martial foundations of the settlement. It is remarkable, however, that such a subtle fluctuation should be apparent in a paleodemographic mortality chart.

An additional factor contributing to this pronounced spike in adolescent/young adult mortality at Viminacium may have been circumstances of intense inward migration to the population. Given the presumably steady influx of new legionary soldiers to the military installation at Viminacium, it is not at all surprising that these young recruits would find their way disproportionally into the graveyards. Even among migrants moving under less stressful and hazardous conditions than military service, it is well-established that recent migrants have a substantially higher risk of death than non-migrants – and that adolescents and young adults are almost universally the ones under the greatest pressure to relocate among human populations (Sharlin 1978; Van der Woude 1982). Risk-bearing young migrants, perhaps both male and female, would almost certainly have contributed to increased adolescent mortality at Viminacium.

Another feature of interest in the Viminacium mortality curve is the set of slight disturbances between about 45 and 65 years of age. These fluctuations from the fairly consistent curve between 20 and 45 years begin with a visible dip at around 50 years of age followed by a small spike at 55 and subsequent dip at around 60. This minor deviation from an otherwise smooth contour could reflect a glitch in the aging methods, or perhaps represent an artifact of random chance produced by a dwindling number of individuals contributing years lived at this later stage of the life cycle. Yet the curve remains very smooth for the remaining ages beyond 65. Alternatively, this phenomenon could reflect a very real aspect of Roman society documented in the classical literary sources and inscriptions – the retirement and resettlement of legionary veterans. Under the Empire, legionary soldiers were permitted to leave their professional military position after some twenty years of service and receive a pension (*praemium*) upon doing

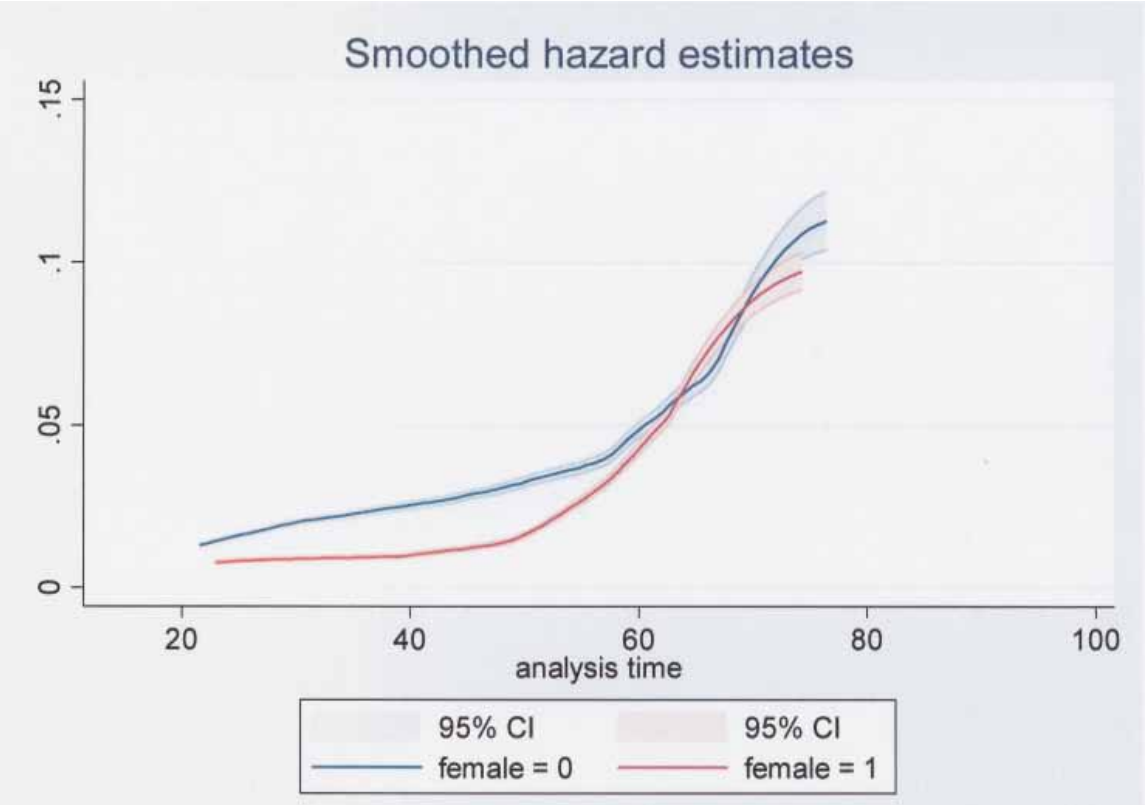

Fig. 6 Statistically Smoothed Risk of Death by Adult Year and Sex at Viminacium (Red = Female). X-axis is years of age, y-axis is chance of death per year.

so (Champion 2004; Phang 2008). Veterans were sometimes also given awards of land or resettled in groups as new settlements called *colonia*. All of these factors could have been an inducement to leave the former legionary station, which would potentially result in fewer persons of retirement age to die and be buried in the graveyards of a military camp like Viminacium. The implication for the present study would be that a substantial number of legionary soldiers were, in fact, surviving to retirement age at Viminacium.

MORTALITY BY SEX

Using the same combined transition analysis and rib score phase composite age-at-death point estimates, risk of death in the skeletal sample was examined by sex. Because sex cannot be reliably determined from the skeleton before adulthood, sex differences in mortality were only assessed from the end of adolescence onward. Graphs of the results from this aspect of the study therefore necessarily begin only at around age 20. Risk of death was estimated for the ancient population using STATA's standard non-parametric life table function that employs smoothing and applies a 95% confidence interval (Cleves *et al.* 2008:91-128). It must be acknowledged in advance that this confidence interval does not take into account the inherent error associated with the skeletal aging process itself. For present purposes, it is necessary to assume that such error is normally distributed and does not introduce any particular directional bias. This is admittedly a large assumption, albeit one that is at present beyond the author's ability to eliminate. The confidence intervals presented in the graphs are therefore somewhat misleadingly narrow. The characteristics of the curves, however, might be assumed to be accurate.

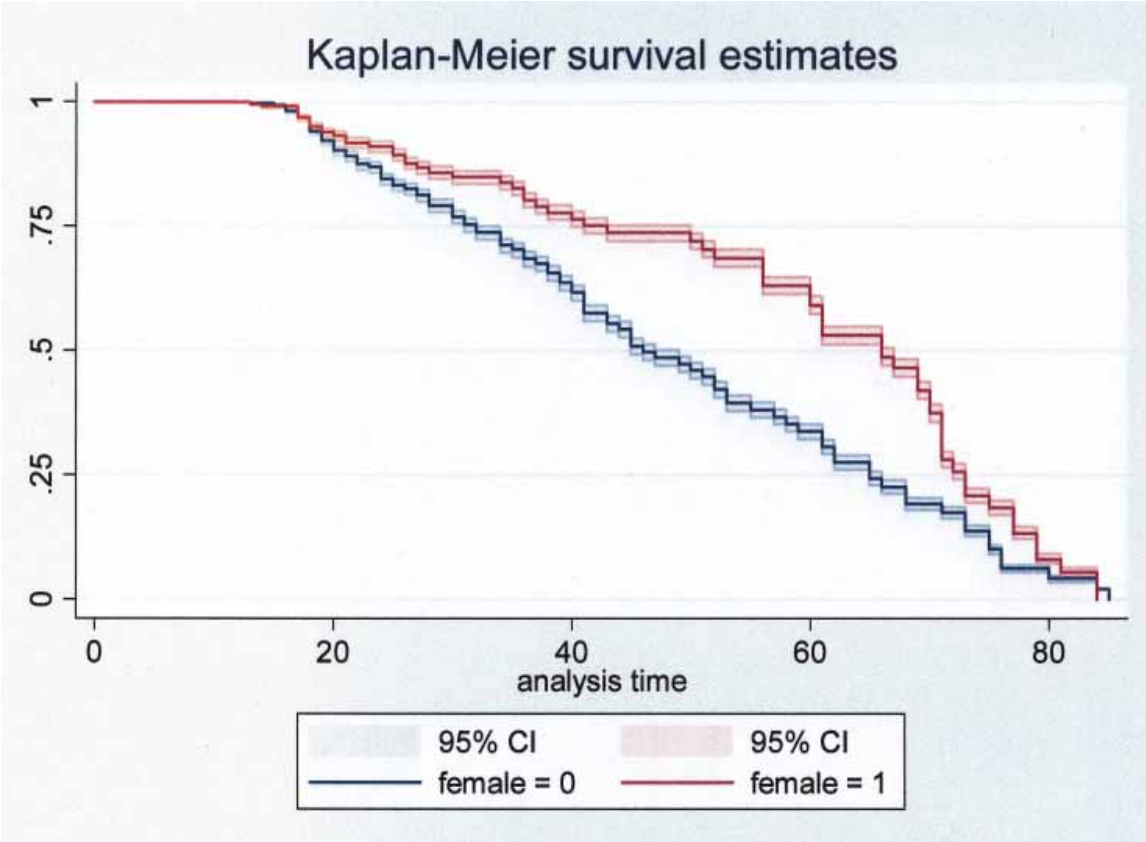

Fig. 7 Differences in Survivorship between Males and Females at Viminacium (Blue = Male). X-axis is years of age, Y-axis is proportion of entering adults remaining in the population.

The results, as one can see from the respective sex-dependant hazard curves (Fig. 6), suggest that adult males consistently experienced a higher risk of death at every age before about their 60th year than did adult females. The crossover at around 65 to 70 may be related to the 'legionary retirement' phenomenon discussed above, and the fact that the fluctuation appears to predominantly be an artifact of the male hazard curve tends to reinforce that interpretation. After about age 60, however, there is no significant difference in mortality hazard, as the curves overlap and do not separate by an amount greater than the estimated confidence interval. The overall effect of this divergence in risk of death between male and female on the population at large can also be appreciated using a survivorship curve, which presents the proportion of an original cohort's expected to survive up to any particular age given the estimated mortality regime. Fig. 7 (below) presents such a graph, constructed using a Kaplan-Meier non-parametric qualitative covariation estimator calculated in STATA (Cleves *et al.* 2008:93-96). The difference in survivorship between the sexes is quite pronounced, with adult females experiencing a considerable advantage in life expectancy up to about 80 years of age.

In a separate calculation, mean estimated age at death for individual skeletons securely identified as female was 50.75 (n = 52, s.d. = 21.8137). For those securely identified as male, mean estimated age at death was 40.92 (n = 88, s.d. = 19.2026). Using a two-tailed Student's t-test one finds that these two age at death estimates are very significantly different from a statistical perspective (t = 2.7812, df = 138, p = .0062). With this information we can estimate that, once they reached adulthood, males lived an average of 9.83

years less than females, and (assuming no significant directional bias in our skeletal age estimates) we can be 95% certain that men survived an average of somewhere between 2.84 and 16.82 fewer years than women.

HIDDEN EFFECTS OF SOCIAL STATUS AND TIME

There are at least two other key variables likely to be obscuring important dimensions of population structure at ancient Viminacium. Firstly, Roman society is well-known to have been characterized by very significant distinctions by social class—ranging from very wealthy *patricians* all the way down through lowly but freeborn *plebs* on to slaves whose owners had the very power of life and death over them (Garnsey and Saller 1987; Storey 2000, 2004). Secondly, we can certainly expect that the risk of death from various threats to an individual's well-being changed substantially through time at Viminacium as the settlement evolved from a small military post of perhaps 100 men on the frontier of the empire into the demographically diverse and socially complex capital city of the province of Upper Moesia. It is therefore only prudent to examine how these variables relate to mortality as evidenced by the skeletal remains.

While the assessment of any individual's social status over the course of their life is not easily accomplished through examination of either their skeletal remains or their grave and its accoutrements, many archaeologists over the years have used mortuary treatment as a type of proxy for wealth or political position (Saxe 1970; Binford 1971; Tainter 1975, 1978; Brown 1995; Carr 1995). According to the many variations on the basic proposition, greater energy expenditure in mortuary ritual and/or wealth and diversity in grave inclusions are considered a mark of the higher social rank or socio-economic status of an interred individual while he or she was alive. Though this equation is not unproblematic and certainly should not be accepted uncritically for all ancient cultures (Ucko 1969; Hodder 1980; Shanks and Tilley 1982), it does seem to hold true in general principle for the classical Mediterranean world. Romans in particular are known to have disposed of the dead using a wide range of methods, with the most highly ranking *patricians* treated to rather extravagant *mausolea* and burial crypts while the commoner poor *plebians* and slaves were left in poorly maintained boneyards (Nock 1932; Toynbee 1971; Reece 1977; Morris 1992). The idea of socio-economic status in Imperial Roman frontier society being reflected to a significant degree in burial treatment was therefore deemed a plausible hypothesis and slated for testing at Viminacium.

To this end, an ordinal scale of evident investment in burial treatment was created for the range of interments found at Viminacium. The mortuary variable found to have the most potential for investigation at the site was grave construction, which takes the form of a broad spectrum of encasement techniques – ranging from no encasement at all to very ornate and elaborate crypts—and with a rather smooth continuum of individually distinguishable gradations in between. The measurement scale was constructed according to several fairly discrete and easily definable categories of increasing energy investment typically found in the site's graveyards. This scale begins with those individuals buried with no encasement at all, scored a '1'. Individuals accompanied by evidence for interment within a wooden coffin by virtue of a series of nails recovered from around the body were scored a '2'. Individuals found within a loose construction of several ceramic tile building slabs, bricks, or roofing tiles were scored with a '3'. And individuals recovered from within a fully constructed brick and mortar crypt or carved sarcophagus were given a '4' on the mortuary scale. The quantity or quality of funerary goods accompanying an individual was not considered as a part of this analysis. Burial goods were excluded not

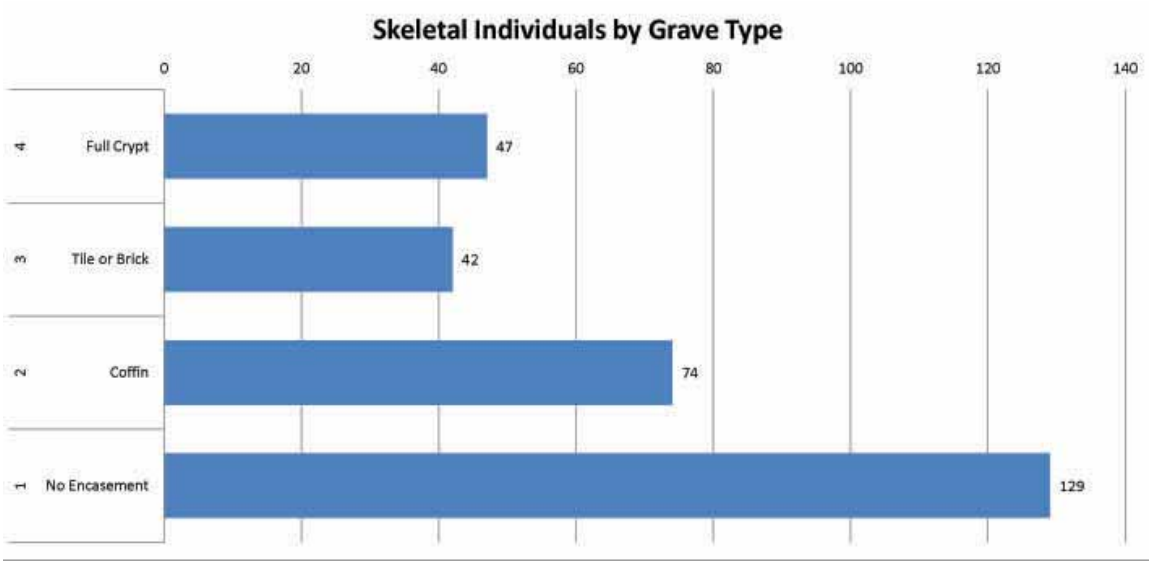

Fig. 8: Individual Frequency of Burial Treatment Types by Presumed Level of Energy Investment.

only because individuals of any rank may acquire one or two items of value during the course of their life, or because such items could have belonged to another individual participating in the interment ceremony and placed in the grave as some sort of symbolic offering, but mostly because so many of the graves in this sample were looted in antiquity and it is precisely these items that are likely to have been taken. Moreover, many such grave goods might have been perishable and are therefore would not have survived for analysis. In addition, many symbolic grave objects – such as metal coins or oil lamps– are likely to have been included for strictly ideological purposes according to alternative religious belief systems, and therefore correlate poorly with the interred person's wealth or political status in life.

The results of this mortuary scale analysis was indeed enlightening (Fig. 8). One can observe that the number of individuals recovered by grave type does in fact roughly present as a 'pyramid' – a system of decreasing frequencies as energy investment increases – theoretically characteristic of social hierarchy. Those interred in constructed tile or brick crypts are far less common than those buried in coffins, which are in turn far less common than individuals buried with no apparent encasement at all. This is exactly what we would expect if the burial treatment of each individual was influenced predominantly by familial wealth or socio-economic status in a hierarchical society in which the greatest number of persons comprised the lowest social classes and the fewest occupied the highest stratum. The single obvious incongruency with the ideal model was an unexpectedly high number of individuals representing the highest level of mortuary investment in the Viminacium sample.

A closer examination of the interment data by sex, however, reveals that the most abundant aspect of the sample, males, is indeed perfectly distributed in decreasing frequency according to presumed energy investment (Table 2). The only abnormality in the hierarchical distribution then can be directly traced to a disproportional number of females buried with the highest level of mortuary investment. Thus, the only aspect of burial treatment at Viminacium that does not appear to adhere to a pyramidal structure of status hierarchy is a strikingly disproportional investment in the mortuary investment afforded to certain women. Mortuary scale 4, reflecting individuals buried in elaborate brick and mortar crypts or sarcophagi, is in fact the only rank at which females outnumber males in the present study. Given what is known

Mortuary Scale	Male	Female	Total
4	11	18	29
3	18	8	26
2	22	10	32
1	50	27	77
Total	101	63	164

Table 2: Mortuary Investment by Sex.

Mortuary Scale	1st – 2nd Cent	3rd Cent	4th Cent	Totals
4	2	3	10	15
3	2	3	13	18
2	10	10	4	24
1	13	8	15	36
Total	27	24	42	93

Table 3: Mortuary Investment by Time Period.

from historical sources about the strongly patriarchal nature of Roman society (Saller 1994; Chrystal 2013), this is a somewhat surprising find. Men in Roman society are generally understood to be the controllers of wealth and manipulators of political power with the very power of life or death over the family (*patria potestas*), at least under the Republic. But even under the Principate women in many cases were not even permitted by law to manage a family's wealth unless there were no other male relatives available to do so. One plausible explanation for the Viminacium mortuary findings might be a predisposition of high-ranking and wealthy men to invest heavily in funerary ceremony upon the loss of their wives, daughters, and perhaps even mothers given the advanced age of many of these females. What does seem clear is that certain women at Viminacium were being treated inordinately well in death. Given the reduced mortality load women seem to have sustained relative to men described above, one might infer that these women were treated disproportionately well in life as well. Of course, it is necessary to keep in mind that this benefit was not by any means experienced by all women. The most frequent burial treatment encountered for women by this study was plain interment without encasement, just as it was for men. Only some 43% of women, however, were treated in this manner, compared with about 50% of men buried with no sign of mortuary encasement.

As the second concern in our examination of population structure, it is also desirable to know how mortuary factors changed through time at ancient Viminacium. If we examine changes in the frequency of various grave types by time period over the course of the city's existence, the results are indeed quite telling. Table 3 shows yet again a generally decreasing number of individuals so interred by increasing level of mortuary investment in the total column by mortuary scale for datable interments—the 'social pyramid' effect. But the most interesting aspects of the data lie in the relative proportions of mortuary scale 2 (coffin burials) versus scale 3 (tile and slab lined graves) and scale 4 (fully constructed crypts) in the latest period of occupation. While coffin graves drop off markedly, both tile and slab-lined graves and crypts soar in popularity.

The increased use of ceramic tile and brick slabs is perhaps unsurprising given the burgeoning ceramic industry at Viminacium, archaeolog-

ically represented by a large complex of firing kilns at the location of Pećine – not far outside the city walls (Raičković and Redžić 2006). The intensive local manufacture of ceramic building materials would likely have made access to them relatively inexpensive. The great decrease in coffin burials is perhaps indirectly related to this same phenomenon, for the ceramic firing process likely consumed a lot of wood as fuel – thereby contributing to its scarcity as a material for coffins. Larger settlements of the past usually relied first and foremost upon their immediate hinterland for the raw materials they needed for daily life and one of the first resources to be exploited to depletion cross-culturally was wood – for both building and fuel (Christaller 1966; Roberts 1996). As populations grow, people increasingly find it necessary to travel further and further afield to find mature stands of trees to satisfy their community's demand for wood. The transport cost for wood tends to grow exorbitant and other resources are eventually called upon to substitute. Such was probably the case at Viminacium, and by the 4th Century AD the area around the city may well have been deforested to some distance. By this time, tile slabs and brick had apparently become much more appealing as materials for mortuary construction than was costly wood for coffins.

The consistently increasing proportion of high levels of mortuary investment (Scale 4) to middle (Scales 2 and 3) and low (Scale 1) levels of such through time (Table 3) suggests an increasing willingness to invest in funerary treatment, perhaps reflecting the overall increasing prosperity of the settlement. Calculated from Table 3, this ratio would be 1/6/6.5 for the 1st & 2nd Centuries, 1/4.3/2.7 in the 3rd Century, and 1/1.7/1.5 in the 4th Century. One might expect that the prestige and wealth of a provincial capital would have increasingly appealed to substantial numbers of higher ranking elites as a place to reside in the later periods, and this would explain the increasing proportion of wealthy burials. This fact also tends to discount any movement towards restraint in mortuary behavior through time as an explanation for the decrease in coffin burial, as if, for instance, the onset of Christianity in the 3rd and 4th Centuries were inducing people to greater humility in choice of burial treatment. If anything, the present study suggests that elaborate graves became more common at Viminacium under Christianity – not less.

CONCLUSIONS

In sum, several conclusions can be reached based upon the paleodemographic and mortuary data examined here. First and foremost, it has been shown that the skeletal assemblage recovered is both consistent in age-at-death and sex distribution with expectations of a death assemblage from a viable human population. Second, the data have been shown to be roughly in agreement with what has previously been found elsewhere at other cemeteries around Viminacium, suggesting that the results are robust in statistical terms and generally applicable to the population of the ancient city at large. Indications are that the cemeteries located to the east of the *castrum* do not differ greatly in demographic composition from those situated elsewhere around the perimeter of the city. This tends to discount the notion that graves nearer the *castrum* have greater association with the military legions than those elsewhere about the ancient city. These findings that the assemblage analyzed here is generally representative of the overall population of Viminacium make some broader socioeconomic and bio-cultural inferences possible. Such inferences are probably best taken as hypotheses for future investigation.

The overall population of Viminacium across the entire period of occupation consisted of about 1.6 males to every female. This aggregate statistic tends to mask changes through time, which is characterized by an extraordinarily high sex ratio of males to females in the earliest periods followed by decreasing values over the subsequent centuries of occupation. Even in the 4th Century,

however, Viminacium appears to have been predominantly male. A pronounced peak in aggregate (not time-sensitive) late adolescent / young adult mortality observed by this study likely reflects both a continually at-risk age cohort of young males facing military service and a strong influx of young migrants to the city over the centuries. These two explanatory factors are, of course, not mutually exclusive. Future research might examine the relative influence of this phenomenon over time as well as the contribution between males and females. The present study has also suggested that adult males regularly experienced a significantly higher risk of death than did adult females at every age before about their 60th year. The difference in survivorship between the sexes is quite pronounced, with adult females apparently experiencing a considerable advantage in life expectancy once they reached adulthood. This fairly extreme divergence is somewhat paradoxical given the strongly patriarchal nature of Roman society. The implication may be that a patriarchal social organization does not necessarily work entirely against females in all regards.

