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# ASPECTS OF CENTRALITY IN THE REGION OF THE LOWER HUNTE RIVER IN THE ROMAN IRON AGE

# ABSTRACT

The question of centrality in barbaricum during the Roman Iron Age was mostly connected to exploring of the so-called central places of non-agrarian character and strong indications of trade and traffic in south Scandinavia. The greatest number of them was discovered in the coastal area, connected to traffic routes along river valleys and the coast.

In the coastal part of northwestern Germany there were no such site which could be analogue to the ones mentioned above. A possible reason could be the structure of the terrain. Still, since metal-detectors are more and more used in German archaeology, the number of finds and their spreading area indicated the existence of some of the production centres. In this paper, the site Elfsleth-Hogenkamp, in the Weser valley in north-western Germany is described, which could represent an example of such a site.

Finds gained in such a way include more than 60 fibulas, over 160 Roman coins made of copper alloy and silver, but also finds of Roman import made of copper alloy and numerous fragments of Roman pottery. This indicates that the site of Elsfleth-Hogenkamp can be considered a Roman Iron Age settlement with strong indications connected to trade and specialized crafts, which probably gained on importance due to its geographic position.

Key words: Roman Iron Age, Hunte, Elfsleth-Hogenkamp, centrality

## **INTRODUCTION**

For the Roman Iron Age period the question of centrality in the barbaricum seems so far to have been dominated by research on so called central places in southern Scandinavia with a nonagrarian character and strong indications towards trade and traffic (summarizing Böhme 2001). The majority of them have been found in a maritime context with access to supra-regional traffic routes along rivers and coastal lines which offered the possibility of ship landing and therefore the establishment of so-called landing places (Ulriksen 1994, 797; 1998). The well-known finding complex of Gudme/Lundeborg, Fyn DK, can be understood as a preliminary model for a central place where the evidence of functions like trade, traffic, craft activity and cult accumulate to what could be called a centre of power and wealth (Kromann et al. 1991, 144 – 161).

Looking at the coastal area of northwestern Germany, comparable central sites have been missing so far. A likely reason for this might be seen in the structure of landscape which is mainly influenced by the given contrast between the clay district areas and the sandy glacial deposits of the so called Geest. However, since the use of metal detectors in German archaeology has become more common, the number and distribution of finds in certain places at least led to the evidence of so called productive sites, as we already know them from Scandinavia and Britain (e.g. Ulmschneider 2003; Watt 2006). The following example of Elsfleth-Hogenkamp, administrative district Wesermarsch, northwestern Germany, might be seen as an instance of such a site.

# Claydistricts Bogland Glacial Deposits Estleth-Hogenkamp

Fig. 1. Coastal area of north western Germany with the location of Elsfleth-Hogenkamp.

#### THE LOCATION

Situated in the clay district of the river Weser, the site can be found on the western bank of the Hunte river estuary, about three kilometres south from the contemporary centre of the village of Elsfleth (Fig. 1). Approximately 200 m behind the modern levee, a more or less round shaped acre of nearly 2.5 ha can be found which is slightly raised from the surrounding area (Fig. 2). Because of their higher altitude such riverbanks probably provided the best conditions for the establishment of rural settlements in the river clay districts (cf. Behre 2008, 32ff.). Nevertheless, recent drilling results could prove that the higher level of Elsfleth-Hogenkamp was caused by artificial advance which indicates a former dwelling mound (Mückenberger in prep.). Following the attribute of a higher ground level, the assumption could be made that the original settlement area might have had an extension towards the northeast, since a similar altitude can be recognized there as well.



Fig. 2. Location of Elsfleth- Hogenkamp. Map basis: Topographical Map 1: 25 000. Copy permission by editor: LGN – Landesvermessung und Geobasisinformation Niedersachsen

Today, this part is separated from the main site by a road while actual finds only emerged from the main area so far.

# **RESEARCH HISTORY**

The first recording of Elsfleth-Hogenkamp goes back to the late 19<sup>th</sup> century when large amounts of pottery still recognisable on its surface today led to a first note in scientific literature (Von Alten 1874). However, first trial trenches were not made until the 1930s (Schütte 1935; 1936; 1937). These investigations led to clear evidence of settlement activity mainly during the Roman period and early medieval times (summarizing Först 1991). An important aspect concerning the character of the settlement was discovered at the end of the 1980s in the find of a little ceramic boat model which represented the first archaeological indication of ships and traffic on the nearby rivers in the Roman period (Först 1989, 171 - 176 esp. 174 f.; Ellmers 1999a 113 – 137 esp. 118). Recently excavated remains of a well preserved wooden wattle structure seem to lend further support to this point (Scheschkewitz 2006). However, the synopsis of these results did not suggest any special attitude of the settlement in comparison with other known stray find sites of the Roman period in the area, until it became the subject of constant surveying with a main focus on the use of metal detectors in the late 1990s. From then on, the density of metal finds increased dramatically.

# THE FINDS

Amongst the finds over 60 brooches, more than 160 Roman copper alloy and silver coins, remains of Roman copper alloy import as well as numerous fragments of Roman pottery must be mentioned (Scheschkewitz 2006). While the col-



Fig. 3. Collection of brooches from Elsfleth-Hogenkamp  $(1^{st} - 6^{th} \text{ century})$  (Foto: R. Kiepe NIhK).



Fig. 4. Collection of nonferrous metal fragments from Elsfleth-Hogenkamp (Foto: R. Kiepe NIhK).

lection of brooches cannot be described in detail, a preliminary overview makes obvious that their dating covers the first five centuries A.D. without any large gaps (Fig. 3) (Scheschkewitz 2007, 170ff.).

In contrast to that, the analysis of the detected coins by Frank Berger, Historisches Museum Frankfurt am Main, led to the result that the majority spans the period from the 2<sup>nd</sup> to the 4<sup>th</sup> century A.D.. The preliminary results concerning the dating of the Roman pottery seem to suggest a similar time span as the coins (Günther Moosbauer, Osnabrück, pers. comm.). Additionally, hundreds of non-ferrous metal pieces have been collected from ploughing soil, mostly consisting of copper alloy. Amongst those remains, one can mainly distinguish between two groups of objects. The first consists of pieces that can be still allocated to their original function. Thus, several pieces of former military equipment such as horse-gear or late roman belt fittings and spurs can be recognized, while fingerings or pieces of vessels might count as objects of civil use (Fig. 4).

In contrast to that, the second group mostly consists of sheet metal fragments and melted copper alloy pieces, showing an indefinite form. Furthermore, a small amount of silver ingots together with a little piece of sheet gold indicate that the local metal handcraft comprised precious metal processing as well.

Due to the datable objects, this processing could be stretched over the same period as the brooches thus indicating that it was already established in the 1<sup>st</sup> century A.D. Having said this, most of these 1<sup>st</sup> century finds, for example eye-brooches or sesterces, seem to show traces of metal working. They make it necessary to discuss if they should rather be seen as aged scrap material which had arrived in Elsfleth together with the Roman pottery or the better preserved coins of



Fig. 5. Distribution of pottery and coins on the site. Green: Estimated metalworking area. Orange: Settlement area.

the 2<sup>nd</sup> and 3<sup>rd</sup> century A.D. Finally, the material is completed by numerous settlement remains like local pottery, spindle whorls, loom weights and grindstones which indicate that rural settlement activity can also be expected on the site.

#### **AREAS OF DIFFERENT USE?**

To gain further information about the former extension of this settlement, recent surveys in 2008 focussed on the general distribution of finds over the area. In the course of the surveys, the remarkable amounts of nearly 300 kg of ceramic shards were collected from the ground surface, giving evidence for settlement continuity from the pre-Roman Iron Age up to the migration period (Mückenberger in prep.). It became apparent that the local pottery as well as the majority of silver coins was spread over the entire demanding area, showing several concentrations in the northern and western parts. In contrast to that, a southwestern area can be recognized where most of the copper alloy fragments appear together with the above-mentioned copper alloy coins of earlier dating (Fig. 5). From this it becomes obvious that one can distinguish between areas of different use within the former settlement. While the pottery and silver coins can probably be ascribed to intensive settlement and trading activity, the concentration of scrap material might show an area of former metal working.

# FUNCTION OF THE SETTLEMENT

All in all it seems that Elsfleth-Hogenkamp can be during the first centuries A.D. (Ellmers 1999b) characterized as a Roman Iron Age settlement with Further support of this idea is given by the above strong indications of market- and specialized hand-mentioned wooden wattle remains and the little craft activity which probably gained significance from boat model which seem to point towards ship trafficits geographical situation. Indeed, the position of Els-as well. Recently found pieces of Roman millstones fleth-Hogenkamp provides excellent conditions for probably suggest the same while their general distritrade and traffic as it offers access to different supra-bution mainly emphasizes the Weser-Hunte systemregional waterways like the Hunte and Weser rivers. as a main route for trade (Bischop 2001, 96f. Fig. 71). For that reason, it could be claimed that the majority Judging from this, it seems most likely that Elsflethof detected import reached Elsfleth by ship as is gen-Hogenkamp also represents a ship landing place of theerally assumed to have been the case for Roman goods. Roman period in the sense of Ulriksen (1998, 259) in northwestern Germany and southern Scandinavia.

#### **TRAFFIC ROUTES**

Concerning regional traffic with the hinterland, the west of Elsfleth (summarizing Hayen 1991, an additional aspect might be the evidence of the 109–122; Fansa/Schneider 1995, 5–42). Show-largest bog path of northwestern Germany



Fig. 6. Settlements of the Roman period and the location of bog path IP XII in the lower Hunte region (after Först 1991 with additions).