The creation of an ordinal scale of grave types based strictly upon burial construction has suggested a strongly pyramidal distribution of funerary investment at Viminacium. Given the relatively proportional distribution of demographic and chronological facts across this pyramid, the implication seems to be that social organization at the ancient city was strongly hierarchical, as anticipated, and that burial construction at least roughly correlates social status at the site. The one aspect of burial treatment at Viminacium that did not strongly adhere to a pyramidal distribution was the disproportional investment in mortuary ritual afforded to some females—presumably those of greatest social status – at the highest tier of grave construction. Certain women seem to have been treated inordinately well in death. The mortuary analysis also revealed some interesting trends through time. Coffin burials became increasingly uncommon in the 4th century, and seem to have been mostly replaced by ceramic tile and brick-lined grave constructions during this late period. This trend was likely a product of the increasing availability of ceramic and brick construction materials as that industry developed at Viminacium, as well as the increasing scarcity of wood for coffins as the hinterland of the city became increasingly deforested.

To conclude, osteological evidence suggests that the population of ancient Viminacium was always predominantly male – consistent with both the presence of a military installation and scholarly views of pre-Industrial cities as mostly the domain of men. Women, as well as children, were present during all periods examined, however, and were in many cases afforded disproportionally high social status. Men, on the other hand, were at a consistently higher risk of death from at least young adulthood through late middle age. It was evidently the lot of adult males to take on the risks of constructing and maintaining a city on the imperial frontier and defending it against the hazards of the borderlands. The disproportional number of their skeletons in the cemeteries surrounding Viminacium strongly attests to this.

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REZIME
PALEODEMOGRAFIJA / PROUČAVANJE GROBOVA IZ ISTOČNIH NEKROPOLA VIMINACIJUMA

KLJUČNE REČI: PALEODEMOGRAFIJA, ANTIČKI GRADOVI, VIMINACIUM, POL I ROD U RIMSKOM PROVINCIJISKOM DRUŠTVU.

Članak predstavlja pregled paleodemografskih podataka dobijenih nakon šest sezona terenskih istraživanja sprovedenih u Viminacijumu – provincijskom gradu na dunavskoj granici Rimskog carstva. Analizirani su skeletni ostaci iz 254 grobova sa 297 individua koji potiču iz četiri nekropole koje se nalaze na istočnom obodu antičkog grada. Rezultati ukazuju da se ispitivan skeletni uzorak može smatrati reprezentativnim pokazateljem smrtnosti antičke populacije u celini. Glavni demografski podaci dobijeni tokom istraživanja pokazuju znatno veći udeo muškaraca u populaciji tokom čitavog trajanja antičkog grada, dok s druge strane značajno duži životni vek među ženama. Analiza materijala je takođe pokazala još neke zanimljive rezultate, kao što je smanjenje upotrebe drvenih sanduka u kasnijem periodu rimske dominacije ili nejednak tretman u sahranjivanju ženskih individua.

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BIOMECHANICAL CHANGES IN THE NECK JOINTS IN INDIVIDUALS WITH ARTIFICIALLY DEFORMED SKULLS FROM MEDIANA

ABSTRACT

During archaeological excavations in 2000, two artificially deformed skulls were found in Mediana, at the site west to the palace. These anthropological materials belong to the Great Migration period and it has been previously published. However, the positioning of the head and the changes that have occurred on the first cervical vertebra has not been the subject of any study so far. The first cervical vertebra has been preserved so well that the analysis could be conducted from the perspective of functional static and functional dynamics of the human body. On the other hand, specific morphological changes in the vertebrae possibly caused by artificial deformation have been created.

KEYWORDS: SKULL ARTIFICIAL DEFORMATION, NECK JOINT MECHANICAL ALTERATION, PONTICULUS POSTICUS, FORAMEN ARCUALE.

INTRODUCTION[1]

Research on artificially deformed skulls is usually reduced to attempts to explain the phenomenon, as well as its propagation zone. It occurs in a variety of geographical and chronological zones with different modalities of treatment (Mikić 1994). J. Nemeskéri (1976) made a division that includes the Balkan Peninsula and the so called central Danube European group. Two skulls with artificial deformation which are numbered as 34 and 35 come from Mediana and they are the subject of this paper. As already mentioned, research on artificially deformed skulls had its focus on explaining the technique that has been practiced in the distortion. This particular research aims to try to answer the question about the biomechanical changes that might be occured during the deformation process of the skull and to explain the changes that have occurred on the first cervical vertebrae, which in turn affected the positioning of the head.

ARCHAEOLOGICAL CONTEXT

During the archaeological excavations of Mediana in 2000, the graves 34 and 35 were discovered (Vasić 2004). According to archaeological finds from the grave 34 (bone double row comb, crescent shape bronze pendant beads of glass paste), this grave can be dated to the end of the 4th or beginning of the 5th century.

1 The article results from the project: *Viminacium, Roman city and military camp – research of the material and non material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalization and 3D visualization* (no 47018), funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.

Grave no. 35, that is carved into a powerful stone column and which belongs to the oldest building phase, is considered to be from the same period. Its orientation differs in comparison to all the others from the same period which have been taken into account. In the tomb were found the following archaeological goods: a bronze coin in the right hand, iron buckle and iron knife.

The orientation and skeletal positioning of graves no. 34 and 35 is the following: extended position, arms stretched out next to the body pointing to the east-west and heads on the west side.

METHODS

Regarding the methodology followed in order to understand the biomechanical changes that the individual suffered possibly as a consequence of the deformed skull in the neck joint, the research has been focused in the macroscopic observation of skeletal shape changes.

The shape and distribution of the occipital surfaces that surround the foramen magnum and the atlas and axis have been evaluated, as well the abrasion of the articular surfaces between all these joints.

On the other hand, this research has also been focused in the physical appearance and biomechanical studies. To proceed with this comparison, the skulls of two individuals with deformed skulls (the individual number 34 and the individual 35) have also been taken into account, as well as another individual with a perfectly functional neck joint: the individual 216 from the necropolis of Pirivoj**.**

As a result, the main aim is to understand how each and every one of these joints have worked, if they've worked perfectly or to see if there is any biomechanical problem or any variation that may help us comprehend the results of the skull deformation in the neck joint.

Fig. 1 Skull no.34-Male around 20 years old

RESULTS

Given that the previous research has already stated the biological age and sex of the individuals, we will again engage in this issue taking over the existing data. Thus, for determining the sex the recommended criteria given by the group of European anthropologists (Ferembach, Schwidetzky and Stloukal 1979) has been used, as well as Buikstra and Ubelaker (Buikstra and Ubelaker 1994). It must be noted that for the determination of these parameters the postcranial skeleton was not available, so they have been determined only according the basis of the skull. To this end, the taken criteria have been provided by Vallois (Vallois 1937), which refers to the obliteration of cranial sutures, and the degree of coronal obliteration in upper surface of molars, which was formulated Lovejoy (Lovejoy 1985).

According to the criteria stated above, skull no. 34 (fig. 1), despite its gracefulness belonged to a man who was about 20 years old, while skull number 35 (fig. 2) belonged to a robust man who was, at the time of death, about 40 years of age.

The second point to be evaluated in this paper is the analysis of the way in which the deformation in both skulls has affected to the neck joint in both individuals, based on the analysis and evaluation of the shape and abrasion of the joint between occipital bone and the vertebras atlas and axis.

Regarding the individual 34, the first point taken into account was the shape of the occipital bone, in the articular surface with the atlas bone and the disposition of the rest of the bone that connects with the sphenoid bone.

As it can be seen in fig. 3, the shape, instead of being flat, is going upwards and the abrasion, which does not affect the inner part of the articular surface, is incomplete in the nearest part to the foramen magnum. On the other hand, in the atlas vertebra shown in fig. 4 it can be seen that the articular surface and the occipital bone present a complete abrasion with a small quantity of porosities.

The axis vertebra shows also an abnormal shape regarding both articular surfaces of the atlas bone. On one hand, in the superior articular facet of this bone it should be noted that the ventral

Fig. 2 Skull no.35-Robust male around 40 years old

zone's articular surface is incomplete.

In fig. 5 we can see a comparison between two axis vertebrae that belong to individuals with the same age at death. The one in the left side of the image belongs to individual 34, which has a deformed skull and the one in the right to individual 216 (necropolis Pirivoj-Viminacium), with no alteration in the skull's shape. The articular surface of the individual 34 is barely altered in comparison to the second one, which can mean that the individual 216 had more movement in this particular joint.

If we focus in the shape and abrasion of the joint between the atlas and axis vertebrae placed in the odontoid process, the articular facet for the anterior arch of atlas, we can see more changes. In fig. 6 we can see that the articular surface only takes half of the odontoid process and barely leaves any space at both sides to provide room for the rotation movement.

In fig. 7 it is shown the complete joint between the skull and the atlas and axis vertebrae of individual 34, where we can see that the joint between the axis and atlas vertebrae does not affect to the whole odontoid process and that the joint located in the articular surfaces between both bones does not fit correctly.

In fig. 8 the comparison between both neck joints (Individual 34 and 35 respectively) is shown. There are pronounced differences between projections of the articular surfaces of the occipital bone. In individual 34 it is visible that it goes upwards, meanwhile the surface of the same bone on the individual 35 is flatter. Also, in the same image it is visible that the articular joint between the atlas and axis vertebrae is more regular in individual 35 what can be caused by aging.

The articular surface between the occipital bone and the atlas vertebra of the individual 35 also displays a regular abrasion but the main change is found in the presence of ossified bilateral foramen in the ventral part of the vertebra, which it is shown in figs. 9 and 10.

On the other hand, the articular surface placed in the odontoid process (fig. 11) takes the whole process and also has surfaced in both sides to provide the rotation movement for the head. Another

Fig. 3 Skull no. 34-Shape of vertebra and missing part of auricular surface

important change that can be found in fig. 12 is that the articular surfaces between atlas and axis vertebra do not fit because the atlas bone is narrower.

DISCUSSION

The foramina that the individual 35 shows in the atlas vertebra are called ponticulus posticus, foramen arcuale or "Kimmerle's anomaly". It is an ossified structure forming a complete or incomplete bridge between the posterior margin of the superior articular facet and the superior margin of the posterior tubercle of the atlas, through which the vertebral artery and the first cervical nerve pass.

The existence of this bridge can cause a higher external pressure over the vertebral artery because it passes through the foramen transversarium from the foramen magnum of the occipital bone. This additional compression could compromise the blood flow resulting in vertebro-basilar insufficiency (Rekha and Rajeshwari 2013).

Historically, the clinical significance of the ponticulus posticus was relevant solely in its association with pathologies as migraine, vertigoes, diplopia, shoulder pain and neck pain, termed as a result as "ponticulus posticus syndrome" (Da-Geng et al. 2015). Also, according with the studies of Cakmac (2005) this additional pressure can cause dizziness and headaches.

The causes of this particular ossification has been largely discussed and no conclusion has been reached yet. According with Lamberty B.H.G. and Živanovic S. (1973), this growth seems to be the consequence of the complete or incomplete ossification of the posterior atlantooccipital membrane over the vertebral artery groove.

Among several theories which have been proposed, one of the more related to our particular case is the one formulated by Rekha (2013), which states: "The bony roof of the posterolateral tunnel probably allows greater attachment of posterior atlanto-occipital membrane in quadrupeds where load of the head is supported by extensor muscles of neck, ligaments and posterior atlanto-occipital membrane, but in man weight of the head is borne

Fig. 4 skull no.34-Presence of abrasion on the Atlas vertebra

Fig. 5 Comparison between two Axis vertebra which belongs to two individuals at same age of death

Fig. 6 Individual 34-Odontoid process and auricular surface on vertebra

Fig. 7 Reconstruction of the skull position of the individual no. 34

Fig. 8 Comparison between both neck joints (individuals 34 and 35)

Fig. 9 Presence of the posticilus posticus of the individual no. 34.

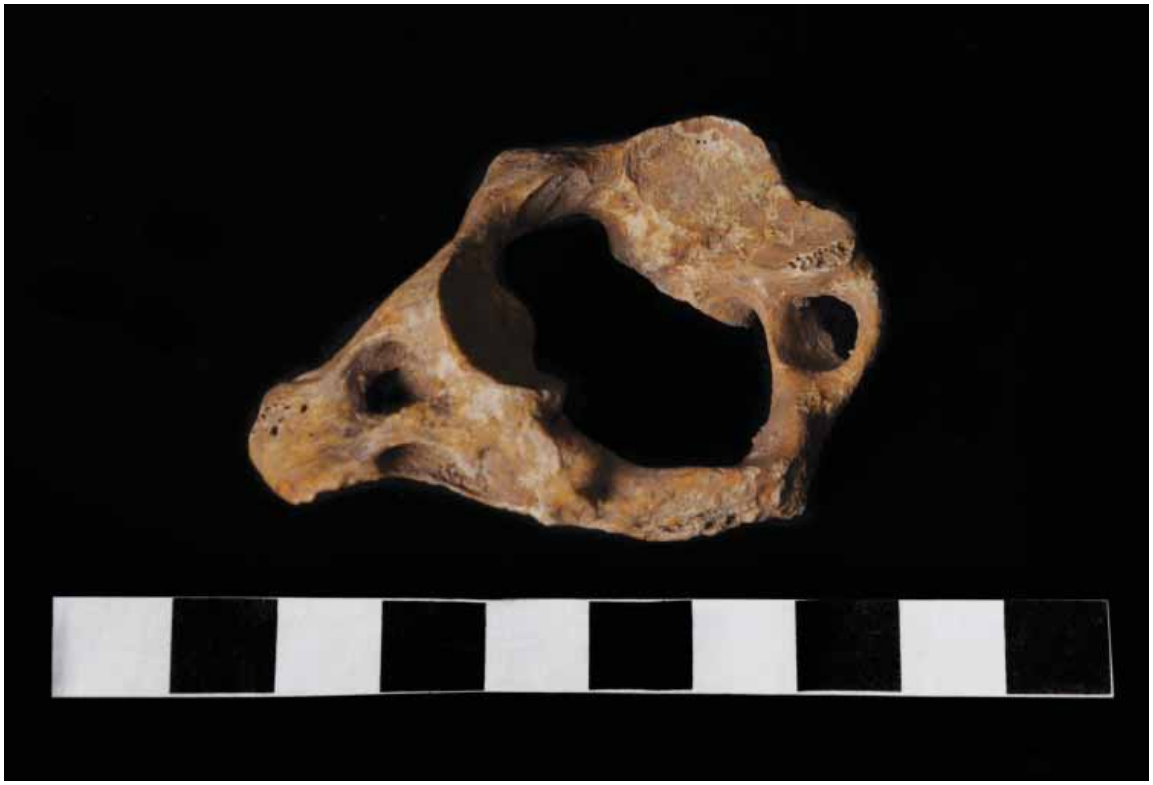

Fig. 10 Posticulus posticus-individual no.34

Fig. 11 Individual no.35-Auricular process on the odontoid process

Fig. 12 Changes on the auricular surfaces between atlas and axis.

by vertical loading of the superior articular facet of atlas the roof of the tunnel has disappeared."

This theory is supported by Schilling et al. (2010) based in the fact that the creation of the bridges does not seem to be affected by aging because they appear also in juvenile population. These results mean that it cannot be considered as an ossification or calcification because it takes time, but rather an ossification with functional significance to protect the passage of the vertebral artery from any damage or compression as a result of craniocervical dynamics.

According to the studies conducted by Dhall et al. (1993) and Pande and Singh (1971), the shape and size of the bridges and the superior articular facet of the atlas vertebra can give us information about the more common head postures and the lateralization of the more dominant muscles of the body. The bigger the bridge and articular facet, the more repetitive use they have suffered. In the particular case of individual 35 we can check that the right facet is more eroded and the bridge is bigger.

CONCLUSIONS

Regarding the biomechanical changes visible in the neck joint as a possible result of the skull deformation, both individuals have a different response.

The individual 34 presents an evident immobilization of the neck joint. The articular facet placed in the odontoid process is incomplete and barely eroded, which means that the movement visible as a result of the friction between atlas and axis vertebrae was minimal and that the rotation movement was severely decreased.

Likewise, the anterior part of the foramen magnum of the occipital bone, where the articular facets and the atlas bone are found and articulate, displays an abnormal shape. Instead of having a flat disposition, it has modified to be upwards, which allows reducing the pressure over the vertebral artery in its way over the atlas bone.

In addition, the erosion of every joint is very slight and partial, as in the case of the joint between the superior articular facet of the axis vertebra and the inferior articular facet of the atlas bone.

On the other hand, the individual 35 presents more movement in every joint, as the regular abrasion of every articular surface between occipital bone and atlas and axis vertebrae shows, maybe because this person was younger. Also, the shape of the atlas bone has been changed to be narrower, which has a less natural movement between it and the axis vertebra as a consequence.

The presence of the ponticulus posticus, according with the conclusions of part of the historiography consulted could be the result of the natural response of the body towards the additional pressure over the vertebral artery in order to avoid pathologies. This situation could allow to the individual to have a more natural use of the neck joint.

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REZIME

BIOMEHANIČKE PROMENE NA NA VRATNIM PRSLJENOVIMA KOD INDIVIDUA SA VEŠTAČKI DEFORMISANIM LOBANJAMA SA LOKALITETA MEDIANA

KLJUČNE REČI: VEŠTAČKI DEFORMISANA LOBANJA, PONTICULUS POSTICUS, MEDIANA.

Dosadašnja istraživanja veštački deformisanih lobanja su se svodila uglavnom na istraživanja tehnika bandažiranja kao i na njihovo geografsko prostiranje. Dve lobanje sa Medijane pod brojevima 34 i 35, a koje su bile predmet ovog rada su pružile jedan novi aspekt istraživanja koji se bavi pozicioniranjem glave i promena koje su nastale na vratnim pršljenovima, a kojima je uzrok mogla biti veštačka deformacija lobanje. Istraživanje je pokazalo da je individua koja potiče iz groba br. 34 imala otežano okretanje vrata. Druga individua koja potiče iz groba br. 35 je imala nešto uži i višlji prvi vratni pršljen. To je moglo uzrokovati otežano kretanje vrata.

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PALEOPATHOLOGICAL ANALYSIS OF THE INDIVIDUAL 1226-D FROM THE NECROPOLIS OF VIŠE GROBALJA: OSTEOMYELITIS ALONG WITH GREENSTICK FRACTURES AND SURGICAL ANTEMORTEM ACTIVITIES

ABSTRACT

The present paper has the aim to show the results regarding the pathological condition of the individual 1226-D, who was recovered during the archaeological investigations carried out in 1985 at the Više Grobalja necropolis, Viminacium, proceeding from the grave number G-1226. This grave revealed itself to be a mass grave with 4 buried individuals, which were labelled as individuals A, B, C and D. The pathological condition of the individual 1226D is the topic of this work, despite of the fact that, unfortunately, the skeletal remains are incomplete. On one hand, the individual presents an advanced osteomyelitis in the distal left femur showing also a cloaca in the same part of the bone, allowing expel pus and necrotic tissue. On the other hand, both distal radius have been broken as a result of a bending trauma when the individual was young, having as a result greenstick fractures, modifying the regular shape of both wrists, pointing both of them to the medial line.

Also, the left ulna presents an antemortem surgical condition, being probably broken by a blunt force and being removed the bone sharps by a surgeon. Finally, the right femur has been cuted postmortem and removed in some moment after death, probably in recent times..

KEYWORDS: PALEOPATHOLOGY, OSTEMYELITIS, AMPUTATION, GREENSTICK FRACTURES, POSTMORTEM CUT, ANTEMORTEM TRAUMA.

INTRODUCTION[1]

Necropolis Više Grobalja was excavating in year of 1985, but this necropolis is not archaeologicaly completly excavated. Excavations on this location continue to nowadays. This period belong to second research fase at Viminacium when the thermo power plant Drmno was expanded. Više Grobalja is part of southern necropolis of Viminacium (Mikić, Korać 2013).

On the other hand, numerous skeletons from this necropolis were almost completely anthropologically analyzed. A small number of skeletons are not analyzed and published. Skeleton marked as G-1226D is one of them and presents unique case of paleopathological changes in entire Viminacium. Also, should be mentioned that on this necropolis were buried very different population.

1 The article results from the project: *Viminacium, Roman city and military camp – research of the material and non material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalization and 3D visualization* (no 47018), funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.

Fig. 1 Left femur with an advances osteomielitis.

Chronologically, grave G-1226D according archaeological finds belong to period from I-V century, but precise dating is unfortunately not possible.

MATERIALS

This individual was buried underneath the individual 1226C, with an orientation E-W and deviation of 24˚. Due to bad preservation conditions and the fact that the skeleton was partially incomplete, the gender could not be determined; even so, the estimated age could be established, that being around 35 years. On the other hand, pathological changes on bones were very well preserved. On this topic, the case of osteomyelitis on the left femoral bone is specially worth mentioning, with a notorious cloaca as a result of the infection.

Regarding the antemortem processes suffered by the individual we can check that on one hand, both radius bones have been broken and healed, thus having the deviation of both to the medial line of the body as a result. In addition, it presents an amputation and an irregular healing in the left ulna, giving the impression that some sort of medical activity was performed, maybe in relation to the broken radius.

METHODS

In this paper was used two-folded methodology. The first part is so called standardized methodology of an anthropological study of skeletons, concerning gender, individual age. For this part we used criteria defined by D. Ferembach, I. Schwidetzky and M. Stloukal (Ferembach, Schwidetzky and Stloukal). On the other hand, paleopathological changes are identified according criteria of D. J. Ortner (Ortner 2001).

At the methodology about the recreation of the biological profile, the anthropologist should pay attention to those parameters which let him to identify characteristics like sex, age at death, ancestry or height according morphologies of the bones which

Fig. 2 Detail of the cloaca in left femur.

comprises the skull or pelvic girdle among others.

In this particular case the only bones which have been recovered are those which form both arms and legs (none of the bones from feet or hands bone are present). This situation limit us in order to obtain any information about this topic because we do not have elements to analyse this parameters.

Regarding the methods followed in order to interpret the pathologies and traumas, the macroscopic appearence of the bones gave us information enough in order to determine the main characteristics of the abnormalities shown in several bones.

On one hand, the left femur show us the appearence of a bone afected by an infectious disease: it has a modification of the shape in the lower part of the shaft and the distal part of the femur showing a bloated appearance and cell-shaped bone tissue in the external part along with a cloaca in order to drain the necrotic and purulent material that the bone has in its inner part as a result of the infection.

Also, macroscopically the individual shows modification in the shape of both radius bone as a result of a previous fracture (probably greenstick fractures as a result of a trauma during the youthful) because they presents the possible results of a healing, and the same occurs with the amputation of the left ulna. Finally, factors as the shape, colour, lack of healing process and the alterations that shows the cut in the right femur demonstrate us that the is result of cut very long time after death, probably in recent time..

RESULTS AND DISCUSSION

Regarding the biological profile, the skeletal representation recovered did not let us obtain more information that it is an individual with more than 20 years when he died because the distal radius and proximal ulna has been fused with the rest of the bone.

In this case we would like to present infection of left femoral bone. Several explanations will be mentioned as possible cause of the infection. The most common case of osteomyelitis is exactly on long bones and this type is known as

Fig. 3 Greenstick fracture in right radius.

hematogenous osteomyeltis. In 80% of osteomyelitic cases, the femur and tibia are counted. (Ortner and Putschar 1981; Aufderheide and Rodríguez-Martín 1998).