(IP XII), ing a length of more than 6 km the western start-which can be found at a distance of about 5 km to ing point of the construction can be located at an exposed Geest ledge nearby Loyerberg, town Rast-dieval times (Krämer 1992, 110ff. Fig. 13). Meanede, administrative district Ammerland, while its while, several other bog paths can be recognized in eastern end can be found quite close to the church the area (Först 1991, 2ff. Fig. 1; Fansa / Schneiderof Bardenfleth/Eckfleth, administrative district 1995, Fig. 1), while their interpretation is still un-Wesermarsch (Fig. 6). Regarding its general align-clear. It has been a point of discussion whether they ment, it more or less seems to lead towards the site of can be generally assigned to an early colonization Elsfleth-Hogenkamp. However, the use of this struc-wave of the river clay districts (Metzler 1995, 60ff) ture in the Roman Iron Age seems quite doubtful at or if they have to be rather seen as ways of trade be-the moment as the preserved planks delivered quite tween land and waterways (Hayen 1989, 68ff.). Both early dendrochronological data from about 712/13 possibilities for an interpretation of bog paths seem B.C.. On the one hand, this early dating seems to ex-reasonable. Nevertheless, their existence accounts clude the possibility for ongoing use in the Roman for a persisting need of man for dry and safe pas-period. On the other hand, the evidence of so called sage through the bogs in different periods. Together mussel tempered ware, which was found along the with supra-regional traffic routes such as rivers, they path in the course of an earlier excavation, might form a combined system of traffic routes of which count for a utilization that lasted up to early me-overland traffic was also a major part. Thus, the site of Elsfleth-Hogenkamp seems to be embedded into further explanation for the remarkable accumulaa system of trade and traffic routes of supra-regional tion of material from the site. and also regional relevance which can be seen as a Centrality in the Lower Hunte River Region Considering trade and traffic as

two major functions of centrality, it should be investigated if further comparable sites exist in the local region which might show a similar set up and therefore deny the outstanding character of Elsfleth-Hogenkamp.

So far, about a dozen settlement places from the Roman period are known in the lower Hunte region (Fig. 6), but only few of them have been investigated by trial trenches (Först 1991, 94ff.). Therefore, it could be claimed that the lack of metal finds in other settlement sites was caused by the lack of a sufficient number of conducted surveys. In fact, most finds from those sites have not been published yet and thus cannot be used for any comparison. However, a small possibility for gaining an insight into the quantitative relations amongst those settlements might be given by considering the already published Roman coin finds which were obtained from nearly all known sites in the area (Berger et al. 2006, 226ff.). Firstly, their evidence confirms that earlier surveys were not only reduced to special places like Elsfleth-Hogenkamp. Secondly, the different amounts of detected coins (e.g. max. six coins from Berne, administrative district Wesermarsch) clearly show the predominance of Elsfleth-Hogenkamp in comparison with the surrounding settlements. While those smaller numbers of coins can be seen as remains of daily life, the amount of about 160 roman coins in Elsfleth-Hogenkamp can only be explained with market activity which caused a series of subsequent losses over a longer period of time, comparable to the market place situation in Lundeborg, Fyn DK (Kromann 1993, 64ff.).

Due to the conditions in the river marshland it was recently assumed that nearly every settlement must have represented a landing place in the past because of the omnipresent tidal gullies in this area (Scheschkewitz 2008, in print). As a result it has to be questioned which circumstances ultimately led to the singular accumulation of material at Elsfleth-Hogenkamp. A possible explanation might be found in the short distance of only 5 km to the east on the other side of the river Weser to the contemporary village of Rekum (Fig. 6) where another settlement of the Roman period had been partly excavated several years before (Brandt 1984, 172-175). In contrast to the marshland settlement of Elsfleth, the site of Rekum was situated on the sandy soil of the nearby Geest where its position marks the most western point of the glacial deposits beyond the river Weser (Bischop 2000, 55ff. Fig. 79). Amongst the recovered features there a three aisled longhouse of 61m length was excavated, representing one of the biggest examples in the whole area so far. Moreover, richly furnished graves within the settlement, dating to the Roman period as well as early medieval times, seem to prove that people at Rekum had comparable access to supra-regional trading goods like in the case of Elsfleth-Hogenkamp. In addition, the appearances of several horse and cattle burials in the environment seem to underline that a cultic significance of the place existed as well. In summary, the former settlement of Rekum provided many features that can be traced back to a place with certain central functions (Jöns 2009, in print). Thus, it might turn out that this settlement has to be seen in relation to the nearby site of Elsfleth-Hogenkamp which comprised different central functions in a close distance. Future research may deliver further indicators that, comparable to the preliminary model of Gudme/Lundeborg DK (Ulriksen 1994, 801-802), central functions were distributed to different places at one time in the lower Hunte region during the Roman period. Due to the special topographical conditions in the river clay district it seems to be appropriate to speak of a central region which, in contrast to southern Scandinavia, provided a different character.

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# NAPOMENA

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# ASPEKTI CENTRALNOSTI U OBLASTI DONJEG TOKA REKE HUNTE TOKOM RIMSKOG GVOZDENOG DOBA

Kai Mückenberger

# APSTRAKT

Pitanje centralnosti u barbarikumu tokom rimskog gvozdenog doba uglavnom se do sada odnosilo na istraživanja tzv. centralnih mesta neagrarnog karaktera i jakim indicijama prema trgovini i saobraćaju u južnoj Skandinaviji. Najveći broj njih otkriven je u primorju, sa pristupom međuregionalnim saobraćajnicama duž reka i priobalnog pojasa.

U priobalnom delu severozapadne Nemačke za sada nedostaju lokaliteti koji bi bili analogni. Moguć razlog za ovo bi se mogao tražiti u strukturi terena. Međutim, s obzirom na sve češću upotrebu detektora metala u nemačkoj arheologiji, broj i rasprostranjenost nalaza na pojedinim mestima ukazali su na postojanje i doveli do utvrđivanja tzv. proizvodnih centara. U radu je opisan lokalitet Elfsleth-Hogenkamp, u dolini reke Weser, severozapadna Nemačka, koji se može smatrati primerom takvog naselja.

Nalazi dobijeni na ovaj način obuhvataju više od 60 fibula, preko 160 rimskih novčića od legure bakra i od srebra, a svakako treba spomenuti nalaze rimskog importa od legure bakra kao i brojne fragmente rimske keramike. To ukazuje na zaključak da se Elsfleth-Hogenkamp može okarakterisati kao rimsko gvozdenodopsko naselje sa jakim indicijama vezanim za trgovinu i specijalizovano zanatstvo, koji su verovatno dobili na značaju zbog svog geografskog položaja.

#### Ključne reči: Rimsko gvozdfeno doba, Hunta, Elfsleth-Hogenkamp, centralnost

#### UVOD<sup>1</sup>

Pitanje centralnosti u barbarikumu tokom rimskog gvozdenog doba uglavnom se do sada odnosilo na istraživanja tzv. centralnih mesta neagrarnog karaktera sa jakim indicijama vezanim za trgovinu i saobraćaj u južnoj Skandinaviji (sažeto Böhme 2001). Najveći broj njih je otkriven u primorskom kontekstu, sa pristupom međuregionalnim saobraćajnim putevima duž reka i priobalnog pojasa, koji su brodovima pružali mogućnost ukotvljavanja i u tom smislu formiranja tzv. lučkih naselja (Ulriksen 1994, 797; 1998). Dorbo poznat kompleks Gudme/Lundeborg, Fyn, Danska, može se smatrati preliminarnim modelom za centralno naselje u kojem su ustanovljene delatnosti kao trgovina, saobraćaj, zanatstvo i kult, a koje se ispoljavaju u nečemu što se može nazvati centralna moć i blagostanje (Kromann et al. 1991, 144–161).

Posmatrajući priobalni deo severozapadne Nemačke, ovde za sada nedostaju lokaliteti koji bi bili analogni. Moguć razlog za ovo bi se mogao tražiti u strukturi predela, uglavnom nastalog u kontrastu između glinovitih područja i peščanih glacijalnih naslaga tzv. Geest-a. Međutim, s obzirom da je upotreba detektora metala postala sve češća u nemačkoj arheologiji, broj i rasprostranjenost nalaza na pojedinim mestima ukazali su na postojanje tzv. proizvodnih centara. Utvrđe-

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no je postojanje proizvodnih centara kakvi su već poznati u Skandinaviji i Britaniji (npr. Ulmschneider 2003; Watt 2006). Naveden lokalitet Elfsleth-Hogenkamp-a, u administrativnoj oblasti Wesermarsch, severozapadna Nemačka, može se smatrati primerom takvog naselja.

# POLOŽAJ

Lokalitet se nalazi na zapadnoj obali reke Hunte, u glinovitoj oblasti reke Weser, oko 3 km južno od centra sadašnjeg sela Elfsleth (sl. 1.). Oko 200 m iza sadašnjeg rukavca, nalazi se površina od 2,5 ha, manje ili više kružne osnove, blago izdignuta u odnosu na okolni teren (sl. 2.). S obzirom na veću visinu, moguće je da su takve obale pružale najbolje uslove za organizovanje ruralnih naselja u glinovitim oblastima oko reka (Behre 2008, 32 i dalje). Ipak, nedavno sondiranje terena je pokazalo da je viši nivo Elfsleth-Hogenkamp-a zapravo rezultat veštačkog naslojavanja, što govori o ranijoj upotrebi ovog tela za nastanjivanje (Mückenberger, u pripremi). Prateći konfiguraciju izdignutog dela terena, može se pretpostaviti da se protezalo dalje u pravcu severoistoka, jer se na tom mestu takođe može uočiti izdignut teren.

Danas je ovaj deo od glavnog lokaliteta razdvojen putem. Nalazi su za sada i poznati samo sa glavnog područja.