The results of the infection are cloaca or sequestrum in association with periostal bone known also as involucrum which presents new sheath of bone and growth around sequestrum (Ortner 2001: 214). On the other hand, cases of osteomyelitis can be results of tuberculosis or smallpox. The most common bacteria which can be cause of infection are Staphylococcus Aurea. The second one is Streptococcus.

The conclusion is that osteomyelitis on individual marked as 1226 D was caused probably by infection. It is because probably this person had not adequate medical treatment after trauma or wound. This wound could have been on the femur, or on other bones. On the other hand, in regarding that this person had other traumas on skeleton and that the normal bone is not resistant on this kind of infection, with even greater certainty we can make this conclusion.

Along with the most characteristic pathology that suffered this individual, the osteomyelitis previously described, both radius bones present deformations on its distal part, showing an antemortem healing process, but they did not seem to have been broken completely but presenting bone fissures.

If we focus our attention to the distal part of the left radius we can check that it presents a strong deformation with the change of shape and location of the articular surface for the joint of the wrist. Also, it has lost its primary position, being slightly moved to the medial line, provoking as a consequence the change of position of the hand presenting a deviation from its natural movement, pointing the hand to lateral when the body is in anatomic position.

The radius bone located in the right arm presents also a abnormal shape in the same place. In this particular case it has a growth of new cartilage as a result of healing and the original position has been turned to pointing the joint to the medial part of the body.

Fig. 4 Greenstick fracture in left radius and amputation in left ulna.

In both cases, it has been created a new bone in form of enthesiophytes as a result of the new stress caused by the change of position of the joint and the creation of new movements in the bones and both seems to have the characteristics of a greenstick fracture as a result of a bending fracture when the individual was in the juvenile period (Ortner and Puschard 2001).

Another factor that change the shape and the use of the left hand is the lost of the continuity of the bone and the posterior healing that the individual shows in the left ulna. It shows an irregular healing, possible medical treatment that was carried out during his life, and it seems to be practiced in the lower part of the shaft of the bone, losing the most part of its distal region and being reabsorbed. It is not possible to know the real afection in the hand because no more bones have been recovered from this part of the body.

Also, as a result, it has been created new bone in the lower part of the shaft of the same ulna in form of enthesiophytes, which means that the joint and the rest of the hand have been seriously affected both the amputation and the modification of the radius bone.

According with the studies carried out by Moodie (Moodie 1920), Brothwell and Moller-Christensen (Brothwell and Moller-Christensen 1963), there are three ways to obtain an amputation: as a result of a surgical amputation, a punitive action against a criminal or captive or injury with a sharp weapon. In this particular case, there is no horizontal cut line but instead it has a fracture that goes from the proximal part of the ulna to its distal part, that has been healed later.

It means that the probability to be the result of one of this options is very low according to the irregular shape that it shows. It is more probable that it was caused by a blunt instrument that broke the bone in an irregular pattern, not affecting to the radius. Also, it means that the bone shards have been medically extracted. On the other hand, it is not possible to check if it has any influence in the hand because it has not been recovered.

Fig. 5 Detail of the amputation in left ulna.

CONCLUSIONS

Purulent osteomyelitis and notorious cloaca as result of infection infer that this person did not have adequate medical treatment. Medicine in Roman times was advanced, but insufficient for the treatment of such diseases. Nowadays, this type of infection is treated with antibiotics or surgery. This type of disease is very painful and would have made mobility very difficult.

Because of this, it can be assumed that this person was immobile. This is particularly evident when we take into account the other paleopathological conditions which have already been discussed.

According with the results obtained regarding the traumas, on one hand we have that the individual has broken his radius in a bending fracture but its youth let him to heal them in form of greenstick fractures, provoking a permanent deformation in both hands, being displaced the shape towards the midline of the body.

On the other hand, the healed fracture it presents in the left ulna shows a surgical intervention in the form of an ampitation technically speaking. Part of the bone, the bone sharps, has been removed and after that the healing was correct, afecting at the movement of the wrist.

If we have into consideration the time when this even occur, it is documented that in Roman Times there existed surgeons and physicians able to carry out this operations. The medicians of this culture had sedatives made of a combination of opium and henbane and another antiseptic techniques which helps the recovery and avoid the extraordinary rate of death within this practice. (MacCallum 2008).

Regarding the cut in the right femur and the lack of recovery of any bone from this distal part to the end of the leg shows that it was removed after his death give us one possibility that someone cuted left femoral bone and for sure this is not posmortem amputation.

The shape of the cut shows us a perfect cut with no expansion lines which means that it could be done by a flat and sharp instrument like a some kind of saw.

Fig. 6 Detail of the cut in right femur.

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REZIME
PALEOPATOLOŠKA ANALIZA INDIVIDUE POD OZNAKOM 1226-D IZ NEKROPOLE VIŠE GROBALJA: OSTEOMIJELITIS UZ PRELOME KOSTI I HIRURŠKE INTERVENCIJE

KLJUČNE REČI: PALEOPATOLOGIJA, OSTEOMIJELITIS, AMPUTACIJA, PRELOM KOSTIJU, ANTEMORTEM TRAUMA.

Tokom arheoloških istraživanja koja su sprovedena na nekropoli Više grobalja na Viminacijumu pronađen je grupni grob pod oznakom G-1226. Sadržavao je ukupno četiri individue, a predmet ovog rada je individua pod oznakom G-1226D. Zbog slabe i nekompletne očuvanosti, pol nije mogao biti utvrđen, dok je individualna starost oko 35 godina. Paleopatološka analiza je utvrdila postojanje nekoliko promena na skeletu: osteomijelitis na levoj butnoj kosti, obe žbice su bile polomljene kao i leva lakatna kost koja je amputirana. Sa druge strane, desna butna kost je bila odsečena u distalnom delu, ali dugo posle smrti i to je uradjeno verovatno u moderno doba za potrebe uzimanja uzoraka. Ovakvo stanje skeleta pruža pretpostavku da se ova osoba verovatno otežano kretala. Kroz analize nabrojanih paleopatoloških stanja došlo se do zaključka da je medicina u rimsko vreme bila napredna, ali nedovoljno za lečenje komplikovanijih infekcija kao što je to osteomijelitis.

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GREEK FACES. ANTHROPOLOGICAL ANALYSIS OF ANCIENT GREEK SCULPTURE

ABSTRACT

This articleis devoted to studying the prospects of using anthropological methods to identify patterns of building sculptural forms. Authors use a well-studied by art history Greek archaic & classic sculpture as a subject of their study. The intent of the work is to reveal the mechanism of the evolution of the art image in Greek sculpture from the different time periods. The dividing of anthropological features out of those which reflect cultural patterns and trends, such as canon, is exceedingly problematic. Nevertheless the applying of anthropological methods to analyze art objects creates a new methodology and reveals tendencies in the evolution of the image.

The study allows us to mark out the characteristics of the image related to the proportions regulated by the canon from the really anthropological features such as a structure of the periorbital area and facial horizontal profile. The stability of the reproduction of these features through time and space suggest the influence on the images of the real anthropological environment. The change of the image in the VI-V cc. BC presumably reflects the change of the anthropological type which took place in the remote past.

The study of the faces of the sculptures reveals the proportional similarity of the Palmyra funerary sculpture and the Greek archaic images.

KEYWORDS: GREEK SCULPTURE, FACE PROPORTIONS, COMPOSITE PORTRAITS, EVOLUTION OF ART IMAGE.

INTRODUCTION

Ancient Greek sculpture is a well-studied phenomenon in the history of the world culture. It has been the subject of detailed study by representatives of various scholarly fields: historians and art theoreticians, esthetic philosophers and culturologists. They have developed a complete picture of processes that took place during the "Great Awakening". Generations of artists and sculptors in modern times have been brought up copying ancient images. The fact that this topic has been thoroughly explored allows investigators to use ancient sculpture for verifying certain hypotheses and testing methodology of studying artistic visualization that can be further used to explore other less investigated artistic traditions. Greek sculpture is often viewed by a researcher through their perception of a concrete object as a masterpiece, i.e. a unique phenomenon. The idea

of this research is trying to view Greek sculpture as a statistical sampling, where each work of art is a variant of an established method of artistic expression of the human image. This approach is based on methods of anthropological science with more elaborated apparatus allowing typologization of human images. The purpose of such an interdisciplinary overview is to define patterns of evolution of the artistic image in ancient sculpture during different historical periods. Separating anthropological characteristics of the art image from those reflecting cultural patterns and trends, such as the canon, poses a particular problem for a culturologist in their research.

In this connection, interdisciplinary (anthropological) methods allow scientists to test different methodologies and consider trends in the artistic image development (taking ancient images as an example) that are difficult to discern in less explored traditions.

The present research is an attempt to use classic anthropometric methods for analysis of objects that are not, strictly speaking, the subject of anthropology. Nevertheless, in different cultural periods, researchers dealt with certain cultural objects because portraits and sculptures of the human face, on the one hand, contain anthropological information, while on the other they, to the great extent, reflect those cultural processes that would take place in different time periods. (Беликов и Гончарова 2012)

The authors have offered a hypothesis of Greek sculpture as a representation of a real-life anthropological type meaning that sculpture can bear the imprint of the "anthropological environment". This hypothesis is not original, with D. Pontikos, a Greek researcher, being among its advocates stating that anthropological peculiarities of Greek population of the antiquity have been preserved (URL:http://dienekes.blogspot.ru/), which does not contradict the paradigm of the conservative nature of the anthropological type. To prove his hypothesis, Pontikos offers composite portraits of Greek sculpture and a modern Greek person

Fig. 1 Composite portraits of Greek sculpture and a modern Greek person.

(Fig.1) put together by Perret's method (Perrett, May and Yoshikawa 1994).

Following this logic, we have created several composite "portraits" of Greek sculptures having grouped them according to the accepted classification of the Ancient Art periods. To achieve this, we chose front view photographs of sculptures (early VII – late IV BC). This period is characterized by the development of the Archaic style, formation and development of the Classic style and its transformation into the Hellenistic Art. Such composite portraits have been created with the aid of Adobe Photoshop by the method of emulation suggested by F. Galton (Galton 1879, Беликов, Гончаров и Гончарова 2014). It will not be difficult to notice that these composite portraits belonging to various historical periods demonstrate obvious differences. The differences can be accounted for not only by the change in the artistic workmanship, but also its anthropological content. Examination of the artistic image evolution from the Archaic to the High Classic period shows a significant change of the art image over a period of only 250 years (Fig. 2).

Provided the anthropological type is stable, such differences may prove that at first the statement of continuity of the anthropological type is false, or secondly that sculpture is not its direct reflection. This is where the question arise of what sculpture does reflect. It is logical to suppose that sculpture, apart from its dependency on the

Fig. 2 Composite portraits from different periods. 1 – The High Archaic; 2 – The Mature Archaic; 3 – The Severe Style; 4 – The High Classic.

real-life anthropological environment, demonstrates some and much more deeper dependency on cultural processes that took place in the given period. Greeks founded their art on the concept of "mimesis", i.e. emulation. At that, emulation did not represent simple nature copying, typical of the Romans. In the process of creation of an image, a Greek master always followed, to a certain extent, canons – widely adopted proportional systems. Thus, in our research we may single out two extremes, between which Greek visual artistry developed. The first extreme is the closest reproduction of the visible form. This thought finally leads to the idea of the direct use of a model. The second extreme is emulation of the ideal essence of an object, unchangeable and perfect, which is expressed through the numeric or proportional canon.

Besides these two methods of emulation, we also ought to bear in mind the creation of an artistic object, which implies that the final product of the sculptor's work is influenced by the artistic consciousness and perception typical of a historic period. This specific understanding is expressed in the choice of relevant and meaningful features of a person that the master tries to convey in the sculpture. Any visual perception is inseparable from the problem of recognition, where the style and manner appear as a specific discourse of such recognition. Sculpture and its prototype are separated by the personality of the artist being influenced by the whole system of stereotypes relating to structures of cognition and perception. The development of such structures determines the characteristic features of the human image of a particular historical period.

Common examples of such structures are:

The specific process of work with a model adopted at a given place and time, as well as each individual sculptor's interpretation of his work.

The level of artistic skills and technological possibilities along with the general level of technological development in the community.

Normative systems and rules regulating the creation of an artistic object (canons), as well as the artist's understanding of such canons.

Local nuances of artistic taste and master's personal esthetic preferences.

Master's personal visual experience revealing itself in the degree and quality of its influence on the image of a specific anthropological environment.

The appearance of first local canons, independent from the Egyptian ones, signified the watershed between the Archaic and the Classical periods in Greek Art. In the Classical and Early Hellenistic periods, there were several such canons, but the most important one is the earliest and most famous Poliklet's Canon. The renowned artist is believed to have developed an instructional text based on the system of Pythagorean geometric calculations. The text was a collection of proportions of the human body in relation to the height and one to another. The master created the famous statue of Doriphorus to illustrate his calculations. It is clear that application of such systems should result in unification of images and making these

images more general, non-concrete, idealised.

The creation of composite portraits made evident certain "ideal" images typical of each historic period (see Fig. 2). These obvious differences between the composite portrait of the Archaic and the Classical sculpture suggest that they can be described not only visually, but also with formal, statistical methods.

MATERIALS AND METHODS

Personal photographs of alabaster sculptures from the collection of the Munich Museum of Ancient sculpture replicas as well as photographs of the Archaic sculpture published by Gisela M. Richter (Richter 1942) were taken for the base. The total number of photographic images used were 177 in the front view and 60 in profile. All pictures were made according to the requirements of scientific research photography.

Damaged and obviously anatomically incorrect sculptures were excluded from the sample. As a consequence, all sculptures related to the Early Archaic period were also excluded because the level of artistic skills in that period could not provide the anatomical accuracy of statues.

Similarly, we did not include portraits of the Hellenistic and Roman periods into the sample, because we dedicated our research to the study of typical features in "ideal" images, not connected with the direct emulation of a model. New actualization of the idea of creation of "idealized" images in the Late Antiquity is closely linked with the Palmyra Art. For this reason, a series of Palmyra funeral portraits was used as a reference group, with which we decided to compare the whole set of images specific for earlier periods. This comparison was aimed at revelation of characteristic features of the image determined by canons and separation from those depending on the anthropological environment.

The material was grouped according to the conventional Art history classification:

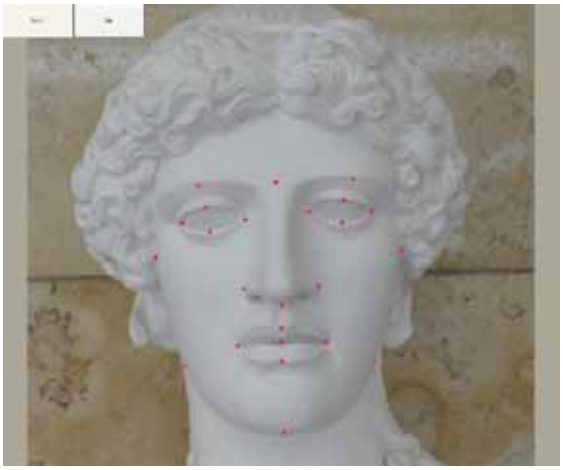

Fig. 3 Reference points for measurements.

High Archaic (570-525 BC)
Mature Archaic (525-490 BC)
Severe Style (480-430 BC)
High Classic (450-400 BC)
Late Classic (400-435 BC)
Hellenistic Art (325-30 BC)
Palmyra funeral portraits (II-III AD)

As mentioned earlier, statues of the Early Archaic period were not included in the analysis. Moreover, we combined the groups of Late Classic and Hellenistic periods in our statistical calculations, because their stylistic difference is rather vague. To sum up, 6 groups of photographs were analysed: "Archaic I" (corresponds to the style of the High Archaic period), "Archaic II" (Mature Archaic), "Severe Style", "High Classic" , "Late Classic", "Hellenistic" and "Palmyra portrait".

The authors would like to thank the Vocord Company, a provider of human face recognition software, for the opportunity to use their product adapted to our purpose. To obtain measurements using Vocord software, reference points were set on each image (Fig. 3), and distance, as well as angles between them, were measured. We also determined classical measurement characteristics conventional for the statistical analysis: morphological height of face (H1), height of upper face (H2), height of lower face (height of lower jaw), relative thickness of lips, the widest part of face (cheekbones, D1), lower jaw width (D2, bigonial

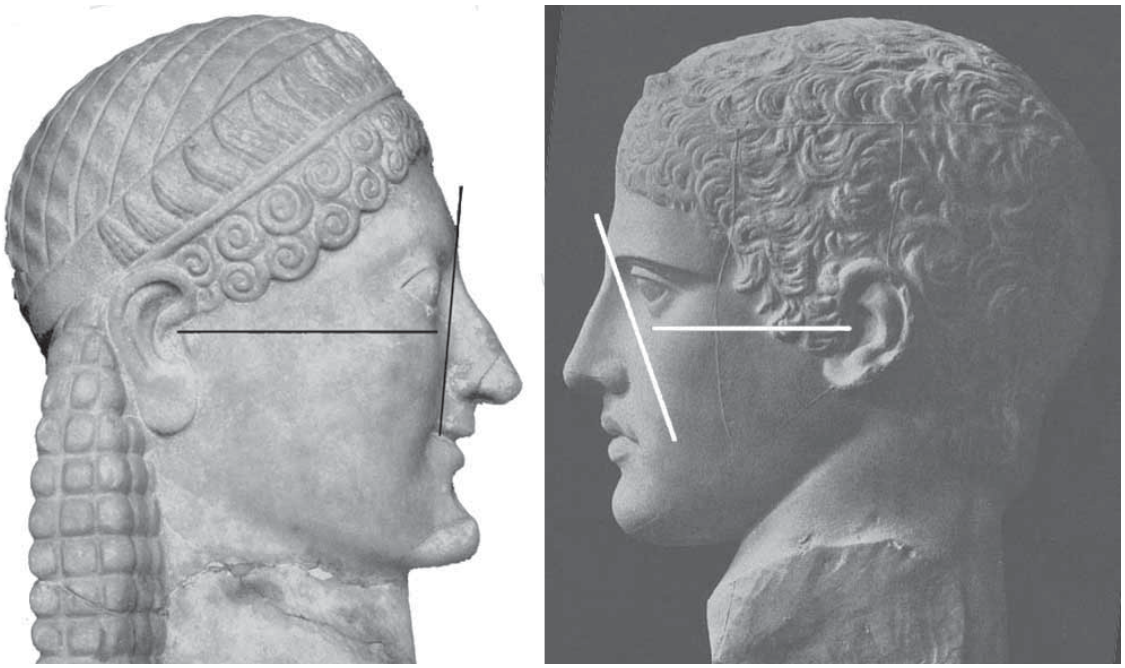

Fig. 4 Measurement of vertical profile of the orbit.

width)[1], nose width. Moreover, we calculated inclination angles of the right and left palpebral fissures. The only possible reference method was comparison of their proportions (indices), because all evaluated images were different in size. The following ratios were calculated: morphological index of face (H1:D1), index of upper face (H2:D1), as well as the relation of nose width to the cheekbone width of face and height of lips to morphological height of face. Thus, values for the relative nose width and relative thickness of lips were received. The total value of the angle between palpebral fissures was calculated based on inclination angles of the right and left palpebral fissures. This total value does not depend on the inclination of the image. Besides, two indices necessary for our research were calculated, namely, the index of face heights and the index of correlations of face widths. The first one is the ratio of the upper face height to the morphological face height (H2:H1).

It is evident that large values of this index correspond to proportional reduction of the lower jaw height in the total face height and vice versa, reduction of the index of face heights signifies increase of the lower level of face. The second index is the ratio of the width between the corners of the lower jaw to the cheekbone width of face (D2:D1, bigonial width: cheekbone width). The increase of this index corresponds to accretion of the width of the lower level of face, at that, the shape of the face becomes more rectangular. The decrease of D2:D1 index means decrease of the lower width of face in comparison with the cheekbone width, at that the face becomes more triangular.

We evaluated characteristics of the profile images that are not usually a part of the standard statistical software. However, we thought it might be interesting to compare the degree of convexity of the eyeball and the inclination angle of the orbits in sculptures of different historical periods. These characteristics are described by M. M. Gerasimov and, according to his study, they explain the difference between the Caucasian and Mongoloid groups. Thus, if the eyeball protrudes beyond the

1 The authors realize that the measurement of the width between the angles of the lower jaw in a picture is not identical to the measurement of this parameter on the real face, because in the front view the angles of the lower jaw are often not visible at all. However, this methodological assumption seems reasonable on the condition that only data obtained from sculpture images are subjected to the group comparison.

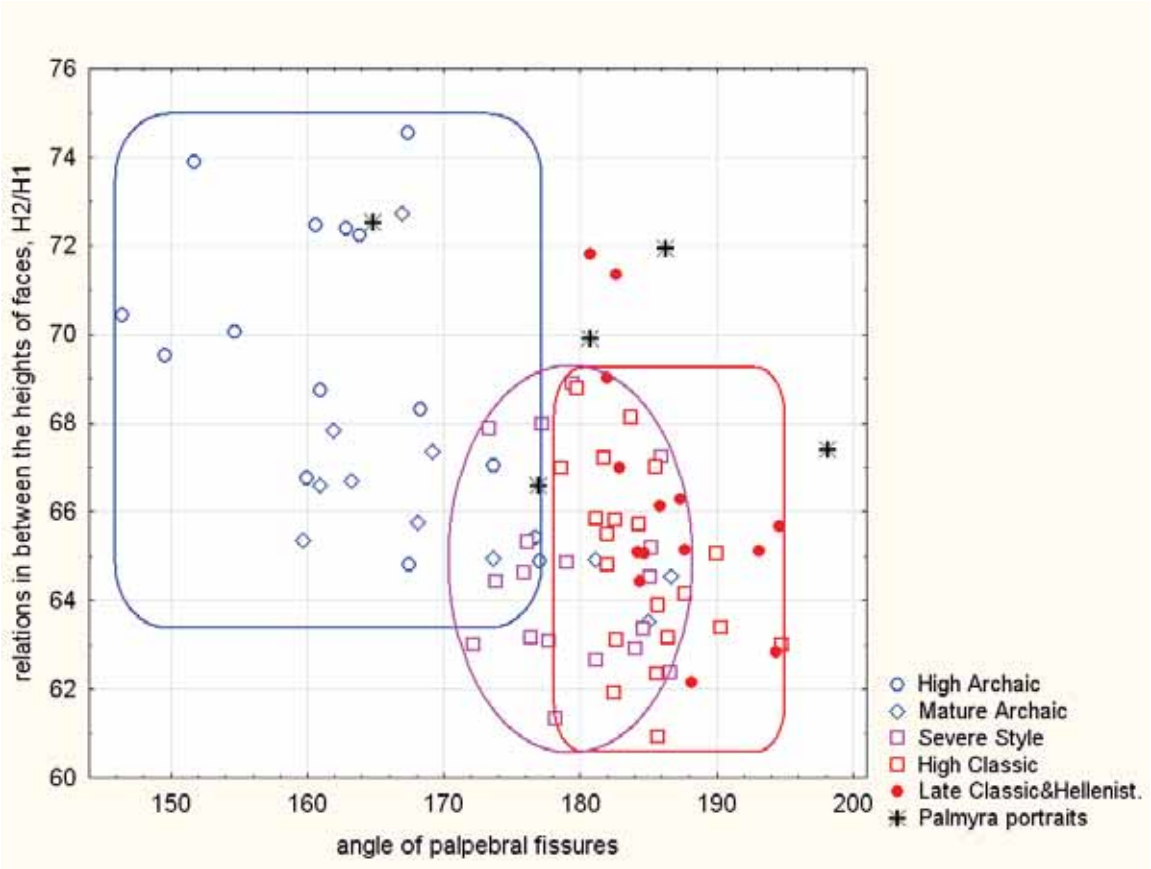

Fig. 5 The diagram of bivariate correlations. The positioning of samples in the space of two characteristics. Male sculpture, division into six periods.

frontal surface of the orbit, it evidences the open structure of the orbit, which is typical of Mongoloid groups (Fig. 4.)