# ISTORIJAT ISTRAŽIVNJA

Prvi pomen Elsfleth-Hogenkamp-a je bio u 19. veku, kada su nalazi velike količine keramike doveli do toga da lokalitet prvi put bude zabeležen u naučnoj literaturi (Von Alten 1874). Ipak, prve probne sonde su postavljene tek tridesetih godina 20. veka (Schütte 1935; 1936; 1937). Ova istraživanja su dovela do otkrivanja jasnih tragova naseljavanja, uglavnom tokom rimskog perioda i

ranog srednjeg veka (sažeto Först 1991). Važan aspekt, koji se odnosi na karakter naselja, otkriven je krajem osamdesetih godina 20. veka. Tada je otkriven model malog broda izređen u keramici, koji predstavlja prvu arheološku indiciju plovidbe i saobraćaja na obližnjim rekama tokom rimskog perioda (Först 1989, 171–176, naročito 174; Ellmers 1999a, 113-137, naročito 118). Nedavno otkriveni ostaci dobro očuvane strukture drvenog broda pružaju dalju potvrdu ove hipoteze (Scheschkewitz 2006). Međutim, sažimanjem ovih rezultata se nije došlo ni do kakvih zaključaka vezanih za tip naselja koje bi se moglo dovesti u vezu sa ostalim slučajnim nalazima sa ovog područja iz rimskog perioda. Tek je krajem 1990-tih ovo područje postalo predmet stalnog pretraživanja pomoću detektora metala. Od tada je količina metalnih nalaza drastično povećana.

# NALAZI

Nalazi obuhvataju više od 60 fibula, preko 160 rimskih novčića od legure bakra i od srebra. Svakako, treba spomenuti nalaze rimskog importa od legure bakra kao i brojne fragmente rimske keramike (Scheschkewitz 2006). Zbirka fibula ovde ne može biti detaljno opisana, ali se preliminarno može reći da njihovo datovanje obuhvata period od prvih pet vekova naše ere, bez većih praznina (sl. 3.) (Scheschkewitz 2007, 170 i dalje).

Nasuprot tome, analiza novčića, koju je izvršio Frank Berger iz Istorijskog muzeja u Frankfurtu na Majni (Historisches Museum, Frankfurt am Main), pokazala je da većina pripada periodu od 2. do 4. veka naše ere. Preliminarni rezultati koji se odnose na rimsku keramiku ukazuju na isti vremenski period (Günther Moosbauer, Osnabrück). Dodatno su na stotine negvozdenih nalaza, većinom izrađenih od legure bakra, prikuljene tokom obrade zemlje. Među njima se uglavnom razlikuju dve vrste predmeta. Prva grupa obuhvata predmete kojima se još uvek može odrediti primarna funkcija. Tako se mogu prepoznati delovi vojničke opreme, npr. konjska oprema, kasnorimski pojasni delovi i mamuze, dok se prstenje i delovi posuda mogu smatrati predmetima civilne upotrebe (sl. 4.).

Nasuprot tome, druga grupa se uglavnom sastoji od fragmenata metalnog lima i komada topljene legure bakra nedefinisanog oblika. Dalje, otkriven je i mali broj srebrnih ingota, kao i mali komad zlatnog lima, koji ukazuju na postojanje lokalne metalurške radionice u kojoj su obrađivani i plemeniti metali.

Uzevši u obzir nalaze koje je bilo moguće datovati, aktivnost ove radionice se može datovati u isti period kao i fibule. Početak njene aktivnosti moguće je opredeliti na početak 1. veka n.e. Većina nalaza iz 1. veka n.e., npr. okaste fibule ili sesterciji, pokazuju tragove naknadne obrade metala. Zbog njih je neophodno razmotriti da li oni predstavljaju stari metal koji je u Elfsleth stigao sa rimskom keramikom ili pak bolje očuvane novčiće iz 2. i 3. veka n.e. Konačno, materijal upotpunjuju brojni ostaci iz naselja, kao lokalna keramika, pršljenci razboja, tegovi razboja i kamenovi graničnici, koji svi ukazuju da na ovom lokalitetu treba očekivati i naseobinsku aktivnost.

# PODRUČJA RAZLIČITE NAMENE?

Da bi se dobile dalje informacije o nekadašnjem obimu naselja, iskopavanja iz 2008. su bila fokusirana na rasprostranjenost nalaza po celom terenu. Tokom istraživanja je sa površine prikupljena impozantna količina od skoro 300 kg keramičkih ulomaka, koji ukazuju na kontinuitet naseljavanja od prerimskog gvozdenog doba do seobe naroda (Mückenberger, u pripremi). Postalo je očigledno da su lokalna keramika i većina srebrnog novca bili rasprostranjeni po celoj istraživanoj površini, sa nekoliko koncentracija u severnom i zapadnom delu. Nasuprot tome, može se definisati jugozapadno područje, na kojem je nađena većina fragmenata od legure bakra zajedno sa ranije spomenutim starijim novčićima od legure bakra (sl. 5.). Usled ovoga, postalo je očigledno da se mogu razlikovati područja različite namene u okviru nekadašnjeg naselja. Dok se keramika i srebrni novčići verovatno mogu pripisati intenzivnom naseljavanju i trgovačkim aktivnostima, koncentracija sekundarnog materijala može da ukazuje na područje predviđeno za obradu metala.