Contrary to the abovementioned, a deeper placement of the eyeball corresponds to the enclosed type of orbits, which is typical of the Caucasian groups (Герасимов 1955:74.) This characteristic was evaluated on the binary scale as "present-absent". On the profile images of the face, we may notice one more characteristic feature separating race groups – the orbit profile. M.M. Gerasimov singles out two types of orbit positioning: vertical, more typical of Mongoloids, and inclining, typical of Caucasians (Герасимов 1955: 75-76) With the vertical orbit positioning, the angle between the German horizontal and the frontal surface of the orbit is close to right (and, in some cases, becomes acute), while with the inclining orbit positioning, the angle is blunt (Fig. 4). These observations were confirmed by the latest research. So, V.Bakholdina established reliable differences between Caucasians and Mongoloids on these characteristics. She stated that greater openness of Mongoloid orbits manifests itself in the lesser value of external hollows and their vertical profile is less than that of Caucasians (Bakholdina, 2002: 23-24). The angle of orbit inclination, corresponding to the angle between the German horizontal line and the line connecting the upper edge of the orbit and the most protruding point of the cheekbone, was measured in degrees in Adobe Photoshop.

The received indices and values became main characteristics of the examined faces and were later used in the statistical analysis of the material. The analysis of sculpture was conducted according to the same principles as in conventional anthropology, i.e. male sculptures were assessed separately

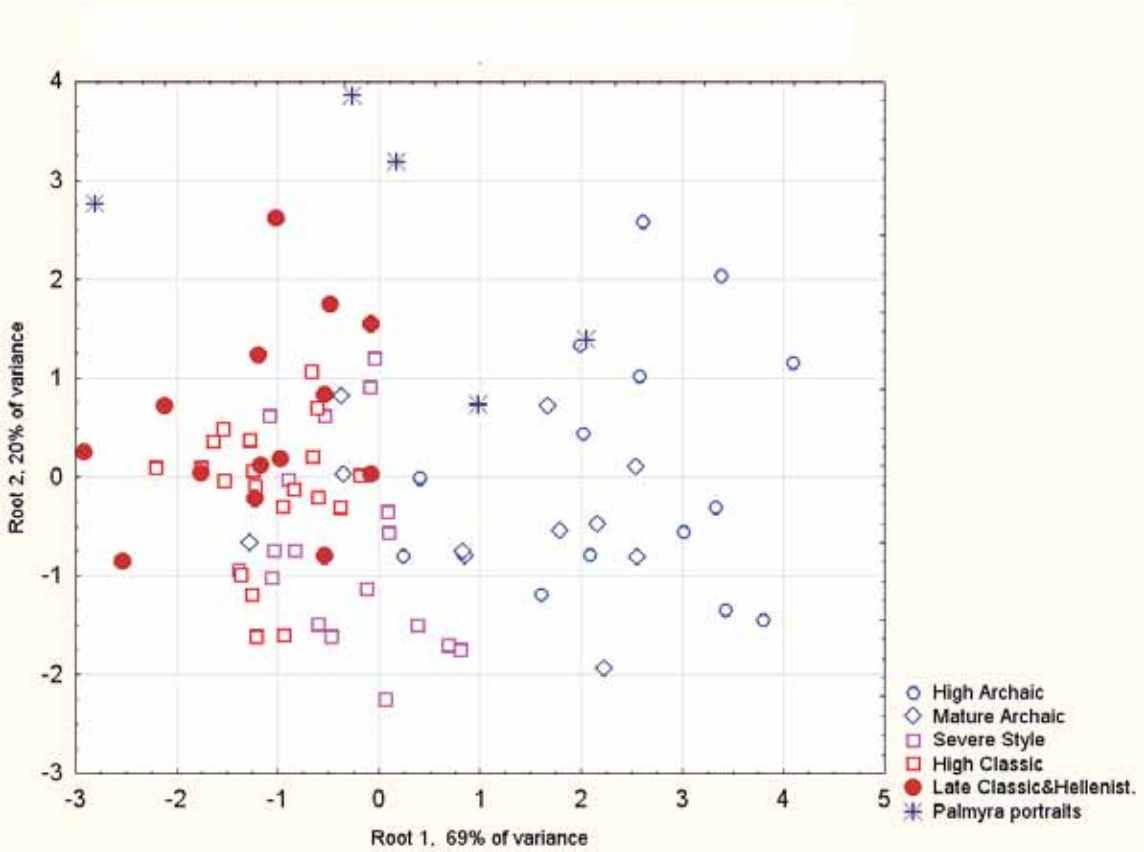

Fig. 6 Positioning of sculpture samples in the space of canonical variables. Male sculpture, division into six periods.

	period of Art style	vertical profile of the orbit	convexity of the eyeball
period of Art style	1	0.68	-0.59
vertical profile of the orbit	0.68	1	-0.61
convexity of an eyeball	-0.59	-0.61	1

Table 1. Correlations between the period of art, the vertical profile of the orbit and convexity of the eyeball

from female ones. We applied standard statistical procedures to determine the differences between faces of various historical periods: Student's t-test and Hoteling's T-square distribution test, analysis of variance and discriminant analysis.

RESULTS AND DISCUSSION

The analysis of variance was used for selection of characteristics demonstrating reliable differences between the groups. Among such characteristics are: the angle between palpebral fissures, the ratio between heights of face, the ratio between widths of face, and thickness of lips. The diagram reflecting placement of individual samples in the space of two characteristics was plotted to illustrate the most expressed differences on these parameters: the angle of inclination of palpebral fissures and correlation of heights of face (Fig. 5.) The diagram demonstrates distinct differences in these characteristics between the Archaic as well as High and Late Classic groups. At that, there is no transgression between, for instance, the High

Fig. 7 From left to right: Archaic, Severe Style, High Classic, Hellenistic, Palmyra sculpture.

Archaic group (Archaic I) and the High Classic at all, while only three samples out of "Archaic II" fall into the zone of compact placement of classic sculptures. The "Severe Style" group, as was expected, takes an intermediate position between two such isolated conglomerates. As for Palmyra funeral portraits, the eye placement tends to the Greek Classic period, although the correlation between the heights of face drifts towards the Archaic sculpture. It is worth noting that the patterns discovered as a result of such a simple analysis of only two characteristics were later confirmed by multivariate methods as well.

The application of the discriminate analysis[2] for male sculptures using six stylistic groups conventionally selected in the history of art resulted in data plotted in Fig. 6. According to the first canonical variable (Root 1), the groups were separated by a complex of characteristics including the eye inclination angle, lip thickness and index of face widths. A lesser value of angle of inclination of palpebral fissures correlated with a lesser value of lip thickness and a greater index of face widths. It may be illustrated as follows: the outer corner of eye is higher than the inner, thin lips, with the shape of face being more rectangular. Along the x-axis, the Archaic sculpture is considerably isolated from the rest with only a few samples falling in to the space of the Classic sculpture.

The second canonical variable (Root 2) divides the groups according to the complex of characteristics including the ratio of heights of face (H2:H1), the angle of orbit inclination and lip thickness. It is evident that the dividing characteristics are repeated, while the leading role in the division of samples on the second parameter is played by the correlation of heights of face, which essentially defines the correlation of the levels of face. Relatively small values of the angle between palpebral fissures (the direct placement of orbits of slightly inclined towards the centre) are typical of samples with the heavy lower jaw and relatively thick lips. The maximum differences on this vector (y-axis) are found in certain samples of the Severe style (the lower part of the coordinate space) and the Palmyra funeral portrait (the upper part of the space). The remaining groups are more or less evenly distributed between these extremes. Summing up the differences on both axes, it is possible to say that on the right side of the space, there are samples with the rectangular face, thin lips and slanted eyes (the outer corner higher than the inner), at that, in the lower part of the space, the lower jaw is heavier and lips are thicker. On the left side of the space, the correlation of the characteristics is reverse: faces are more triangular with relatively thick lips, with the outer corner of the eye being lower than the inner one. At the same time, as in case with the right side of the space, samples with the high lower level of face are placed in the lower part of the plot, which in fact corresponds to the heavy lower jaw. Fig. 7 demonstrates the most more typical images of each period.

2 Discriminant function analysis is used to determine which variables discriminate between two or more naturally occurring groups. A biologist could record different characteristics of similar types (groups) of objects, and then perform a discriminant function analysis to determine the set of characteristics that allows for the best discrimination between the types.

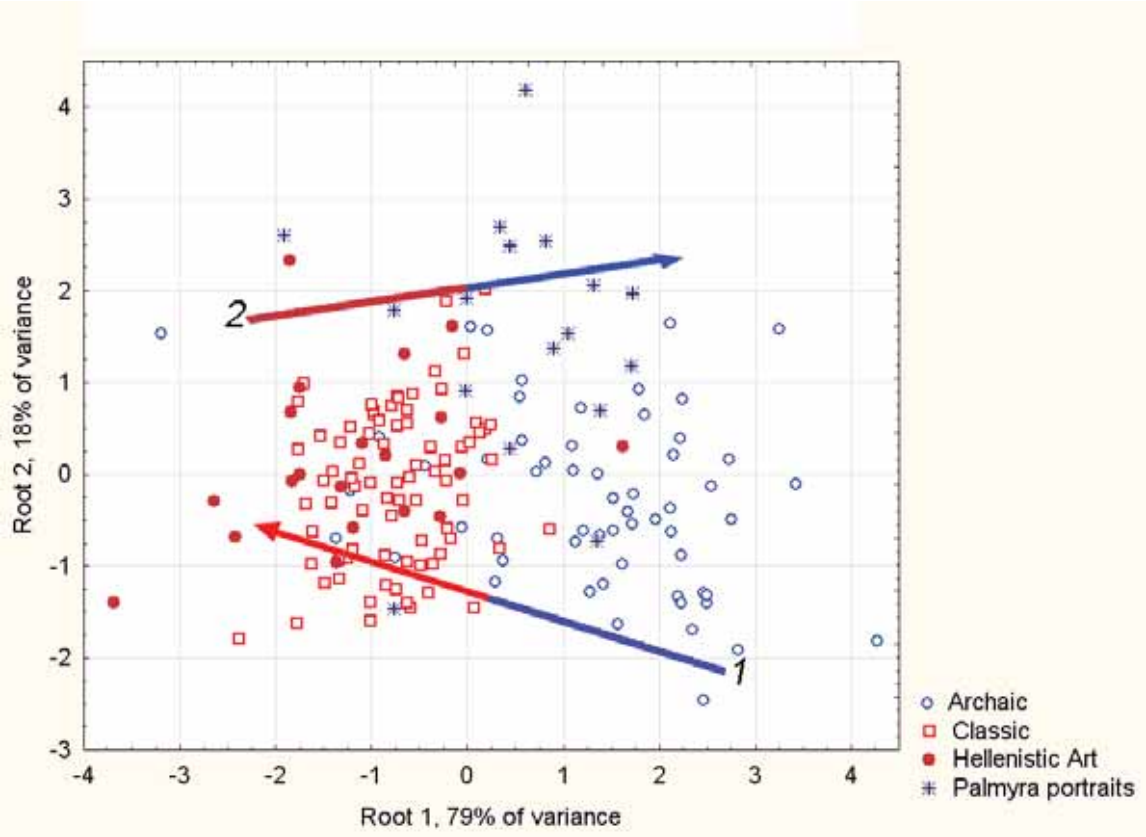

Fig. 8 The positioning of the pooled sample in the space of the first two roots.
The arrows show how systems of visual methods changed from period to period: the first arrow is from Archaic to High Classic and Hellenistic, the second is from High Classic and Hellenistic to Palmyra funerary sculpture.

Thus, the division of the examined groups is reliable, and defined complexes of characteristics are clearly visualized. More general grouping of the material with only 4 groups (Archaic, Classic, Hellenistic and Palmyra portrait) demonstrates the same patterns. The same approaches were applied to the analysis of female sculptures. The results of division are somewhat less clear, but dividing characteristics are the same, and patterns of group differentiation remain constant regardless of the grouping principle – six or four style periods. This fact (the same patterns of intergroup variability) substantiated our deviation from the conventional anthropological principle of separate analysis of male and female samples and performance of the pooled sample analysis comprising all investigated models of sculpture.

The results of the discriminant analysis are depicted in Fig. 8. Examination of the pooled sample enabled observation of the main artistic trends in creating an image of the human face in the specified historical periods. First of all, it is necessary to underline greater density of placement of the Classic sculpture in the diagram as opposed to the Archaic sculpture. At that, such compactness is observed both on the x- and y-axes. It is easy to suggest that such low variability of face proportions in the Classic sculpture is primarily explained by rigid regulations in depicting the human face, which leads to unification of the form. The second interesting fact is presence of two contradictory trends in development of the sculpture form. During the transition from the Archaic to the Classic sculpture, a shift in proportions, apart from decrease of variability can be observed: the face tends to become more triangular, with the face lower level becoming higher (especially in the Severe samples), lip thickness increases, and

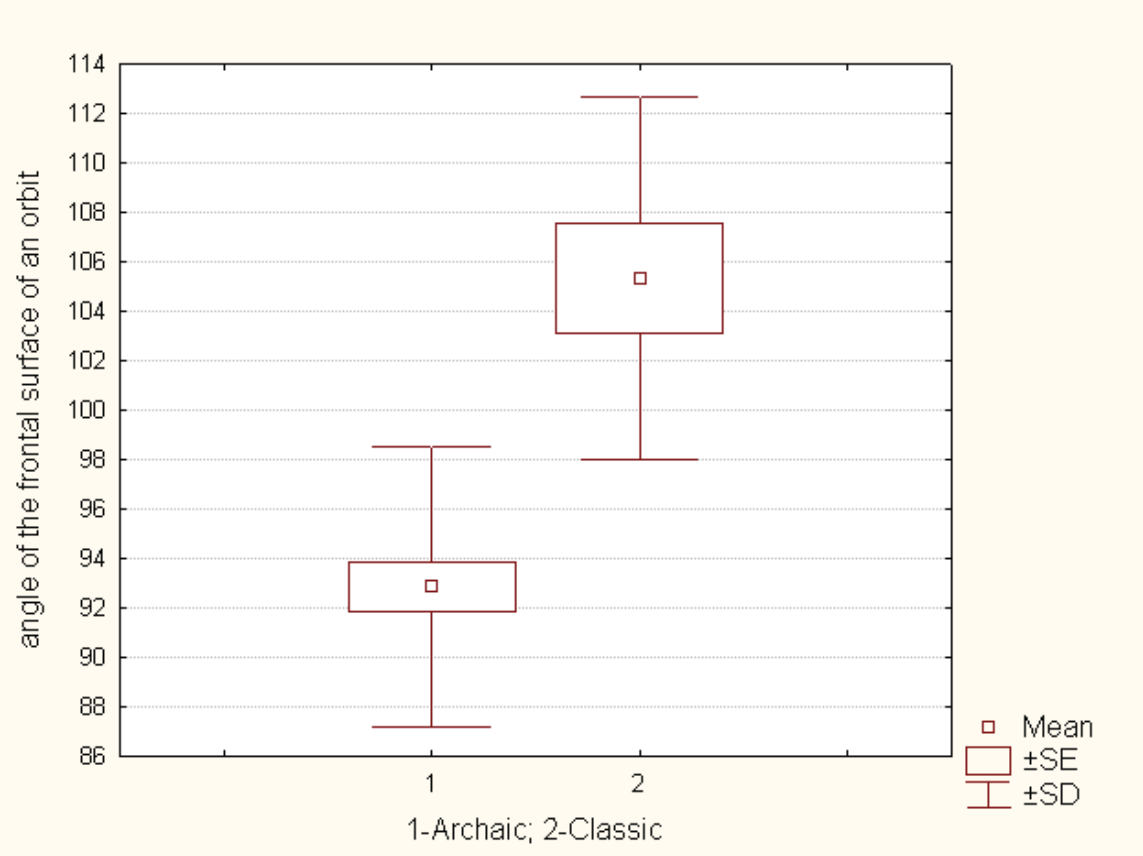

Fig. 9 Values of inclination angles of the orbit. Results of t-test are statistically significant. 1 – Archaic period. 2-Classic period.

eyes acquire the specific "weeping" expression on account of principally different inclination of palpebral fissures. This tendency in its ultimate expression results in creation of the Hellenistic images occupying the most left positions in the field of coordinates in Fig. 8.

However, deviation from the abovementioned tendency occurs simultaneously, that is why a part of Hellenistic sculptures and, particularly, Palmyra funeral portraits return to the system of proportions characteristic for the Archaic sculpture. In other words, the face becomes more rectangular, lips thinner, and the lower level of the face decreases. As for the position of palpebral fissures, the Palmyra sample contains exemplars with both types of frontal eye placement, i.e. faces with higher outer eye corner in comparison with the inner one, but opposite variants are also presented. It should be noted that the study was particularly focused on the placement of palpebral fissures because this characteristic feature has become one of the most reliable markers in dividing different periods in the ancient sculpture. Along with that, in classifications of races the attention is also paid to the position of eyes, because the inclination of palpebral fissures is evidently connected with the degree of horizontal profile of the face: the lesser the angle of horizontal profile, especially at the orbit level, the more probable is lower placement of the outer corner of the eye in relation to the inner one.

As the eyes are particularly important features in the system of characteristics defining artistic expression of the image, we paid special attention to this area of the face. The transition from the Archaic to the Classic periods was accompanied by a shift in the relative placement of the outer and inner corner of the eye. It is not difficult to notice that Greek sculptures of different historical peri-

ods (meaning styles) have a different structure of the cheekbone area. Archaic sculptures can be differentiated by a slightly greater convexity of the cheekbones forward, which creates the impression of a slightly flat face. Moreover, on the faces of Archaic sculptures the eyeball protrudes forward compared with the plane of the face. Ancient artists were able to convey this peculiarity perfectly depicting a slight swelling in the area of the upper eyelid. These characteristics could not escape our attention. It is established that the angle of the vertical profile of the orbit on the profile image (Fig. 4) can be reliably discriminated in sculptures of different periods (Fig. 9). The Classic sculpture has the angle of orbit inclination shifted to greater values. It means that in the Classic sculpture the cheekbone protrudes far less. The reason for faces appearing flatter is that sculptures of the Archaic period have protruding cheekbones. The correlation analysis showed presence of non-random correlations of the middle level between the vertical profile of the orbit and the degree of eyeball protrusion evaluated as a binary parameter: convexity – 1, lack of convexity – 0 (Table 1).

The data shows that the vertical profile of the orbit characteristic for the Archaic sculpture is connected with the presence of swelling of the upper eyelid, and, vice versa, – greater angles of the vertical profile of the orbit (Classic sculpture) correlate with its absence. It is necessary to note that the eye area structure could have been out of regulations according to the canon. In any case, extant evidences of the canon do not contain instructions on how to depict the eye area.

It enables supposition that, as opposed to face proportions, the considered characteristics of the eye area, most likely, reflect a shift of the anthropological image of the population. At that, Archaic sculptures unexpectedly recreate anthropological peculiarities typical of the Asian race: high rounded orbits (arched eyebrows) with lesser external hollows (open form of the orbit) and swelling of the upper eyelid. These features are very representative for the Archaic type, and differences between the Classic and the Archaic types are statistically significant. Asian features in the facial structure of the ancient Greek population do not look realistic, and for this reason it is possible to suggest that these non-Greek features in the Archaic face reflect some anthropological peculiarities of a pre-Greek population of the region retained after the hellenisation of Greece and Asia Minor for a considerable period of time. These features are mentioned by some ancient writers. We would like to quote Polemon's (I-II AD) description of Ionic Greeks (according to Herodotus, Ionic Greeks, Athenians in particular originate from the Pelasgians): "…their men are rather tall with broad shoulders, handsome, well-built and rather fair-skinned. Their hair is not quite fair, relatively soft and slightly wavy. Their faces are broad with high cheekbones, thin lips and straight nose. Their eyes are bright and full of fire." This ancient "verbal portrait" is in many ways a reflection of the Archaic sculpture.

CONCLUSION

Anthropological methods are able to pinpoint typological peculiarities of sculptures of different historical periods. To the great extent, these differences are manifested in the inclination of palpebral fissures, correlation of heights and widths of the face and relative thickness of lips. At the same time, the variability of face proportions in the Archaic sculpture is higher than in the Classic period, which is explained by appearance and wide distribution of the proportional canon. The revealed differences may be accounted for by the application of the proportional systems rather than by the anthropological environment.

The scope of data analysis in combination with the historical study of development of the ancient art enables determination of characteristics of the image pertaining to canonical proportions and separate features outside the canon.

The degree of convexity of the eye and the vertical profile of the orbits appears to be not included

in the proportional characteristics of the canon because of the complexity of formalisation. Changes of these characteristics in various periods may be tentatively explained by the influence of the anthropological environment as well as peculiarities of artistic taste. These characteristics are connected both with each other and simultaneously with the period by moderate correlations.

The stability of reproduction of these characteristics on a large territory and for a considerable period of time suggests the artistic image being influenced by the existing anthropological environment of the period. The change of the image at the turn of the VI-V centuries BC probably reflects the shift in the anthropological type that took place in the distant past. For a number of reasons, this shift was actualized in art significantly later.

The obtained data analysis allows us to hypothesize existence of a pattern in the development of the artistic form not connected with the human image and not reflecting a concrete anthropological type. The study of idealized images of the human face (not connected with copying a model) demonstrates extreme closeness of Palmyra funeral images to the proportional model characteristic for Greek Archaic images. At that, proper anthropological characteristics of the image (structure of the orbital area) indicate to the number of considerable differences between the Palmyra portrait and Greek Archaic sculpture, which can probably be explained by the difference between anthropological types of Peloponnese population in IV-V centuries BC and the Roman province of Syria in the second and third centuries BC and to AD. The above stated is of principal importance because the full scope of considered images, despite being attributed to different historical periods and geographical regions, is integrated by common Greco-Roman artistic tradition. The revealed tendencies and patterns represent the tendencies and patterns of cultural development of the greatest civilization regarding as the foundation of today's European artistic tradition.

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URL:http://dienekes.blogspot.ru/
date of the application to electronic resources 01.02.2016

REZIME
GRČKI PORTRET. ANTROPOLOŠKA ANALIZA ANTIČKE GRČKE SKULPTURE

KLJUČNE REČI: GRČKA SKULPTURA, PROPORCIJE LICA, EVOLUCIJA UMETNIČKE SLIKE.

Članak je posvećen izučavanju mogućnosti korišćenja antropoloških metoda za identifikaciju uzoraka vajarskih dela. Autori su koristili grčku arhaičnu i klasičnu skulpturu pošto je već izučavana i može da pomogne u proučavanju nove metodologije istraživanja. Pretpostavlja se da je grčka skulptura prikaz stvarnog antropološkog tipa. Za testiranje hipoteze izmereno je više od 150 uzoraka grčke skulpture. Sa druge strane namera ovog rada je da se otkrije mehanizam evolucije grčke skulpture iz različitih vremenskih perioda. Odvajanje antropoloških karakteristika od onih koje odražavaju kulturne obrasce i trendove, kao što su kanon, izuzetno je problematično. Ipak, primena antropoloških metoda za analizu umetničkih predmeta stvara novu metodologiju i otkriva tendencije u razvoju slike. Studija nam omogućava da odvajamo karakteristike koji su povezane s kanonom od antropoloških karakteristika kao što su strukture periorbitalnog prostora i horizontalni profil lica. Stabilnost reprodukcije ovih funkcija kroz vreme i prostor ukazuju da postoji uticaj na slike iz realnog antropološkog okruženja. Promena slike u toku prelaza od arhaičnog do klasičnog doba verovatno odražava promenu antropološkog tipa koji se dogodio u dalekoj prošlosti.