# **FUNKCIJA NASELJA**

Sve u svemu, čini se da se Elsfleth-Hogenkamp može okarakterisati kao rimsko gvozdenodopsko naselje, sa jakim indicijama vezanim za trgovinu i specijalizovano zanatstvo, koje je verovatno dobilo na značaju zbog svog geografskog položaja. Zaista, položaj Elsfleth-Hogenkamp-a daje odlične preduslove za trgovinu i saobraćaj, a takođe pruža mogućnost prilaza međuregionalnim plovnim putevima, kao što su reke Hunte i Weser. Iz ovog razloga, može se tvrditi da je većina importa do Elsfleth-a došla rečnim putem, što se inače, kada je rimska roba u pitanju, smatra čestim slučajem u severozapadnoj Nemačkoj i južnoj Skandinaviji tokom prvih vekova naše ere (Ellmers 1999b).

Još jednu dopunu ovoj ideji predstavljaju napred navedeni nalaz drvenog broda, kao i nalaz male makete broda, koji ukazuju i na brodski saobraćaj. Nedavno otkriveni komadi rimskog žrvnja možda ukazuju na isto. Opšta rasprostranjenost ovih nalaza uglavnom ističe plovni put Weser-Hunte kao glavnu trgovačku rutu (Bischop 2001, 96 i dalje, sl. 71). Sudeći po ovome, vrlo je moguće da Elsfleth-Hogenkamp takođe predstavlja luku u rimskom periodu, onako kako je tumači Ulriksen (1998, 259).

# SAOBRAĆAJNI PRAVCI

Što se tiče regionalnog saobraćaja sa zaleđem, to bi bio dodatni aspekt koji bi mogao predstavljati dokaz o postojanju najvećeg puta kroz močvaru u severozapadnoj Nemačkoj (IP XII), a koji se nalazi na rastojanju od oko 5 km zapadno od Elsfleth-a (sažeto Hayen 1991, 109-122; Fansa/Schneider 1995, 5–42). Put je dug preko 6 km, a njegovo polažište na zapadu se može locirati na Geest platou u blizini Loyerberg-a, grad Rastede, administrativna oblast Ammerland. Njegov istočni kraj se nalazi sasvim blizu crkve Bardenfleth/ Eckfleth, administrativna oblast Wesermarsch (sl. 6). S obzirom na njegov opšti pravac, on manjeviše vodi ka lokalitetu Elsfleth-Hogenkamp. Međutim, njegova upotreba tokom rimskog gvozdenog doba dovedena je u sumnju u trenutku kada su očuvani balvani dali vrlo rano dendrohronološko datovanje od oko 712/713 g.p.n.e. Sa jedne strane, izgleda da ovako rano datovanje isključuje mogućnost kontinuirane upotrebe u rimskom periodu. Sa druge strane, otkriće tzv. keramike sa primesama tucane školjke, nalažene duž ovog puta tokom ranijih iskopavanja, može ukazivati na upotrebu koja je trajala sve do ranog srednjeg veka (Krämer 1992, 110 i dalje, sl. 13). U međuvremenu je otkriveno još nekoliko puteva kroz močvare u ovoj oblasti (Först 1991, 2 i dalje, sl. 1; Fansa/Schneider 1995, sl. 1), ali je njihova interpretacija još uvek nesigurna. Suština ove rasprave je da li ove puteve treba povezati sa ranim talasom naseljavanja rečnih gliništa (Metzler 1995, 60), ili ih pre treba smatrati putevima trgovine između zaleđa i rečnih dolina (Hayen 1989, 68 i dalje). Kada je u pitanju interpretacija puteva kroz močvare, obe mogućnosti imaju smisla. Njihovo postojanje, svakako, ukazuje na potrebu ljudi za suvim i bezbednim prolazima kroz močvare tokom različitih perioda. Zajedno sa međuregionalnim saobraćajnim putevima, kao što su reke, oni čine kombinovan sistem saobraćajnica, čiji su glavni deo činili kopneni putevi. Na ovaj način se

lokalitet Elsfleth-Hogenkamp uklapa u sistem trgovačkih i saobraćajnih puteva međuregionalnog i regionalnog značaja. To se može smatrati dodatnim objašnjenjem velike akumulacije materijala sa ovog lokaliteta.