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RANSOMWARE THREAT TO INFORMATION SYSTEMS

ABSTRACT

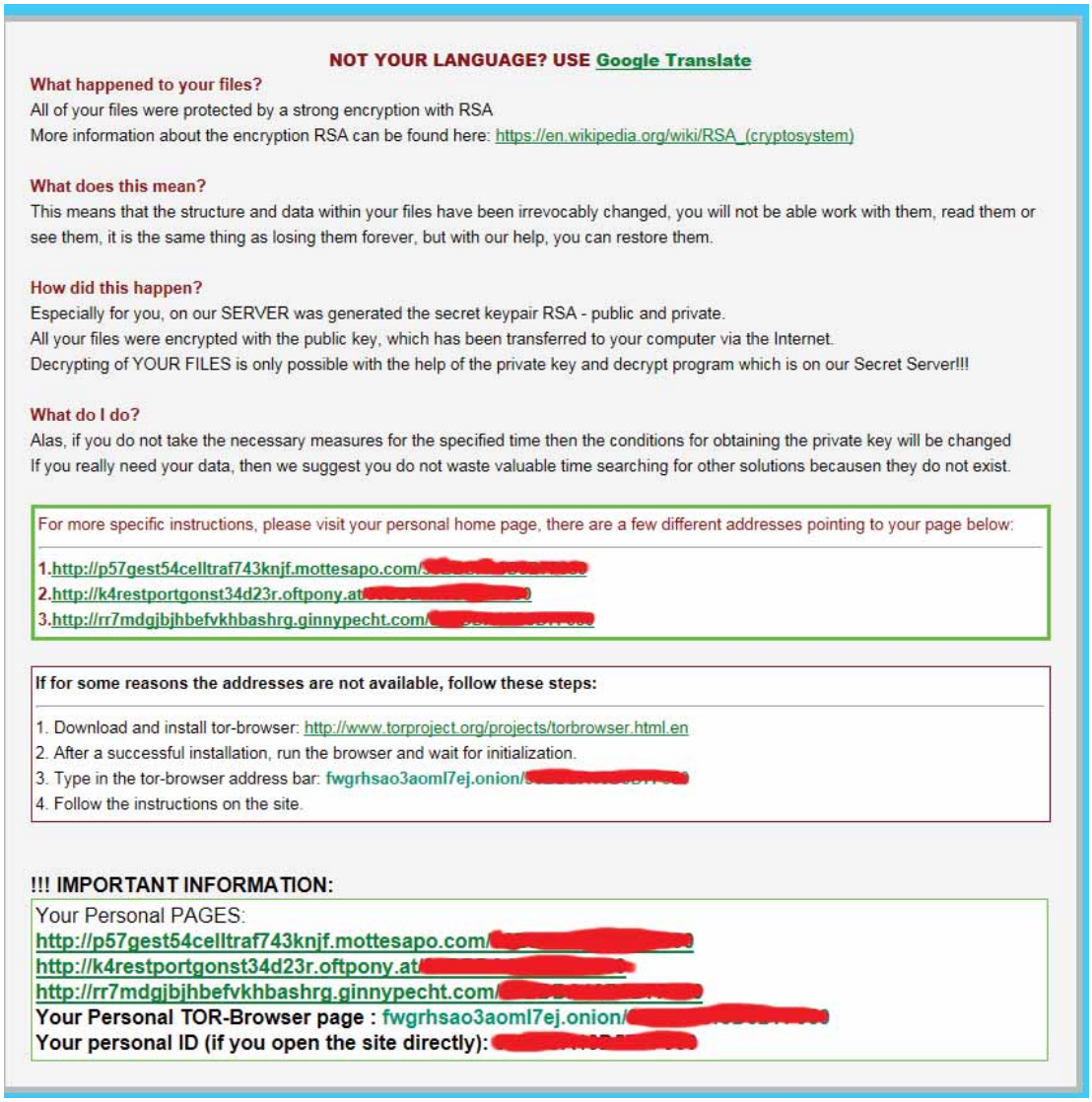
Although a few years ago, it existed as a random threat, crypto ransomware now represents one of the biggest threats in the Internet, endangering data security on operating systems. New technologies, initiating the beginning of mobile communication, the appearance of virtual currenciesand TOR net, formed an environment that enabled ransomware to become even more dangerous. This invasive ransomware, coming in different variations and combinations [Chechik et al. 2016] (Cryptolocker, HydraCrypt, DMA Locker, The Locky, TeslaCrypt 3.0, CryptoWall, The CoinVault, Bitcryptor, TorrentLocker, SynoLocker, Pletoretc.) is now growing, leading to a huge number of infected computers and servers with a Windows environment at providers, organisations, but also in households. In this paper, reliable ways are described to avoid or mitigate the serious damage that can be caused by these malicious threats. Further on, this paper also contains the legal aspects of making and loading malicious crypto ransomware program to a computer.

KEYWORDS: RANSOMWARE, CRYPTO RANSOMWARE, MALICIOUS PROGRAM, INFORMATION SECURITY, SECURITY THREATS, VIRUS THREATS.

MALICIOUS CRYPTO RANSOMWARE PROGRAM[1]

CryptoLocker, or some of its variants, represents a malicious program, belonging to the crypto file type of ransomware. This type of malicious program, or virus, encrypts documents that are placed on an exposed computer system, by using long keys, for example RSA-2048 or RSA-4096, with the encryption algorithm AES CBC 256-bit. After performing document encryption, a window appears on the operating system offering data decryption, but only after a sum of several Bitcoins, actually around $500, is paid within the

1 The article results from the project: *Viminacium, Roman city and military camp – research of material and non- material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalization and 3D visualization* (no 47018), funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.



NOT YOUR LANGUAGE? USE Google Translate

What happened to your files?
All of your files were protected by a strong encryption with RSA
More information about the encryption RSA can be found here: https://en.wikipedia.org/wiki/RSA_(cryptosystem)

What does this mean?
This means that the structure and data within your files have been irrevocably changed, you will not be able work with them, read them or see them, it is the same thing as losing them forever, but with our help, you can restore them.

How did this happen?
Especially for you, on our SERVER was generated the secret keypair RSA - public and private.
All your files were encrypted with the public key, which has been transferred to your computer via the Internet.
Decrypting of YOUR FILES is only possible with the help of the private key and decrypt program which is on our Secret Server!!!

What do I do?
Alas, if you do not take the necessary measures for the specified time then the conditions for obtaining the private key will be changed
If you really need your data, then we suggest you do not waste valuable time searching for other solutions becausen they do not exist.

For more specific instructions, please visit your personal home page, there are a few different addresses pointing to your page below:
1.http://p57gest54celltraf743knjf.mottesapo.com/
2.http://k4restportgonst34d23r.oftpony.at
3.http://rr7mdgjbjhbefvkhbashrg.ginnypecht.com/

If for some reasons the addresses are not available, follow these steps:

1. Download and install tor-browser: http://www.torproject.org/projects/torbrowser.html.en
2. After a successful installation, run the browser and wait for initialization.
3. Type in the tor-browser address bar: fwgrhsao3aoml7ej.onion/
4. Follow the instructions on the site.

!!! IMPORTANT INFORMATION:

Your Personal PAGES:
http://p57gest54celltraf743knjf.mottesapo.com/
http://k4restportgonst34d23r.oftpony.at/
http://rr7mdgjbjhbefvkhbashrg.ginnypecht.com/
Your Personal TOR-Browser page : fwgrhsao3aoml7ej.onion/
Your personal ID (if you open the site directly):

Fig. 1 File content of recovery+xxkji.html

following 48, 72 or 96 hours, depending on the ransomware variant. Of course, the longer one waits, the more files will be encrypted and the blackmail sum will increase. After exposing computer systems and encrypting files, in cases of ransomware of the TeslaCrypt type (TeslaCrypt v3, Trojan.Cryptolocker.N), information will appear on the desktop in the form of pop-up windows .txt, .png and .html types (recovery+xxkji.html, recovery+xxkji.png, recovery+xxkji.txt), indicating that computer files have been encrypted. These three files will be positioned on computer systems in each folder in which files have been encrypted. These databases contain information about what happened to users' documents, the ways of purchasing the keys necessary to decode the data, as well as links with payment instructions and hints about decoding the documents. The content of all of the three files is the same and is shown in Fig. 1.

All of the encoded documents (images, video files and other personal documents) will possess a new extension, depending on the ransomware type (Teslacrypt, depending on its version, adds encrypted extensions .mp3 **.XXX,** .**TTT, .MICRO, .aaa**, .xyz, .zzz; CryptoLocker adds encrypted extension .7z; Locky adds encrypted extension .locky. CryptoWall does not add an extension

Fig. 2 One of the .js exploited versions that appeared between 11th and 22nd March 2016.

whilst DMA Locker does not add extension to the encrypted file, but adds an identifier in the header of the encrypted file **[unique_id][identifier]. locky** [Abrams 2016]). Documents that can be encrypted by malicious ransomware, depending on its type, are as follows [Pilici 2015]: *.mp4, .mp3, .7z, .m4a, .csv, .d3dbsp, .sie, .sum, .ibank, .t13, .t12, .qdf, .gdb, .tax, .pkpass, .bc6, .bc7, .bkp, .qic,*

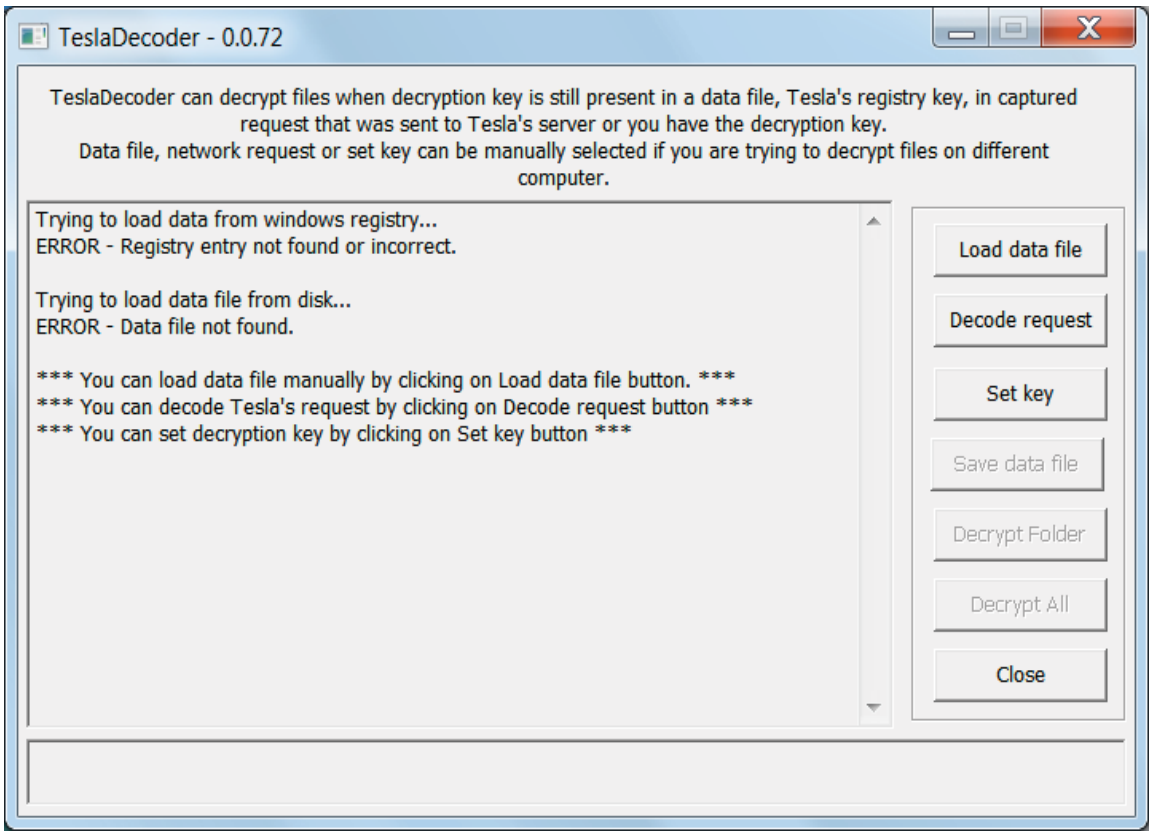
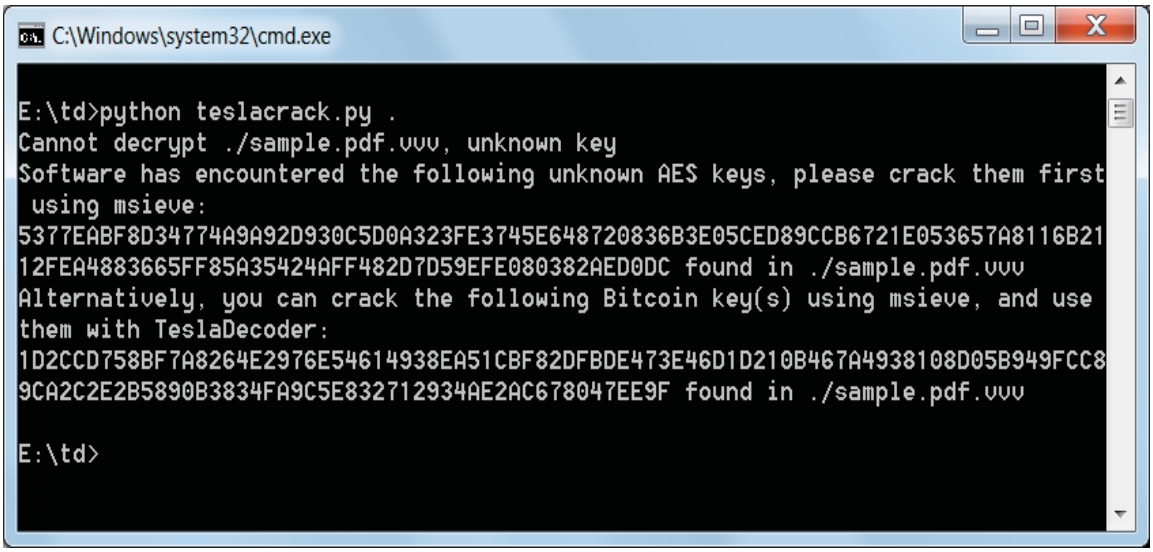


Image BloodDolly TeslaDecoder Source:
(http://www.bleepingcomputer.com/news/security/teslacrypt-decrypted-flaw-in-teslacrypt-allows-victims-to-recover-their-files/)

.bkf, .sidn, .sidd, .mddata, .itl, .itdb, .icxs, .hvpl, .hplg, .hkdb, .mdbackup, .syncdb, .gho, .cas, .map, .wmo, .itm, .sb, .fos, .vdf, .ztmp, .sis, .sid, .ncf, .menu, .layout, .dmp, .blob, .esm, .vcf, .vtf, .dazip, .fpk, .mlx, .kf, .iwd, .vpk, .tor, .psk, .rim, .w3x, .fsh, .ntl, .arch00, .lvl, .snx, .cfr, .ff, .vpp_pc, .lrf, .m2, .mcmeta, .vfs0, .mpqge, .kdb, .db0, .dba, .rofl, .hkx, .bar, .upk, .das, .iwi, .litemod, .asset, .forge, .ltx, .bsa, .apk, .re4, .sav, .lbf, .slm, .bik, .epk, .rgss3a, .pak, .big, wallet, .wotreplay, .xxx, .desc, .py, .m3u, .js, .css, .rb, .p7c, .p7b, .p12, .pfx, .cer, .der, .x3f, .srw, .pef, .ptx, .r3d, .rw2, .rwl, .raf, .orf, .nrw, .mrwref, .mef, .erf, .kdc, .dcr, .cr2, .crw, .bay, .sr2, .srf, .arw, .3fr, .dng, .jpe, .cdr, .indd, .ai, .eps, .pdd, .wb2, .rtf, .wpd, .dxg, .xf, .dwg, .pst, .accdb, .ppt, .xlk, .xls, .wps, .doc, .odc, .odm, .mid, .wma, .flv, .mkv, .mov, .avi, .asf, .mpeg, .vob, .mpg, .wmv, .fla, .swf, .wav, .qcow2, .vdi, .vmdk, .vmx, .gpg, .aes, .arc, .paq, .tar.bz2, .tbk, .bak, .tar, .tgz, .rar, .zip, .djv, .djvu, .svg, .bmp, .png, .gif, .raw, .cgm, .jpeg, .jpg, .tif, .tiff, .nef, .psd, .cmd, .bat, .class, .jar, .java, .asp, .brd, .sch, .dch, .dip, .vbs, .asm, .pas, .cpp, .php, .ldf, .mdf, .ibd, .myi, .myd, .frm, .odb, .dbf, .mdb, .sql, .sqlitedb, .sqlite3, .asc, .lay6, .lay, .ms11 (security copy), .sldm, .sldx, .ppsm, .ppsx, .ppam, .docb, .mml, .sxm, .otg, .odg, .uop, .potx, .potm, .pptx, .pptm, .std, .sxd, .pot, .pps, .sti, .sxi, .otp, .odp, .wks, .xltx, .xltm, .xlsx, .xlsm, .xlsb, .slk, .xlw, .xlt, .xlm, .xlc, .dif, .stc, .sxc, .ots, .ods, .hwp, .dotm, .dotx, .docm, .docx, .dot, .max, .xml, .txt, .uot, .pdf, .stw, .sxw, .ott, .odt, .pem, .csr, .crt, .key, wallet.dat, .3g2, .3gp, .c, .gz, .sh,

According to reports by the leading global antivirus companies, most ransomware begins its distribution through phishing attacks, eventually becoming more and more sophisticated, building itself precisely and in a focused manner, in the victim's local language. This malicious program can be found either as an attachment, as an executive file or through a macro virus in a document.



Googulator **TeslaCrack Python Script** Source (http://www.bleepingcomputer.com/news/security/teslacrypt-decrypted-flaw-in-teslacrypt-allows-victims-to-recover-their-files/)

An interesting fact is that if the virus came with the aid of a spam phishing technique, with an attachment as an executive file, the icon appearing to a user on a Windows system is a PDF document [Hassell 2013]. One of the reasons is that in the system, by default, an option "hidden extensions for known file type" is switched on. When, at the end of malicious file name, a malicious attacker adds .pdf (ime.pdf.exe), Windows hides the known .exe extension and the user is deceived into thinking that it is a PDF file from a known sender. This is one of the ways used by encryption ransomware to reach computer systems. The second way it is spread was described by Lawrence Abrams [Abrams 2016]. According to him, this malicious ransomware can be installed on a user's system with the assistance of a malicious macro. For example, an email message containing the "Subject" type:

To: Petar Jovanovic

Subject: Bill number 366

Attachment: name_fajl.doc

Body: Please look at the attachment containing bill to be paid. Detailed specification is contained in the bill.

In other words, the attachment name_file.doc is actually the malicious Word document. When the document is opened, the text will be illegible (although there are variants when the text is legible) and a message will appear on the document, saying that it is necessary to enable a macro in order to make the text legible [Abrams 2016]. Windows will give a warning in the form of Protected View "*Be careful - email attachments can contain viruses. Unless you need to edit, it's safer to stay in Protected View*". The very moment the user enables this malicious macro, the downloading process of the malicious ransomware and the execution from a remote server begins, encrypting those documents with the mentioned extensions.

It should be noted that, in March 2016, an enormous quantity of spam appeared, containing an attachment in java script, with an extension .js. It is specific that until 16th March 2016, none of the known antivirus packages recognised it. The aforementioned .js attachment was of a small size, only 7kb, and appeared to contain only simple text, but it was executed in such a way that the computer would become contaminated [Chechik et al. 2016] [Mendrez 2016].

We should remind ourselves that, on the Internet, there are servers distributing malicious content and, sometimes, it is enough just to click an advertisement for our computer to be contaminated[2].

2 http://www.securitycentral.org.nz/cybersecurity-for-home-internet-users/dealing-with-cryptolocker-ransomware/, accessed on 5th January 2016.

It is worrying that certain encryption ransomware (Locky ransomware) can scan all the local drives, and mapped and unmapped shared net resources, aiming to encrypt documents on them [3] [4]. By encrypting all the documents on the NAS server from a remote server,3 certain ransomware (SynoLocker ransomware) targets NAS (network attached storage) devices and uses the vulnerability of non-updated versions of NAS servers. The trend of accessing and encrypting shared resources with ransomware is expected to continue. This is why extra attention should be paid to licenses when it comes to shared resources, especially those with open shared access, and limit them, in accordance with one's business environment, to the minimum level allowed. Furthermore, there is a danger for data encrypted on a computer to become synchronised with some cloud resources, such as Dropbox and Onedrive, making it possible for data on them to become encrypted.

In addition to, and as a part of, the encryption process, later versions of encryption ransomware also delete the create option and delete all the Shadow Volume copies, as well as copies of the Volume restore on a computer system, in order to prevent the later recovery of a user's documents. To prevent the automatic backup of the Windows volume, they execute the following commands [Cheng 2014]:

-vssadmin.exe Delete Shadows /All /Quiet

Additionally, commands are executed that disable the Windows error recovery startup window:

-bcdedit /set {default} recoveryenabled No

-bcdedit /set {default} bootstatuspolicy ignoreallfailures

In addition, a malicious program will attempt to disable services related to protection, Windows update and information about errors, in order to avoid detection on the system: wscsvc, WinDefend, wuauserv, BITS, ERSvc, WerSvc [Cheng 2014].

PREVENTIVE MEASURES

- Turn on DEP (related to the entire system) - *system properties - performance - settings- data execution prevention - turn on*

- Turn on system protection on other drives - *system properties - system protection - only restore previous versions of files*

- Uncheck the option "*hide extensions for known file types*" as follows: *Organise - folder and search options -view - hide extensions for known file types*. This should be done on every account on a computer, since settings refer only to a specific computer user!!!

IN CASE OF RANSOMWARE CONTAMINATION

Instantly switch off the computer system (each minute of work has another encrypted file as a consequence),

Do not attach USB memory sticks or HDD in order to copy data (switch off PC)

It is necessary to immediately inform colleagues and in organisations it is necessary to inform security staff and the systems administrator, colleagues and friends whose addresses are in your address book about the risk, as well as the police authorities responsible for cyber crime[4].

If a user or an organisation possesses a backup on cd/dvd/blueray/cloud, or, for example, a corporate backup, the data is protected. If there is no backup, the options are as follows:

Attach disc to a Linux work station and make a backup image of discs and files.

Attempt to clean the system with a live version of an antivirus program, eg. Endpoint Symantec protection SERT, using another computer, eg. Linux computer (forensic work station) and use antivirus software. However, there is no guarantee that the computer will be 100% cleaned and the

3 http://www.mcafee.com/us/resources/solution-briefs/sb-quarterly-threat-q1-2015-2.pdf, accessed on 16th February 2016.

4 http://www.securitycentral.org.nz/cybersecurity-for-home-internet-users/dealing-with-cryptolocker-ransomware/, accessed on 5th January 2016.

virus itself fully recognised!

Only after that, attempt to save the data. First try with Shadow explorer and try to recover previous file versions (this action has been useful with some types of ransomware).

Rescued data should be saved to cd/dvd/blueray

The contaminated computer should be re-installed, update the OS, install the latest antivirus and scan the saved cd/dvd/blueray disc.

Experts can recover some data by using the "undelete recovery" function, to recover deleted files, since after file encryption, the originals are deleted. This is a long process and is performed on a computer with a Linux OS or a Mac OS x, since the data is extracted directly from a disc or an image backup disc with specialist programs.

When it comes to Mail servers, it should be forbidden to send executable files. With Linux, for example, this can be performed with procmail, using the following lines:

```
LOGFILE=/var/log/procmail.log
:0
* < 256000
* ! ^Content-Type: text/plain
{
        :0B
        * ^(Content-(Type|Disposition):.*|[
]*(file)?)name=("[^"]*|[^  ]*)\.(bat|cmd|com|exe|-
js|pif|scr)
#3#  /dev/null
        /var/spool/mail/EXE
}
```

At the moment, older versions of TeslaCrypt, possessing a weak point enabling data to be recovered, i.e. decrypted, possess different extensions: .ECC, .EZZ, .EXX, .XYZ, .ZZZ, .AAA, .ABC, .CCC, and .VVV. Later versions, without the aforementioned weak point, can not be decrypted, but they can be recognised by their extensions .xxx, .ttt, .micro and .mp3. For TeslaCrypt 2.0, there are tools that can provide an encryption key, eg. BloodDolly[5] and Googulator scripts6 [Abrams 2016]. In cases when data is encrypted with a later version of TeslaCrypta, perform backup of the data (encrypted) and wait for tools with more up-to-date solutions.

LEGAL ASPECTS OF MAKING AND LOADING A MALICIOUS ENCRYPTION RANSOMWARE PROGRAM

Making and loading malicious programs belongs to the category of unlawful actions against computers and computer systems, actually against confidence, integrity and data and system accessibility. Such crimes are sanctioned according to national laws and their coordination with international legal acts. The most important legal act in Europe, which is coordinated with national laws, is the Council of Europe's Convention on Cybercrime, of 2001. This Convention demands national laws forbidding *illegal access* to information contained on a PC or computer system, aimed at collecting, altering or destroying them. Furthermore, it demands prosecution for *altering data* on a PC, in the sense of partial or complete damage, deletion, the alteration of content, compression or any other method of changing the original data. At first sight, such an act may appear similar to *illegal access*, but it needs to be understood as a complementary act.

In accordance with the Convention on Cybercrime, a definition of illegal computer actions was introduced into Serbian law with the Criminal Law of 20057, Chapter 27, as "crimes against computer data" (paragraphs 298–304a). High technology crime in the sense of this law includes performing illegal actions by using computers, computer networks, computer data, as well as their products in

5 http://download.bleepingcomputer.com/BloodDolly/TeslaDecoder.zip

6 https://github.com/Googulator/TeslaCrack

7 Krivični zakonik, „Sl. glasnik RS", nr. 85/2005, 88/2005, 107/2005, 72/2009, 111/2009, 121/2012 and 104/2013.

material or electronic form, as objects or means of performing illegal actions. In the Criminal Law, the term *computer virus* is defined as a computer program or any similar set of orders entered into a computer or computer network, intended to multiply itself and influence other programs or data on a PC or computer network by adding the program or set of orders to one or more computer programs or data. According to the definition of a malicious program, paragraph 300 of the Criminal Law of Serbia sees it as a special act of *making and loading computer viruses.* A person who makes a computer virus, with the aim of loading it onto a computer or computer network, will be punished with a fine or imprisonment of up to six months. A person who loads a computer virus onto a computer or computer network, and causes damage therein, will be punished with a fine or imprisonment of up to two years. Devices and means used to commit this illegal act will be confiscated.

According to Serbian Criminal Law, in making and loading a malicious encryption ransomware program, an illegal act of *damaging computer data and programs* has been committed (paragraph 298 of the Criminal Law). An unauthorised person who deliberately deletes, alters, damages, hides or in any other way makes computer data or a program useless, will be punished with a fine or imprisonment of up to one year. If the caused damage exceeds RSD 450,000, the criminal will be imprisoned for between three months and three years. If the caused damage exceeds RSD 1,500,000, the criminal will be imprisoned for between three months and five years. Devices and means used to commit this illegal act, if owned by the executor, will be confiscated.

According to the Council of Europe's Convention on Cybercrime, and according to national law, making and entering a malicious encryption ransomware program definitely constitute illegal actions with the accompanying fines and prison terms.

CONCLUSION

At the moment, there is no way to obtain a private key for encoding data without buying it. Although there are antivirus houses that can find an encoding method, such encoders are not universal and are efficient only with targeted ransomware[8]. Since ransomware copies the original file with a coded version, with later versions it even deletes Volume Shadow copies, the only reliable way to recover documents is recovery from a backup. Apart from the aforementioned preventive measures, the best way to protect against ransomware is the implementation of an antivirus system based on endpoint protection[9] (Symantec endpoint protection[10], Sophos Enduser Protection Bundles[11], Kaspersky Endpoint Security[12], McAfee Complete Data Protection13 and others), keeping it updated and installing the latest security patches on a system [Davidovac and Korać 2011]. Proactive protection in the form of making regular backup copies of the most important data onto a device (or network backup location) which is attached only during the backup process will reduce damage to a minimum. The cheapest backup is the use of cd/dvd/blueray or cloud storage (Dropbox, Google drive and others), with the condition that there is no synchronisation (not ascribed as an access letter), while the data upload itself should be done only via a web interface. Backup to USB memory sticks or USB HDD is not advisable, given that these are RW media (it is possible to write data to USB memory sticks or USB HDD).

8 https://noransom.kaspersky.com/

9 Endpoint protection represents a united protection, including antivirus and spyware protection, protection on a network level by recognising malicious traffic and blocking it with its own firewall.

10 https://www.symantec.com/products/threat-protection/endpoint-family/endpoint-protection

11 https://www.sophos.com/en-us/products/enduser-protection-suites.aspx

12 http://www.kaspersky.com/business-security/endpoint-select

13 http://www.mcafee.com/us/products/complete-data-protection-advanced.aspx

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REZIME
RANSOMWARE PRETNJA INFORMACIONIM SISTEMIMA

KLJUČNE REČI: RANSOMWARE, ENKRIPTUJUĆI RANSOMWARE, MALICIOZNI PROGRAM, INFORMACIONA BEZBEDNOST, BEZBEDNOSNE PRETNJE, VIRUSNA PRETNJA.

Iako je pre par godina postojao kao sporadična pretnja, enkriptujući ransomware je trenutno jedna od najvećih pretnji na Internetu koja donosi veliku opasnost za bezbednost podataka na računarskim sistemima. Nove tehnologije koje su inicirale prelazak na mobilnu komunikaciju, pojavu virtuelnih valuta i pojavu TOR mreže, oblikovale su okruženje da ransomware bude još opasniji. Ovaj invazivni ransomware koji dolazi u različitim varijantama i kombinacijama [Chechik et al. 2016] (Cryptolocker, HydraCrypt, DMA Locker, The Locky, TeslaCrypt 3.0, CryptoWall, The CoinVault, Bitcryptor, TorrentLocker, SynoLocker, Pletor i dr.) trenutno beleži porast, što za posledicu ima veliki broj zaraženih računara i servera sa Windows okruženjem kako kod provajdera, organizacijama, tako i onih u kućnom okruženju. U samom radu su opisani pouzdani načini da se izbegnu ili da se ublaže, vrlo ozbiljne štete koje ove zlonamerne pretnje mogu da izazovu. Takođe, ovim radom su obuhvaćeni i pravni aspekti pravljenja i unošenja zlonamernog enkriptujućeg programa ransomware na računar.

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PRIVACY CONTROL ON WINDOWS 10

ABSTRACT

Just as with every information system, an organisation's policy focuses on the security questions of privacy control. This paper gives suggestions related to the information system of the archaeological site "Viminacium", necessary to the upgrade of its computer systems, in order to secure the demanded privacy of collecting data during the processing of digital archaeological data. Windows 10 contains complex settings regarding the privacy of its users. There will be information on settings recommendations regarding security on Windows 10 OS. Settings will be mentioned that can be chosen during installation, and further on there will be details regarding the switching off of certain hidden privacy settings, as well as a discussion about the advantages of using local accounts on Windows 10. There will also be mention made of Microsoft's use of users' Internet flow and ways of disabling it. At the end, there will be a section on the privacy problems related to the new features of Windows 10: the new Internet search-machine Edge and the personal assistant Cortana.

KEYWORDS: PRIVACY, PRIVACY CONTROL, WINDOWS 10 AND PRIVACY.

I INTRODUCTION[1]

When a new operating system is being installed, it is necessary to pay attention to privacy protection. In modern times, privacy can be defined as the right of a person to control information about him/her that is being collected, processed and given to third parties. Besides many positive effects, electronic communication has made it possible to observe people without them being aware of it and without their permission, following their activities and everything they type on the keyboard, again without their awareness or permission. Additionally, the storage and distribution of information collected about each person is possible, also without his/her awareness or permission. In such a way, an organisation or a person can find their privacy rights, guaranteed

1 The article results from the project: *Viminacium, Roman city and military camp – research of material and non- material culture of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalization and 3D visualization* (no 47018), funded by The Ministry of Education, Science and Technological Development of the Republic of Serbia.

under national and international law, endangered. Such rights specify that a person alone should determine when, how and in what quantity information about him/her, gained through electronic communication, will be accessible to others. This prerequisite for the gathering, processing and distribution of data about him/her is an explicit agreement in written, electronic or oral form. The latest legal regulation of the European Union, from May 2016, describes explicit, unambiguous, voluntary and special acceptance as a condition.[2] Privacy rights protect data and records connected to one's private life from being published, or from any kind of misuse (Vilić and Radenković 2015). On one hand, there are tendencies to protect one's privacy through national and international legislation as well as possible, but on the other hand, software producers and companies that earn money collecting, processing and distributing personal data, tend to collect as much data as possible, even when users do not give their unambiguous permission. The need for privacy protection is especially important for companies producing operating systems, since they are being used on a daily basis on every computer. The danger of collecting an owner's (private or legal entity) sensitive data, photos, codes and other information that he/she does not want to share, is always present with companies that produce Oss, and it is a very real danger. As a result of this, and in order to protect users, it is necessary to use all the possibilities offered by the OSs themselves, to protect privacy as well as possible from the very beginning, i.e. while the OS is being installed.

Further on in this paper, certain recommendations will be presented regarding privacy in Windows 10 OS, related to the information system of the archaeological site "Viminacium".

II RECOMMENDATIONS

1. Avoid using the express setting during installation

By choosing the express setting, the maximum sharing of users' information with Microsoft is enabled. Choosing the "custom install" option offers a larger number of keys for setting privacy in several sets. The first set, which enables the sending of personal data, should all be switched to "off".

The second set of keys is more intriguing, but is rather important, so they should be switched off, in order to maintain privacy.

The first two options send additional activities to Microsoft, while the following two options are more subtle. These options enable automatic connections to open Hotspots and networks comprising the users' contacts!? The last option, for sending diagnostic information and error information, can be described as harmless. However, if a problem occurs, like a system crash, "information" that is sent could contain a large amount of sensitive data (if the user's computer broke down while working in Word or Excel, which could include confidential date, this would be uploaded onto the Microsoft server, along with error and diagnostic information).

2. Switching off hidden settings

Settings made while installing are just a subgroup of the privacy settings on the Windows 10 system, which contain a rather large number of pages and dialogues on the user interface that are not very visible. According to Auerbach (Auerbach 2015), in one of the dialogues during settings, Microsoft reveals its insincerity. Actually, when the user decides to switch off the options

2 *Regulation on the protection of individuals with regard to the processing of personal data and on the free movement of such data to the European Parliament and the European Council*, 2016/679, and *Directive on the protection of individuals with regard to the processing of personal data by competent authorities for the prevention, investigation, detection, criminal offenses or the execution of criminal sanctions and on the free movement of such data to the European Parliament and the European Council*, 2016/680, http://ec.europa.eu/justice/data-protection/

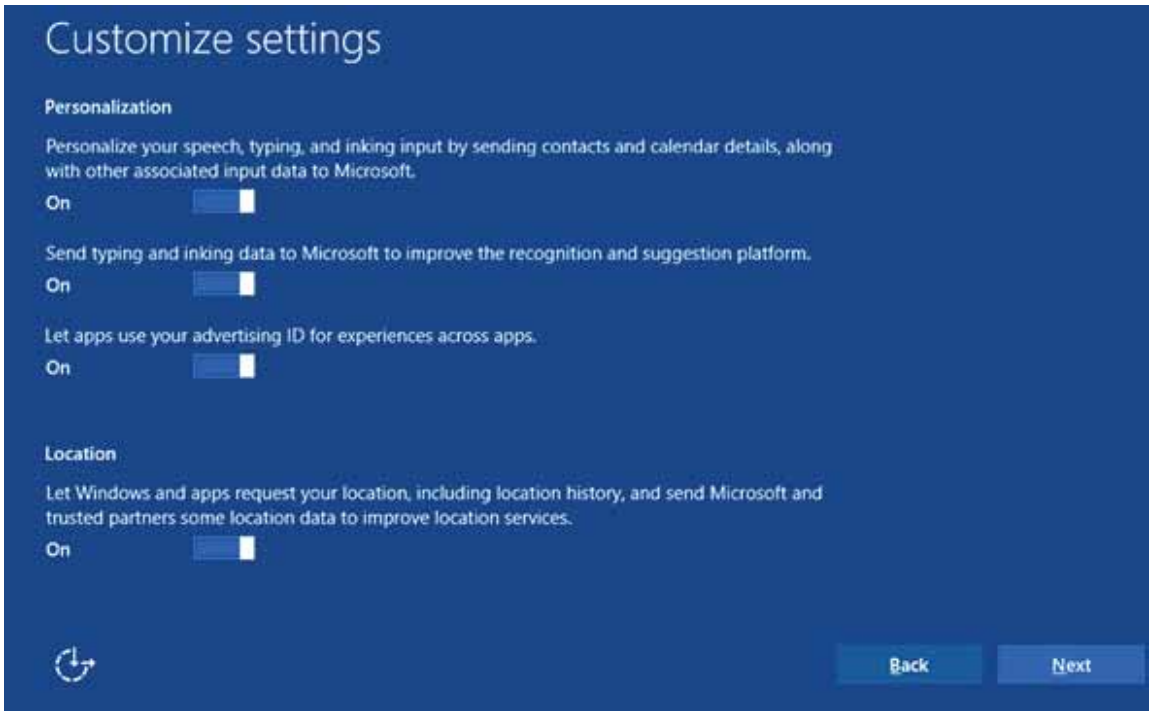

Fig. 1 The first set of keys that enable the sending of personal data

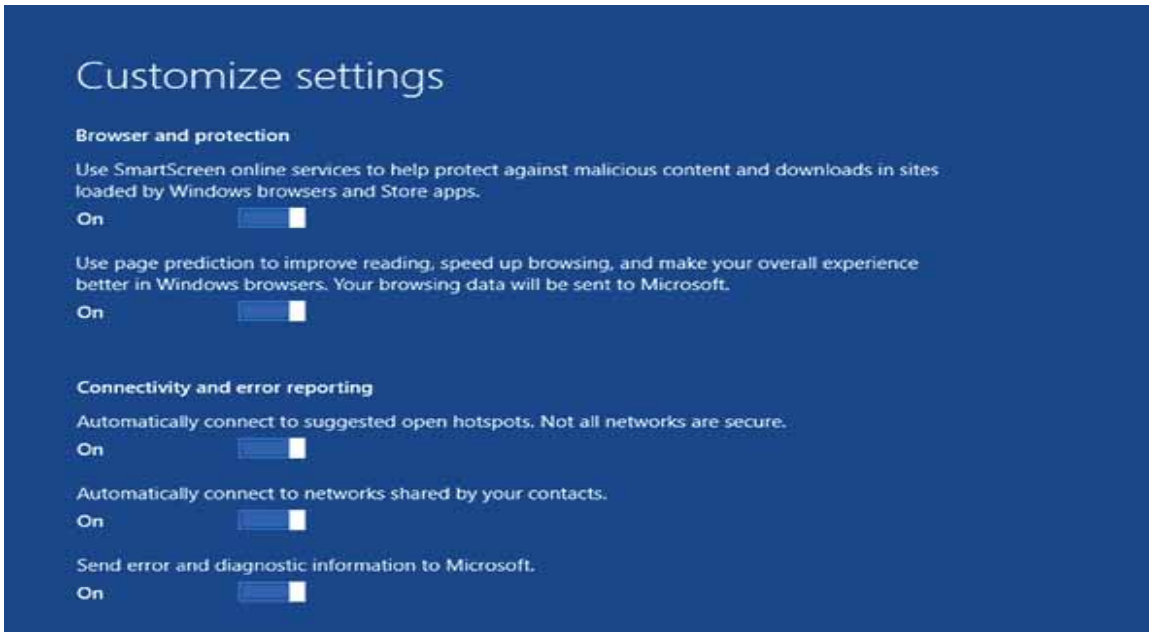

Fig. 2 The first set of keys that enable the sending of personal data

"sending diagnostic information and error information", the system limited sending information from FULL to enhanced. In order to truly reduce the sending of such information, it is necessary to go to Start menu- Settings, Privacy-Feedback and Diagnostics and choose the "Basic" option and reduce the sending of random data to Microsoft to a minimum (Fig. 4). Also set "Feedback frequency" to "never". It is necessary to mention that, apart from the "full, enhanced and basic" options, there is a fourth, hidden, option named "security". Of all the options, this sends the least data to Micro-

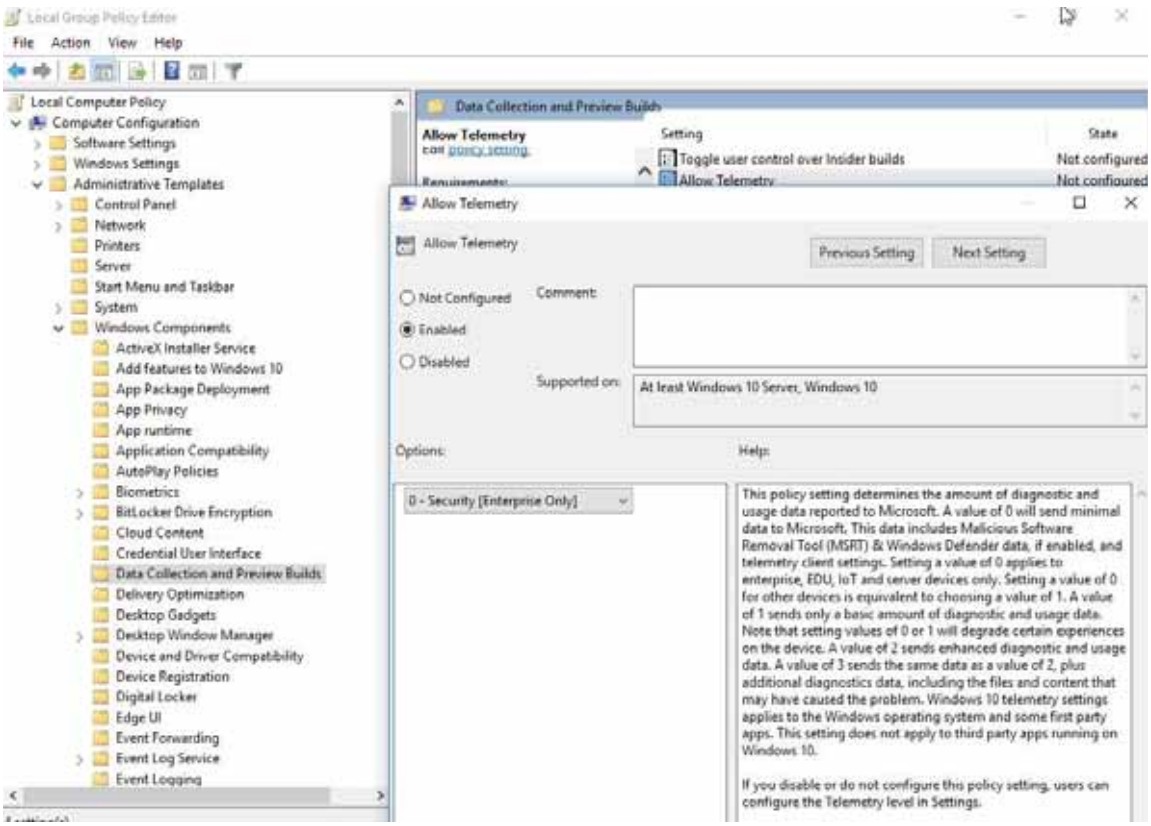

Fig. 3 Allow Telemetry dialogue

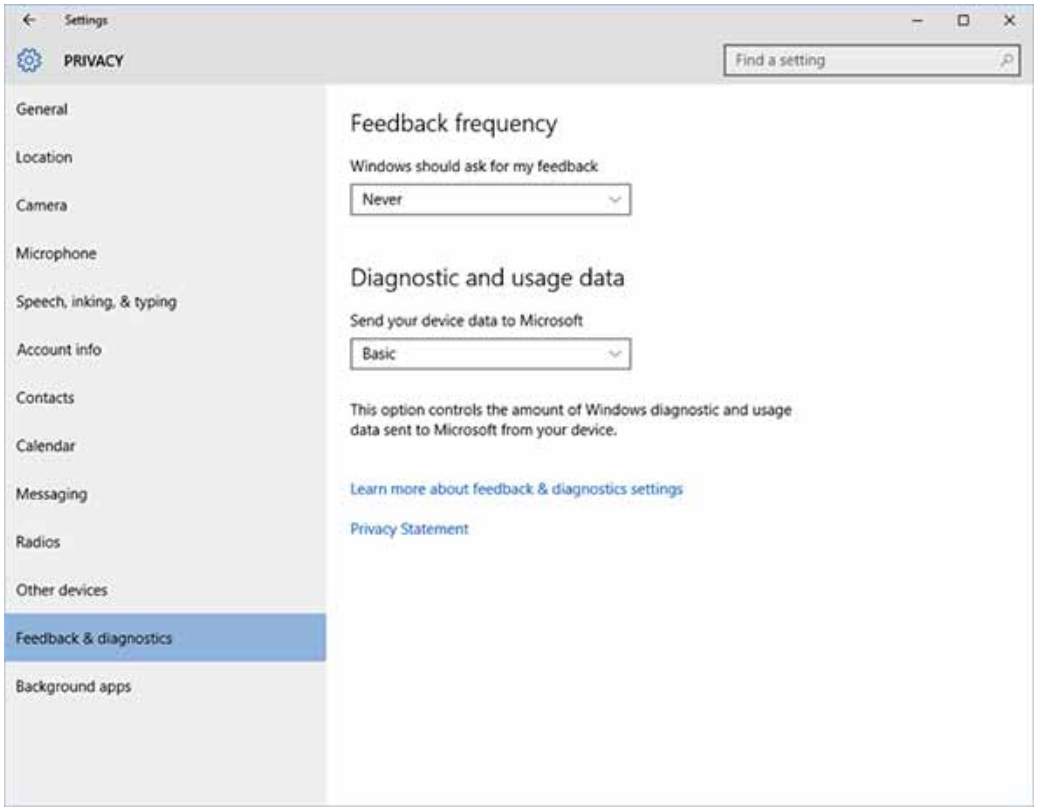

Fig. 4 Section of the privacy dialogue for switching off the sending of diagnostic information and error information

soft (AskVG 2016). Nevertheless, choosing this option is not possible from any standard settings dialogue, but it is necessary to do it through the editor for policies of local groups. This editor is easily activated from the RUN dialogue (the easiest way to reach this is by using a combination of the WIN + R keys), then enter "gpedit.msc" and press "enter". In this editor, it is necessary to find the "Allow Telemetry" option, which is on the following path: Computer Configuration → Administrative Templates → Windows Components → Data Collection and Preview Builds. From there, it is necessary to choose "Allow Telemetry", obtaining the dialogue as shown in Fig. 3.