# CENTRALNOST U OBLASTI DONJEG TOKA REKE HUNTE

Ako se uzme da su trgovina i saobraćaj dve glavne funkcije centralnosti, trebalo bi utvrditi da li u ovoj oblasti postoje slični lokaliteti, koji bi pokazali sličnu strukturu i na taj način opovrgli stav da je lokalitet Elsfleth-Hogenkamp jedinstven.

Do sada je otkriveno desetak naselja iz rimskog perioda u oblasti donjeg toka Hunte (sl. 6), ali je samo nekolicina istražena pomoću probnih sondi (Först 1991, 94 i dalje). S toga se može tvrditi da je nedostatak metalnih nalaza sa ostalih naseobinskih nalazišta bio rezultat nedovoljnih istraživanja. Zapravo, većina nalaza sa ovih lokaliteta još nije publikovana i ne može biti korišćena za bilo kakvo poređenje. Ipak, uvid u kvantitativne odnose među ovim naseljima mogu predstavljati već objavljeni nalazi rimskog novca, koji postoje na gotovo svim lokalitetima u okruženju (Berger et al. 2006, 226 i dalje). Prvo, njihovo evidentiranje potvrđuje da prethodna istraživanja nisu bila usmerena samo na posebne lokalitete kao Elsfleth-Hogenkamp. Drugo, različite količine otkrivenog novca (npr. najviše šest novčića iz Berne-a, administrativna oblast Wesermarsch) jasno ukazuju na dominaciju Elfsleth-Hogenkamp-a u odnosu na ostala naselja u okruženju. Dok manje količine novčića mogu da se posmatraju kao pokazatelji svakodnevnog života, količina od gotovo 160 rimskih novčića iz Elfsleth-Hogenkamp-a, može se tumačiti samo kao trgovačka aktivnost, tokom koje je došlo do veće količine zagubljenih novčića u okviru dužeg vremenskog perioda, slično tržnici u Lundeborg-u, Fyn, Danska (Kromann 1993, 64 i dalje).

Od nedavno se smatra da je, kada se u razmatranje uzmu uslovi u rečnim močvarama, u prošlosti, gotovo svako naselje moralo predstavljati i luku, s obzirom na sveprisutne tragove plavljenja u ovoj oblasti (Scheschkewitz 2008, u štampi). Dalje, treba ispitati koje su okolnosti zaista dovele do akumulacije materijala u Elfsleth-Hogenkamp-u. Moguće objašnjenje bi bilo, malo rastojanje od samo 5 km ka istoku do druge obale reke Weser, kod savemenog sela Rekum (sl. 6), na kojem se nalazilo sledeće naselje iz rimskog perioda, a koje je nekoliko godina ranije delimično iskopavano (Brandt 1984, 172-175). Za razliku od močvarnog naselja Elfsleth, lokalitet Rekum se nalazi na peskovitom zemljištu obižnjeg Geest-a. Njegov položaj predstavlja najzapadniju tačku glacijalnih naslaga iza reke Weser (Bischop 2000, 55 i dalje, sl. 79). Među nalazima se izdvaja kuća dužine 61 m sa tri hodnika, koja predstavlja do sada najveću otkrivenu građevinu u ovoj oblasti. Osim toga, bogato opremljeni grobovi u okviru naselja, datovani u rimski period i period ranog srednjeg veka, ukazuju da su ljudi u Rekumu imali dodir sa međuregionalnom trgovinom baš kao što je to slučaj sa Elfsleth-Hogenkamp-om. Najzad, pojava nekolicine sahrana konja i stoke u okruženju, potvrđuje da je ovo mesto imalo i kultni značaj. Ukratko, nekadašnje naselje u Rekum-u je imalo mnogo odlika koje bi se mogle pripisati naselju sa izvesnom centralnom funkcijom (Jöns 2009, u štampi). Tako bi moglo da se pokaže da ovo naselje treba dovesti u vezu sa obližnjim lokalitetom Elfsleth-Hogenkamp, koje pak ima različite odlike centralnosti, a nalazi se u blizini. Dalja istraživnja bi, u poređenju sa primarnim modelom Gudme/ Lundeborg u Danskoj (Ulriksen 1994, 801-802), mogla da pokažu da su centralne funkcije bile raspoređene na različitim mestima u isto vreme - u donjem toku reke Hunte tokom rimskog peiroda. S obzirom na specifične topografske osobine u predelu rečnog gliništa, čini se da se može govoriti o centralnoj oblasti, koja je, nasuprot nalazištima iz južne Skandinavije, imala drugačiji karakter.

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# AN ASSESSMENT OF WINE AND OIL PRODUCTION IN ROME'S HINTERLAND: CERAMIC, LITERARY, ART HISTORICAL AND MODERN EVIDENCE\*

# ABSTRACT

This paper presents a model of wine and olive oil production in the area defined as Rome's immediate hinterland. The paper begins with a review of recent ceramic studies that indicate the supply patterns of wine and oil toward the city of Rome. According to these ceramic studies, there is a conspicuous void in supplies – apparently no local wine or oil was consumed in Rome. A review of literary, art historical and archaeological evidence reveals that Rome's hinterland was indeed a major producer of wine and oil, but that these products are "archaeologically invisible" since they were not transported in ceramic amphorae. The writer presents a series of calculations based upon a reading of Cato, scant archaeological evidence and modern records of wine and oil production, suggesting that as much as 33% of the wine and 25% of the oil consumed in Rome may have derived from her agriculturally rich hinterland.