With the use of this dialogue, it is possible to choose the hidden "Security" option. Nevertheless, it needs to be said that choosing such an option makes sense only for Enterprise, EDU, IoT and server versions of Windows 10. With other versions (Core/Home and pro), this option behaves the same as the "Basic" option, so choosing the "Security" option would be pointless.

The dialogue shown in Fig. 4 contains a total of 13 sections related to privacy (Epstein 2015). It is necessary to dedicate special attention to each one of them in order to establish the users' need to share certain information or not.

Account info is a very important sub-section of privacy. In it, it is defined that each and every application installed has access to data about a user's account. This needs to be switched off. In Fig. 5, a dialogue is shown in which it is possible to deny applications access to data related to the user's account.

3. Using local account only

Microsoft, as well as Apple, encourages users to create their accounts, such as a Microsoft Live account, by integrating the OS with the user's account. When it comes to privacy, this actually represents one of the most disputed elements. As long as the user is logged into the system, Microsoft can upload any user profile data from the OS to the server without the user's knowledge. Basically, logging in with a Microsoft account initiates the synchronisation of settings and data, including internet search history, favourites, currently opened applications and recorded applications. In addition, coded information from websites and mobile hot-spots, as well as Wi-Fi network names and their codes are transferred (Wright 2015). Without a Microsoft account, it is rather difficult, almost impossible in fact, to upload this data. In addition, without a Microsoft account, the problematic Wi-Fi sense function is disabled. By not using a Microsoft account, users protect themselves from numerous Microsoft attempts at collecting data through their offered privacy policy. It is recommended to use local accounts, while for email communication, alternatives should be used (Gmail, Yahoo and others).

4. Microsoft's use of users' internet flow

By default, Microsoft turns the user's computer into a peer-to-peer node for distributing Windows 10 OS corrections, aimed at saving the flow costs of the Microsoft server. In Microsoft terminology, this is called WUDO or Windows Update Delivery Optimization (Microsoft 2016). WUDO should be switched off by default, since it can slow down the user's internet connection, but it can also increase the user's internet expenses in cases when it is paid according to flow. In order to switch off WUDO, it is necessary to go through four rather unclear screens.

Step 1: Settings -Update & security.

According to what is stated in Microsoft's updated users' terms, Microsoft will always know what you are currently doing on your computer: "*Micrososft will collect information from you and your devices, including for example 'app use data for apps that run on Windows' and 'data about the networks you connect to'.*"(Microsoft 2015a)

Step 2: Update & security - Advanced op-

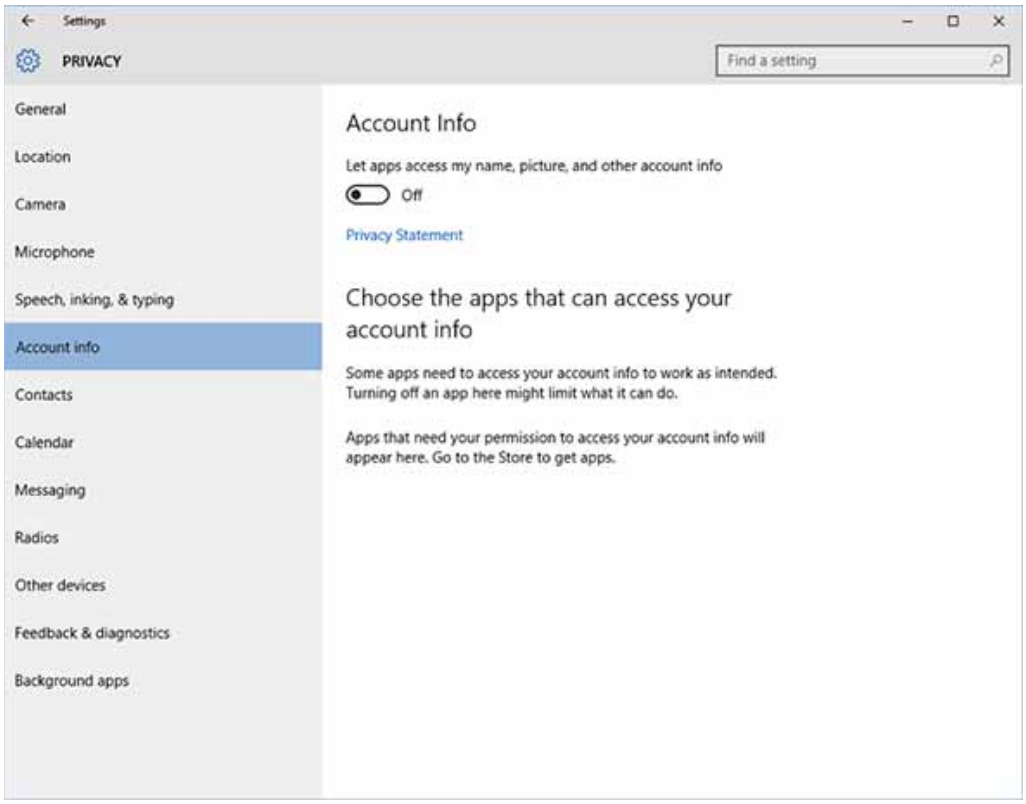

Fig. 5 Privacy dialogue section for denying applications access to the user's account

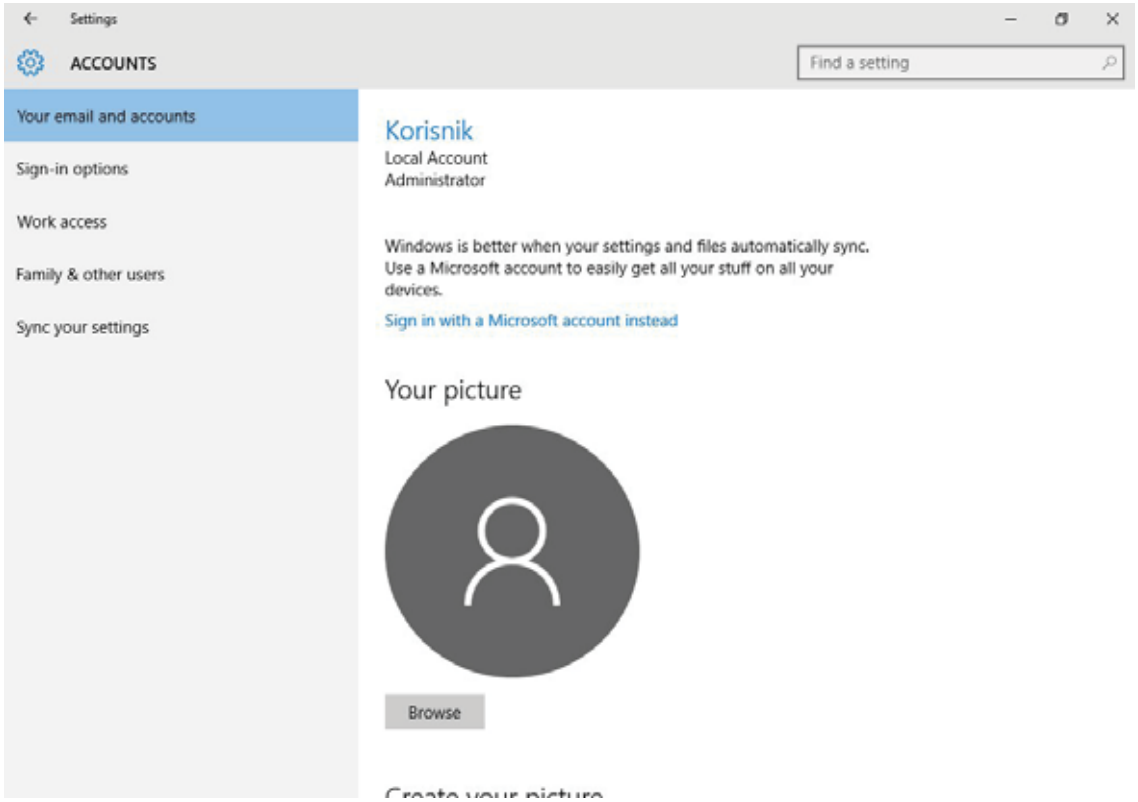

Fig. 6 Dialogue for account settings

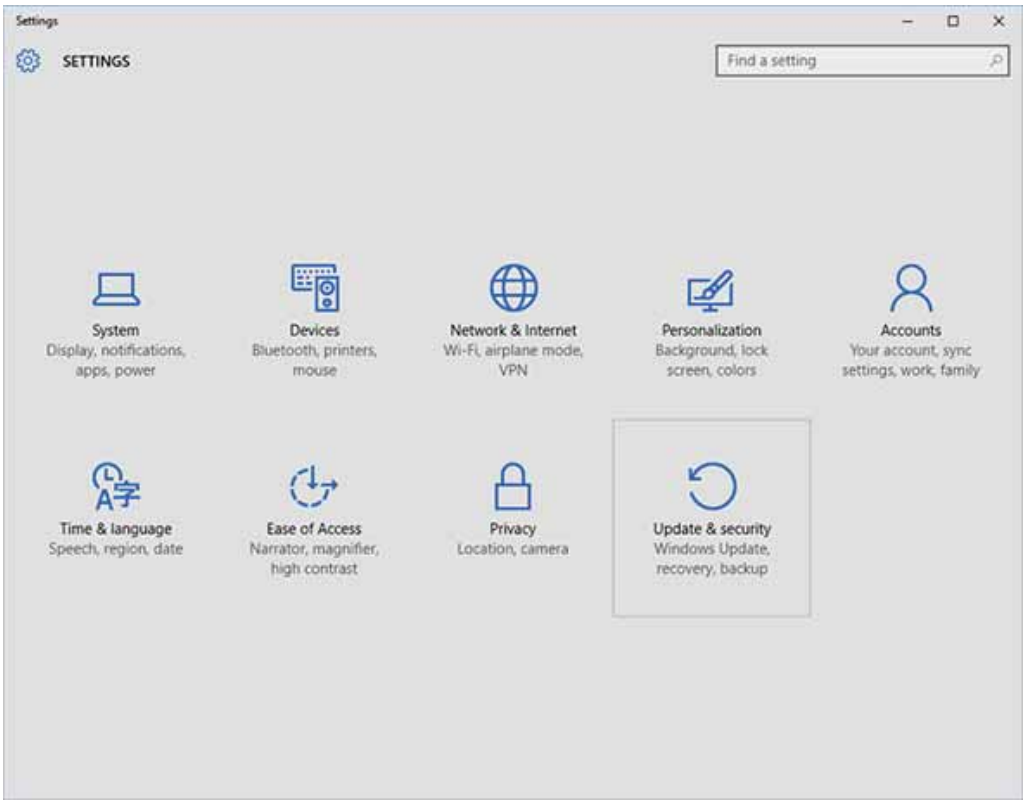

Fig. 7 Dialogue in which the Update & Security dialogue appears

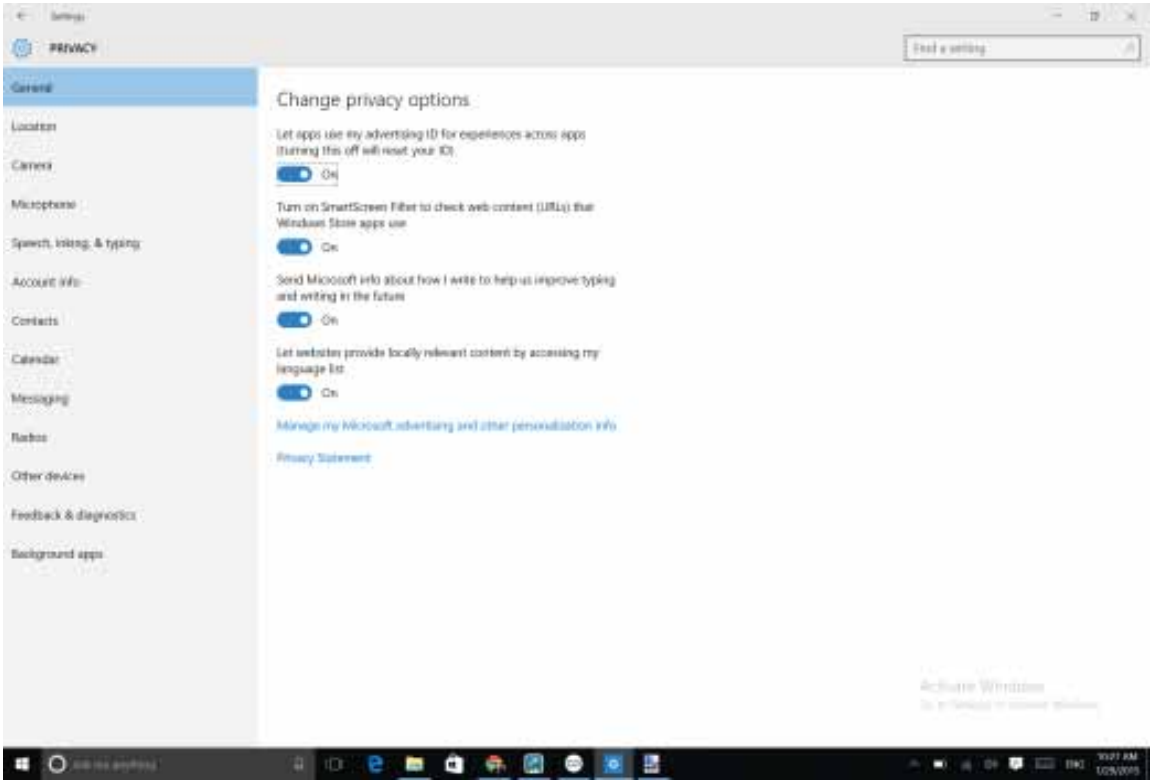

Fig. 8 Update & Security dialogue, with advanced options for Windows Update

tions

Step 3: In the Advanced options choose "*Choose how updates are delivered"***.** Choose the option **"***Notify to schedule restart***"** in order to avoid automatic restarting of the PC by Windows after updating, and to require permission to perform this action.

Step 4: Switching off peer-to-peer correction distribution.

5. Disabling the monitoring of advertising IDs

Windows 10 generates unique advertising IDs for every user on every PC (Microsoft 2015b). This can be misused by programmers and ad networks for profiling users. These options can be switched off, but one needs to know where:

6. Do not use Edge or Cortana

Microsoft's personal assistant Cortana and the new Edge browser are designed to take advantage of as much personal information as possible, in order to customise the user experience, take annotations, and learn all about the user (Auerbach 2015) (RT 2015). Until Microsoft clarifies or revises its privacy policy, it is better not to use any options that go into users' privacy. Regarding privacy, Firefox, Chrome or the latest version of Internet Explorer are better alternatives to Edge.

By switching on the Cortana virtual assistant, the system is allowed to provide personalised speech recognition, collect your voice input, as well your name and nickname, access your recent calendar events and the names of the people in your appointments, as well as information about your contacts, including their names and nicknames. This additional data enables the system to better recognise people and events when you dictate messages or documents (Microsoft 2015c).[3]

This is not a complete list, but only the most important items are highlighted, in which Microsoft encroaches into user privacy. Microsoft should centralise options regarding user privacy in a much more transparent way and explain all the implications of their usage. Obviously, however, the "free" Windows 10 update is actually paid for through the exchange of the user's personal data on the OS.

III CONCLUSION

While installing a new Operating system, it is necessary to pay attention to the protection of privacy, since modern computers contain sensitive data that users are not willing to share. Windows 10 really does represent a considerable improvement compared to previous versions of this operating system (8 and 8.1) in different fields, and it can be considered a good operating system. However, Windows 10 has a certain number of settings which are switched on by default and that can encroach into user privacy. In modern times, user privacy is very important. Confidential data that can be found on a computer, the use of computers for electronic transactions and access to different web portals from a PC with the user's name and password are only some examples where user privacy is so important. As a result, it is necessary for a PC user with the Windows 10 operating system, either as a private user or a legal entity, to make certain system adjustments according to his/her needs, regarding data protection and privacy rights. This paper contains an overview of settings regarding privacy on Windows 10, as well as recommended values for these settings that offer adequate privacy regarding the information system at the archaeological site of "Viminacium". Furthermore, in this paper, methods of adjusting these settings are mentioned, which are, in some cases, not particularly intuitive for the average operating system user.

3 https://privacy.microsoft.com/en-us/privacystatement/

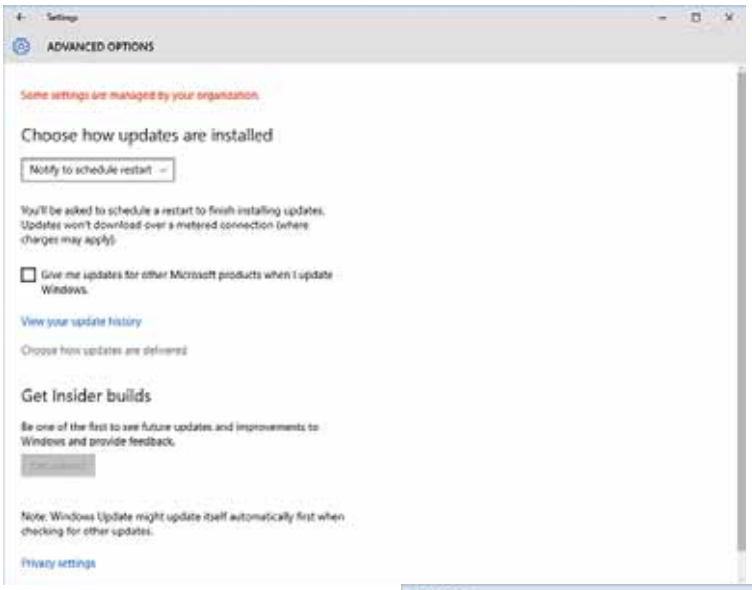

Fig. 9 Dialogue with advanced options for Windows Update – choosing how to install updates

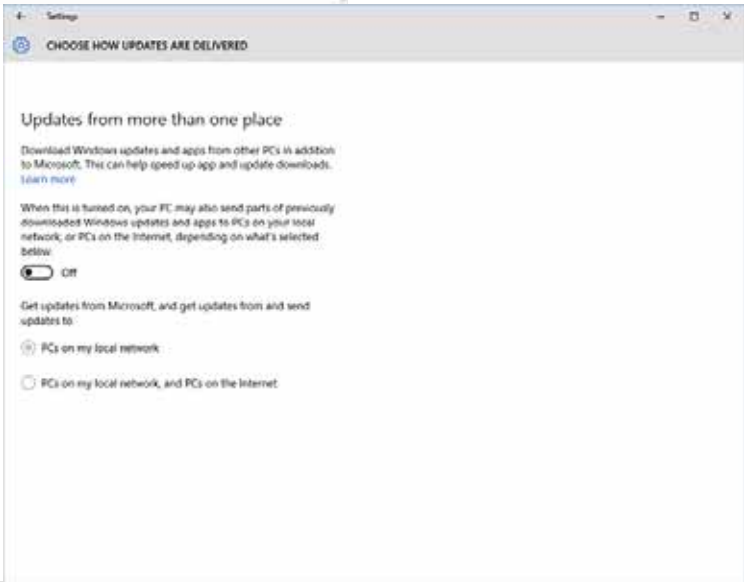

Fig. 10 Dialogue for switching off peer-to-peer correction distribution

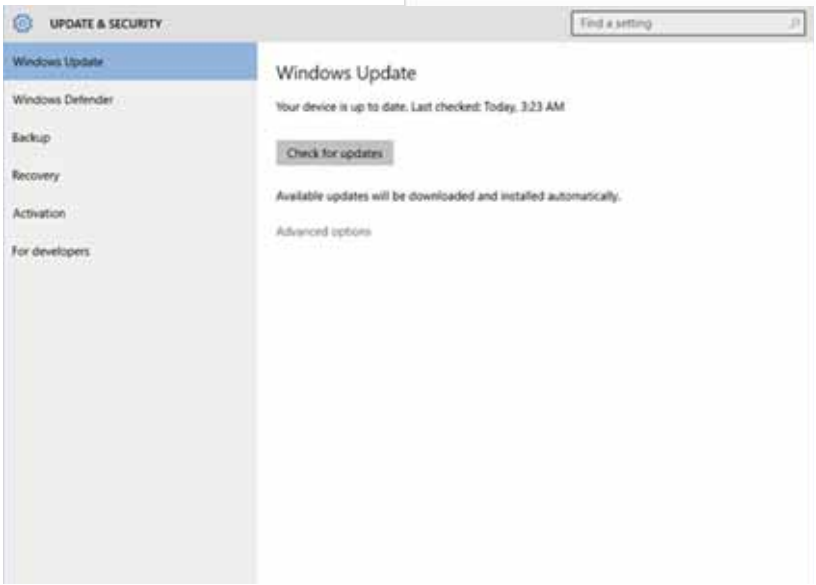

Fig. 11. Dialogue for disabling the monitoring of advertising IDs

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REZIME
KONTROLA PRIVATNOSTI NA WINDOWS 10 OS

KLJUČNE REČI: PRIVATNOST, KONTROLA PRIVATNOSTI, PRIVATNOST I WINDOWS 10.

Kao i kod svakog informacionog sistema pitanje zaštite privatnosti je u fokusu politike bezbednosti organizacije. Ovim radom date su smernice koje se odnose na informacioni sistem na arheološkom lokalitetu „Viminacium“ koje su neophodne pri nadogradnji računarskih sistema, da bi se obezbedila zahtevana privatnost prikupljenih informacija u toku obrade digitalne arheološke građe. Windows 10 sadrži složena podešavanja koja se tiču privatnosti korisnika ovog operativnog sistema, i u nastavku radaće biti reči o preporukama za podešavanja koja se tiču bezbednosti na Windows 10 OS. Biće reči o podešavanjima koja se mogu odabrati tokom same instalacije, zatim o isključivanju određenih skrivenih podešavanja privatnosti kao i o prednosti korisćenja lokalnog naloga na Windows-u 10. Takođe ce biti reći o iskorišćavanju korisničkog Internet protoka od strane Microsofta i o tome na koji se način ono onemogućuje. Na samom kraju će biti reči i o problemima privatnosti koje donose novi sastavni delovi Windows-a 10: novi Internet pretraživač Edge i personalni asistent Cortana.

PRIKAZI - REVIEWS

Mirjana Vojvoda, Nemanja Mrđić, NALAZI NOVCA SA VIMINACIJUMSKE NEKROPOLE VIŠE GROBALJA I NJIHOVA ULOGA U POGREBNOM RITUALU / COIN FINDS FROM THE VIMINACIUM NECROPOLIS OF VIŠE GROBALJA AND THEIR ROLE IN FUNERARY RITUAL, Arheološki institut, Beograd 2016.

402 strane: 50 strana teksta (dvojezično srpski i engleski); 12 grafikona, 6 tabela i 1 slika u osnovnom tekstu; 293 strane kataloga; 60 strana tabela; 3 strane bibliografije; 4 table sa fotografijama.

Kroz čitav period rimske carske uprave u srpskom delu Podunavlja Viminacijum je bio vojni i civilni centar provincije Gornje Mezije. Od vremena Hadrijana kolonija, kasnije, od vremena Gordijana III mesto kovnice provincijalnog novca, rano je prerastao u bogat i veliki grad privlačan za raznovrstne zanatlije i trgovce, posebno iz istočnih oblasti Rimskog carstva. Trajanje i mnogoljudnost Viminacijuma obeležavaju i potvrđuju, između ostalog, i njegove brojne nekropole. Od ukupno devet nekropola lociranih na prostoru južno od legijskog logora i civilnog naselja, vremenu rimske dominacije pripada pet, hronološki ograničenih na period od sredine prvog do prvih decenija petog veka. Kako je čitav ovaj prostor planiran za potrebe izgradnje termoelektrane Kostolac 2, počev od 1977. godine preduzeta su obimna zaštitna arheološka istraživanja. Do sada je otkriveno i istraženo preko 14.000 grobova.

Po vremenu nastanka, nekropola na lokalitetu "Više grobalja" je najstarija, a publikovan je i jedan deo do sada istraženih grobnih celina sa nje (Lj. Zotović i Č. Jordović, V*iminacium I, nekropola ''Više grobalja''*, Arheološki institut, Republički zavod za zaštitu spomenika kulture, Beograd 1990; M. Korać i S. Golubović, *Viminacium, Više grobalja*, Tom II, Arheološki institut, Beograd 2009). Nekropola ''Više grobalja'' nalazi se na oko 700 m jugozapadno od legijskog logora i naselja uz logor. Zahvata prostor dužine oko 450 i širine koja se kreće od 80-100 m. Blizu 4000 otkrivenih grobova na ovoj nekropoli pripadaju periodu od prvih decenija prvog veka do sredine trećeg, sa pojavom istovremenog sahranjivanja spaljenih i inhumiranih pokojnika. Ova pojava sadrži elemente i autohtonog i rimskog shvatanja zagrobnog života (Zotović, Jordović 1990, 3). Novčani nalazi potiču iz grobova spaljenih i inhumiranih pokojnika, ali i sa žrtvenih površina iznad grobova, kulina, gde je odlagan prilikom priređivanja daća. Oni potiču sa zaštitnih arheoloških iskopavanja nekropole ''Više grobalja'' koja su se odvijala u rasponu od nekoliko decenija, a sama publikacija predstavlja studiju nastalu u oviru naučnog projekta IRS – *Viminacium, rimski grad i legijski vojni logor – istraživanja materijalne i duhovne kulture stanovništva primenom najsavremenijih tehnologija daljinske detekcije, geofizike, GIS-a, digitalizacije i 3D vizuelizacije* (Projekat III 47018, Ministarstvo prosvete, nauke i tehnološkog razvoja Republike Srbije).

Autori Mirjana Vojvoda i Nemanja Mrđić novce sa viminacijumske nekropole ''Više grobalja'' prezentuju u katalošku obradi po uobičajenim standardima i sa odovarajućom relevantnom literaturom. Autori su raspolagali bogatom terenskom dokumentacijom, a katalošku obradu su završili tokom 2006-2007. godine. Od ukupnog broja pronađenih novaca (3161 komad), konstatovan je gubitak nastao zbog loše očuvanosti,

fragmentovanosti, a delimično i pri konzervaciji. Katalogom je obuhvaćeno 2736 komada novca (str. 59-352).

Novčani sadržaj koji obuhvata kovanja rimskih careva I-IV veka, detaljno je opisan u tekstualnom delu (str. 9-57) koji je, u dvostubačnom prelomu, dat dvojezično, na srpskom i engleskom jeziku. Tabelarnim pregledima i grafikonima, na jednostavan i slikovit način, sagledane su karakteristike i vrednosti specifičnog novčanog nalaza, koji uverljivo pokazuje opticaj rimskog *aes*-a u Viminacijumu i šire. *Aes* je kao tekući i jeftiniji nominal, dominanto prsutan kao prilog uz pokojnika (Haronov obol), dok je broj srebrnih moneta zanemarljiv. Broj nalaza novca kao grobnog priloga, 1595 komada, približan je broju komada otkrivenim na žrtvenim površinama i u sloju iznad grobova (1538 komada). I jedna i druga skupina sadrže carska i provincijska kovanja. Carska su zastupljenija u prvom i drugom veku, a provincijska u trećem. U carskim kovanjima najzastupljeniji su asi i dupondiji, osobito u razdoblju od Trajana do M. Aurelija (preko 80%), a u provicnijskim novci bitinijske Nikeje (preko 10%), čiji je broj izrazito povećan za vladavine Aleksandra Severa. Evidencija nalaza, grubo sagledana, na prostoru srpskog Podunavlja pruža vrlo sličnu sliku.

Dalje, čitav niz faktografskih i studijskih opažanja autori iznose u poglavljima u kojima se bave detaljnim zapažanjima o pojedinim aspektima novčanih nalaza sa nekropole ‘’Više grobalja’’. U poglavlju *Mesto nalaza novca u okviru nekropole* (str. 11-13) upoznaju nas sa procentualnim odnosom novaca nađenih u grobovima inhumirani, odnosno kremiranih pokojnika. Poglavlje *Zastupljenost carskog i provincijskog novca u grobovima* (str. 13-17) sadrži detaljne podatke o naslovljenoj temi, uz poređenja sa situacijama na drugim panonskim i mezijskim nekropolama. Autori se, ukratko, osvrću i na pitanje *Zastupljenost novca različitih nominala u grobovima* (str. 18). Značajna zapažanja iznose u poglavlju *Broj novaca kao priloga u pojedinačnim grobovima i njihov položaj u odnosu na pokojnika* (str. 19-27). To pitanje detaljno razrađuju, razmatrajući devet dominantih položaja novca u odnosu na pokojnika, kako kod inhumiranih tako i kod kremiranih pokojnika. Posebnu pažnju poklanjaju nalazima više novaca u pojedinim grobovima, u poglavlju *Grobovi sa većim brojem primeraka novca – hronološki raspon od najstarijeg do najmlađeg primerka* (str. 28-29). Po obimu su najveća dva poslednja poglavlja: *Perforirani novci pronađeni u grobovima* (str. 30-36) u kome se razmatra i moguća prvobitna primena takvih nalaza (delovi monetarnog nakita?), i *Zastupljenost reversnih tipova* (str. 37-45), u kome autori veoma studiozno pristupaju obradi reversnih tipova, najpre ih razvrstavajući u tri velike grupe: I civilni; II vojni; III religiozni, koji su dalje podeljeni u tri podgrupe - IIIa personifikacije blagonaklonosti, IIIb drugi svet/žrtvovanja/pijetet, IIIc opšti religiozni. Obrađujući reversne predstave na pronađenom novcu, autori sve vreme vode računa i o periodima u kojima su pojedine grupe reversnih predstava zastupljene, te o međusobnom odnosu pojedinih grupa reversnih predstava u određenim periodima.

U zaključnom razmatranju (*Zaključak*, str. 46-57) autori uspešno kombinuju sve prethodno obrađene vrste podataka, kao i rezultate obimnih razmatranja koja su sproveli. Posebno bi čitaoca trebalo uputiti na zanimljiva detaljna razmatranja o tzv. Haronovom obolu (str. 48-49), kao i o nalazima novca na žrtvenim povšinama (str. 49 i 52).

Nakon toga sledi Katalog obrađenog novca (str. 59-302), koji sadrži 2736 jedinica, i u kome su novci obrađeni u skladu sa svim standardima numizmatičke obrade novca. Sledi tabelarni pregled (popis) novca iz grobnih celina inhumiranih i spaljenih pokojnika po C brojevima (brojevima terenskog inventara) usaglašenim sa kataloškim brojevima publikovanim u Katalogu (*Tabele*, str. 355-393). Na stranama 394-396 navedena je korišćena literatura. Izvesne zamerke mogle bi se uputiti na račun grafičkog uređenja publikacije. Tu stoji neusklađenost teksta sa očekivanim prilogom, verovatno kao posledica prisustva dvostubačno datog dvojezičnog teksta, dok su fo-

tografije novca date na tablama su tamne i lošijeg kvaliteta. Iznenađuje i odluka autora pri izboru novca čije će fotografije biti prezentovane, jer broj datih fotografija novca (za 50 kom) veoma je mali u odnosu na ukupno obrađen broj primeraka.

Značaj Kataloga obrađenog novca, kao grobnog nalaza, nemerljiv je. Kataloški obrađen novac podrazumeva bliže datovanje, godinu kovanja. Nije isto, na primer, da li je jedan *as* Antonina Pija kovan 139. godine ili 20 godina kasnije. Za sagledavanje celokupnog grobnog sadržaja ovo je itekako važna okolnost. U arheološkoj praksi, a često i u izveštajima, zadovoljavamo se samo sa informacijom da je, između ostalog, ‘’tu bio i jedan bronzani novac tog i tog cara’’, što je nedovoljno. Katalog rimskog novca sa nekropole ‘’Više grobalja’’ doista pruža mnogo više. Detaljna obrada nalaza novca pruža nam pouzdani *terminus post quem* za više hiljada zatvorenih celina (grobova), što pruža potpuno nove, i široke mogućnosti za sagledavanje relativno hronoloških odnosa određenih delova nekropole, ali i za proveru datovanja drugih vrsta pokretnih nalaza koji su otkrivani u istim grobovima kao i publikovani novac.

Sitni, bronzani nominali, koji se nalaze u našim muzejskim zbirkama najčešće su pribavljani kao slučajni nalazi, ili kao delovi ostava, tezaurisanih u dužem vremenskom periodu od strane jedne osobe ili porodice. Nalazi iz zatvorenih celina viminacjumske nekropole ‘’Više grobalja’’ daju nam najpotpuniji i najpouzdaniji uvid po pitanju opticaja sitnih nominala u središtu provincije Gornje Mazije, za period od početka prvog do sredine trećeg veka. Pored te osnovne vrednosti ove monografije, autori su razmatranjem više različitih aspekata vezanih za sam novac, kao i kontekste u okviru kojih je nalažen, uspostavili jedan novi standard na našem prostoru kada je u pitanju obrada novca poteklog sa arheoloških iskopavanja.

Nikola A. Crnobrnja

GUIDELINES FOR SUBMITTING MANUSCRIPTS FOR THE PERIODICAL ARHEOLOGIJA I PRIRODNE NAUKE (ARCHAEOLOGY AND SCIENCE)

Editorial staff of the periodical *ARHEOLOGIJA I PRIRODNE NAUKE* decided to apply *Akta o uređivanju naučnih časopisa*[1] (Acta about editing scientific periodicals) proposed by the Ministry of Science and technological development of the Republic of Serbia. By applying these acta, complete editing of scientific periodicals is determined, quality of periodicals is promoted and their integration into the international system of exchanging academic information shall become more complete.

Papers submitted to the editorial staff of the periodical *ARHEOLOGIJA I PRIRODNE NAUKE* must be formed in a standard way. Each paper submitted has to contain: title; author's name; name of the institution (affiliation); abstract; key words; main text; resume; illustrations with captions; bibliography; contact address.

1. Titles need to be short and clear, describing content in the best possible way. Words used in titles should be apropriate for indexing and web-searching. If there are no such words withing titles, it is advised to add a subtitle. Titles are to be written in the fifth or sixth line, under the top margin, bold and with font size 14 (pts).

2. Author(s) should give their full name(s), including first name, surname and middle initial.

3. Autor(s) need to state official names and addresses of their employees, including names and addresses of employees which conducted research that lead to the results published. With complex institutions, complete title is to be named (ex.: Belgrade University, Faculty of Philisophy, Archaeological Department, Belgrade).

4. Abstract, consisting of 100-250 words, describes shortly content of the paper. Within abstracts, it is advised to use terms convenient for indexing and web-searching. Abstracts should offer data about aims, methods, results and conclusions of the research. Abstracts should be bilingual (in Serbian, English or some other foreign language). Abstracts in foreign languages need to be adequatly lectured, i.e. posses correct grammar and spelling.

5. Key words need to be terms which describe paper's content in a best way, suitable for indexing and web-searching. They should be named according to a widely accepted international source (lists, indexes, dictionary, thesaurus), like list of key-words Web of Science. The number of keywords should not exceed ten words.

6. The lenght of papers should not exceed 32 pages, DIN A4, including footnotes and illustrations. The main text should be written in Times New Roman or Arial (12 pts), MS Office Word 97 or later, line-spacing 1,5 and with margins 2,54 cm. Main text should not contain illustrations. They are to be submitted as separate files.

7. Apart from Serbian, manuscripts can be submitted in one of worldwide languages (English, German, French). Names of translators, if any, should be stated. Papers submitted should have an abstract and a resume written in some other language. If a paper is submitted in a language other than Serbian, there should be an abstract and a resume written in Serbian language. Words, quotations and titles written in some other language should be written in their original form.

Footnotes can be incorporated within the main text. They should contain less important data or apropriate explanations. They are not to be replaced with quoted literature. (An appendix to

1 Acta about editing scientific periodicals, proposed by the Ministry of Science and technological development of the Republic of Serbia, can be found at the following web-site: http://www.nauka.gov.rs/cir/images/stories/vesti/09-07-17/akt_o_uredjivanju-casopisa.pdf

these Instructions explains the way of quoting to be applied).

8. Abstracts should have the same content as resumes, only in an extended form, whose length is not exceeding 10% of the main text. It is very much desired to submit a resume in a structural form.

9. Illustrations (photographs, tables, drawings, graphs etc.) should be submitted in a proposed manner. Scanned illustrations should be submitted in a 600 dpi resolution, while photographs are to be submitted in a resolution of at least 300 dpi, in formats TIFF, PSD or JPG. Illustrations are to be submitted as separate files and should not be incorporated into the main text. Captions should be submitted bilingually (using the language in which the manuscript was written and in English or some other of the proposed languages).

10. Quoted literature should include bibliographic sources (articles, books etc.) and it should be submitted as a separate part of the manuscript, as a list of references. It is a part of every scientific article, with precisely named bibliographic references which were quoted. Bibliography should be written in a proposed manner, depending on standards precisely described in this instruction. Bibliography should be written using the language and alphabet in which it was originally published.

11. Bibliography's structural elements (author's name, title of work, source etc.) should be written according to standard forms of quoting. Editorial staff of the periodical *ARHEOLOGIJA I PRIRODNE NAUKE* accepted the reccomendation of the Ministry of science and technological development and decided that authors should precisely follow quotation rules named below.

The following examples describe the most frequently quoted kinds of references:

I BOOKS (MONOGRAPHS)

1. Author's books

a. single author

within main text: (Popović 2006)

in bibliography:

Surname, name's initial. Year of publishing *Title of book* (*italic*), Place: Editor.

Popović, I. 2006

Roma aeterna inter Savum et Danubium, Works of Roman Art from the Petrović-Vasić Collection, Belgrade: Archaeological Institute.

- Series' name and number is also needed:

Mirković, M. 1968

Rimski gradovi na Dunavu u Gornjoj Meziji, Dissertationes 6, Beograd: Arheološko društvo Jugoslavije.

Papazoglu, F.1969

Srednjobalkanska plemena u predrimsko doba (Tribali, Autarijati, Dardanci, Skordisci i Mezi), Djela 30, Centar za balkanološka ispitivanja 1, Sarajevo: Akademija nauka i umjetnosti Bosne i Hercegovine.

b. two or three authors

Between the names of the first and the second author, or the second and the third author,

"and" should be written, no matter what the main language of the publication.

within main text: (Popović i Borić-Brešković 1994)

in bibliography:

Popović, I. i Borić-Brešković B. 1994

Ostava iz Bele Reke, Arheološke monografije 7, Beograd: Narodni muzej.

Ivanišević, V., Kazanski, M. and Mastykova, A. 2006
Les necropoles de Viminacium a l'Epoque des Grandes Migrations, Monographies 22, Paris: Association des Amis du Centre d'Histoire et Civilisation de Byzance.

c. four or more authors

Books written by four or more authors, within the main text and in Serbian cyrillic, only the first name is written and **i dr.** is added. Books printed in Lati alphabet, the abbrevation ***et al.*** is applied. The abbrevation ***etc.*** is used in cases when there are more than three editors or places of editing.

2. Author's books with added name of the editor

within main text: (Jeremić 2009: 40)
in bibliography:
Jeremić, G. 2009
Saldum, Roman and Early Byzantine Fortification, S. Perić (ed.), Cahiers des Portes de Fer, Monographies 6, Belgrade: Institute of Archaeology.

3. Edited books (instead of the author – editor, translator) - (ed., eds.), (trans.).

within main text: (Поповић 1994)
in bibliography:
Поповић, И. (ур.) 1994
Античко сребро у Србији, Београд: Народни музеј.
within main text: (Morris 2002)
in bibliography:
Morris, I. (ed.) 2002
C*lassical Greece-Ancient Histories and Modern Archaeologies*, Cambridge: Cambridge University Press.
within main text: (Hurst and Owen 2005)
in bibliography:
Hurst, H. and Owen. S.(eds) 2005
Ancient Colonizations-Analogy, Similarity and Difference, London: Duckworth.
within main text: (Радојчић 1960)
in bibliography:
Радојчић, Н. (prev.) 1960
Законик цара Стефана Душана 1349. и 1354., Београд: Српска академија наука и уметности.

4.Way of quoting books without author's name

within main text: (Anon. 1985)
in bibliography:
Anon. 1985
Anonymi Peri strategias, The Anonymous Byzantine Treatise on Strategy, *Three Byzantine Military Treatise* (trans. G.T. Dennis), Washington DC.

5. Simultaneous quoting of several books of the same author

a. written in different alphabets

within main text: (Поповић 2002, Popović 2006)
in bibliography:
Поповић, И. 2002
Накит са Јухора, остава или сакрални тезаурус, Археолошке монографије 14, Посебна издања 36, Београд: Народни музеј и Археолошки институт.
Popović, I. 2006
Roma Aeterna inter Savum et Danubium, Works of Roman Art from the Petrović-Vasić Collection, Belgrade: Archaeological Institute.

b. written in the same year

within main text: (Dawkins 1996a, Dawkins 1996b)
in bibliography:
Dawkins, R. 1996a
Climbing Mount Improbale, London: Viking.
Dawkins, R. 1996b
River out of Eden, London: Pfoenix.

6. Quoting chapters in books (acta)

within main text: (Петровић 1997: 87-90)
in bibliography:
Петровић, Б. 1997
Накит, у: *Античка бронза Сингидунума,* С. Крунић (ур.), Београд: Музеј града, 85-117.

within main text: (Samson 1970: 44-68)

in bibliography:
Samson, C. 1970
Problems of information studies in history, in: *Humanities information research*, S. Stone, (ed.), Sheffield: CRUS, 44-68.

7. Translated books
in bibliography:
Bajron, DŽ. G. 2005 (1812)
Čajld Harold, Z. Paunović (predgovor), N. Tučev (prevod), Beograd: Zavod za udžbenike i nastavna sredstva.

8. Books and articles published in electronic form
within main text: (Fishman 2005: 11)
in bibliography:
Fishman, R. 2005
The rise and fall of suburbia, [e-book], Chester: Casle Press. Available through Anglia Ruskin University Library. http://libweb.anglia.ac.uk>[pristupljeno 5 juna 2005].

II PAPERS PUBLISHED IN PERIODICALS, CONGRESS ACTA AND SIMILAR

within main text: (Vasić 2008: 69, fig.3)
in bibliography:
Surname, name's initial. Year
Title, *Title of the acta (italic)*, Name's initial. Surname, (ed.), Place of editing: Editor, page numbers.

Vasić, M. 2006. Stibadium in Romuliana and Mediana. *Felix Romvliana 50 years of archaeological excavations.* M**.** Vasić (ed.). October, 27-29 2003, Zaječar, Serbia. Belgrade: Institut of Arhcaeology, Committee on Archaeology of Serbian Academy of Sciences and Arts, and Zaječar: National Museum, 69-75.

Series' data are also needed:

Петровић, П. 1997
Римљани на Тимоку, у: *Археологија источне Србије* (Научни скуп Археологија источне Србије, Београд-Доњи Милановац, децембар 1995*)*, М. Лазић (ур.), Центар за археолошка истраживања 18, Београд: Филозофски факултет, 115-131.

III PERIODICALS

within main text: (Бајаловић-Хаџи-Пешић, 2001: 108)

Surname, Name's initial. Year
Title, *Name of the periodical (italic*) number of the periodical: page number.

Бајаловић-Хаџи-Пешић, М. 2001, Налази хабанске и постхабанске керамике у Србији, *Годишњак града Београда* 47-48 (2000-2001): 107–121.
- For periodicals with similar titles, behind the name of the periodical, place of publishing should be stated in brackets:
Анђелковић, Б. 1988
Праисторијски налази са локалитета Јелица-Градина, *Зборник радова Народног музеја* (Чачак) 18: 81–85.
Анђелковић, Б. 1994
Први резултати анализе мумије из Народног музеја у Београду, *Зборник Народног музеја* (Београд) 15-1: 153–159.

- Depending on the year of publishing *Старинар* is named in its full title:
years 1884-1895 *Старинар Српског археолошког друштва*
years 1906-1914 [novog reda] *Старинар* (н.р.)
years 1922-1942 [treća serija] *Старинар* (т.с.)
years 1950-2010 [nova serija] *Старинар* (н.с.)

- If there is a difference between the year of actual printing and the year of publishing, the second is stated in brackets:
Жеравица, З., и Жеравица, Л. 1979, Средњовековно насеље у Поповици код Неготина, *Старинар* (н.с.) XXVIII-XXIX, (1977-1978): 201–211.

IV PAPER IN PRINT / FORTHCOMING

- (in print), within papers written in English (in print)
- (forthcoming), within papers written in English (forthcoming).

within main text: (Јовановић, in print)
in bibliography:
Јовановић, А. (in print)
Бор и околина у античком периоду, у: *Бор и околина у праисторији, антици и средњем веку*, ур. М. Лазић, Бор и Београд: Музеј рударства и металургије и Филозофски факултет.

Papers overtaken from the internet, from electronic periodicals, are quoted in the same way as printed papers, only there is a full web-address written at the end with http://...

V DOCTORAL AND MASTER THESES

Instead of place of editing and editor, the full name of faculty/university is given, where the thesis was conducted.
within main text: (Ilić, 2005)
in bibliography:
Ilić, O. 2005
Ranohrišćanski pokretni nalazi na području dijeceze Dakije od IV do početka VII veka, Magistarska teza, Filozofski fakultet, Univerzitet u Beogradu.

within main text: (Patch, 1991)
in bibliography:
Patch, D. C. 1991
The Origin and Early Development of Urbanism in Ancient Egypt: A regional Study, Ph.D thesis, University of Pennsylvania.

VI ARTICLES FROM NEWSPAPERS

within main text: (Кашанин, 1929)
in bibliography:
Кашанин, М. 1929, Музеј савремене уметности, *Политика, 23. јул, 7-8.*

MAIN TEXT

Quoting bibliography in the main text according to the pattern (author's surname and year: page number, footnote, figure, table):
(Papazoglu 1969: 52, sl. 4/1, T. 18-4-6)
(Babović 1984: 68; Moritz 1978: 68, figs. 40-41; Tasić 1997: 84, sl. 21)
- Additional data within brackets can be written after a dash:
(Swoboda-Milanović 1958: 55, Taf. 18/24 – olovne pločice).
- The same work of the same author in the next quotation can be quoted abbrevated *ibidem* (*ibid.*: page number).
- The second work of the same author in the next quoting, if there are no quotations in between, is quoted as (*idem* year: page number): (Faltings 1998a: 367; *idem* 1998b: 31–32).
- In papers written in Serbian language, the transcribed exact pronounciation of a foreign author's name is written within the main text, without brackets, but the original name is written in quotation: ...Vencel (Wenzel 1965: T. HS/4).
- If the author, work and page number are the same as in the previous quotation, they are quoted as *loc. cit.* (lat. *loco citato)* – quoted place.
- Abbrevation *cf.* (lat. *confer*) - compare
- Abbrevation *e.g.* (lat. *exempli gratia*) - for ex-

ample
- Abbrevation *i.e.* (lat. *id est*) - actually.

12. All of the quoted referrences are listed after alphabetic order, if written in English or some other foreign language, initial's order withing author's surname or the initial letter within the quoted title (if the author or editor are not stated).

SUBMITTING PAPERS

13. While submitting, the author should write his/her full contact address in a separate file: address of the institution and e-mail address. If there are several authors, only the contact address of the first author should be written. Author is also obligated to name title and code of the project, i.e. name of the programme under which the artice came to being, as well as the name of the institution which financed the project.

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