Key words: Wine production, Oil Production, Rome's hinterland, Historical Sources, ceramics, supply patterns

# **INTRODUCTION**

The 1990s witnessed the publication of two important books that have altered conceptions of the ancient Roman economy for many scholars. Steven L. Dyson's Community and Society in Roman Italy (1992) and Neville Morley's Metropolis and Hinterland: the City of Rome and the Italian Economy 200 B.C. – A.D. 200 (1996) were written in the light of extensive surveys in Etruria and Sabina by British, Italian and American researchers that revealed hundreds of rural sites in the

<sup>\*</sup> I wish to thank Prof. Anna Gallina Zevi and Dr. Elizabeth Jane Shepherd of the Soprintendenza per i Beni Archeologici di Ostia as well as Drs. Michael Heinzelmann and Archer Martin, Directors of the DAI/AAR Ostia Project, for their continued interest and support. I am indebted to the organizers of the conference "Roman Villas around the Urbs" for accepting this paper. In particular, I would like to thank Allan Klynne for his many useful comments on an earlier draft of this paper.

Roman countryside and beyond.<sup>1</sup> Until this time many historically and/or ceramologically oriented scholars were focused on the "global" aspects of the Roman economy,<sup>2</sup> whereby issues such as the slave mode of production, sea-borne trade and the economic boom of North Africa were highlighted and, intentionally or not, local economies within the Roman Empire were downplayed. By the 1980s, some scholars began to stress the economic importance of regional economies in Italy, including Rome's hinterland.<sup>3</sup> Together with the books by Dyson and Morley, these studies have convinced many researchers to look closer to home for answers. The purpose of this paper is to highlight the role of Rome's immediate hinterland in the supply of agricultural goods to Rome and Ostia.<sup>4</sup> That long-distance transport, whether dictated by the State through taxation and the annona system or by entrepreneurs, was important in the Roman world is not repudiated in this paper. The writer, primarily a ceramics specialist who follows the work of Carandini, Fulford, Panella, Peacock, Peña and others, has become sensitive to the importance of regional economies in the global system of the Romans and seeks to account for goods not represented archaeologically both qualitatively and quantitatively through a review of several different sources of evidence and modeling.<sup>5</sup> It is hoped that this study might complement the archaeological field surveys, such as the Tiber Valley Project, and re-analyses of survey

data by scholars whose work is presented in this volume and elsewhere.<sup>6</sup>

This paper begins with a brief review of ceramic studies, which until now have presented a skewed vision of trading patterns toward the city of Rome and suggest that all staple goods were shipped from abroad. Next, information is presented which indicates that the immediate hinterland of Rome was, indeed, an important producer of fresh and preserved goods and that they are not detected archaeologically because commodities such as wine and olive oil were transported overland in perishable containers. The third part of this paper presents a model for wine and olive oil production in the immediate hinterland of Rome. The suggested volumes of local wine and oil are then considered in the light of statistical information gathered from the recent study of amphorae excavated at Ostia Antica in order to demonstrate a more realistic picture of supply trends.

# **CERAMIC HERESY? WINE AND OLIVE OIL PRODUCTION IN ROME'S HINTERLAND**

During the height of the imperial period, the city of Rome required enormous quantities of food and drink each year in order to satisfy the needs of her one million inhabitants. Scholars have estimated that 150 million tons of grain, 167 million liters of wine, 20 million liters of olive oil, and 22 million liters of fish sauce were imported to Rome each year.<sup>7</sup> Many studies in the last 20 years have sought to determine the source of foodstuffs consumed in Rome based upon historical

<sup>1</sup> Duncan 1958; Jones 1962; Kahane et al. 1968; Hemphill 1975; Kahane 1977; Dyson 1978; Potter 1979; Forma Italiae series.

<sup>2</sup> E.g., Carandini 1970, 1983; Rickman 1980; Whitehouse et al. 1982; Panella 1985, 1989; Anselmino et al. 1986; Carignani et al. 1986; Martin 1989.

<sup>3</sup> Evans 1980; Purcell 1985, Barnish 1987.

<sup>4</sup> Because this paper is largely theoretical the chronological context of this paper is the first half of the second century AD, which has been chosen for two reasons: 1) to indicate that even during the height of trade during the imperial period, there was significant local production; 2) abundance of ceramic evidence from the DAI/AAR excavations at Ostia Antica.

<sup>5</sup> Clarke 1968, 21–22; Aldrete & Mattingly 1999; De Angelis 2000; MacKinnon 2001, 2004; De Sena 2003.

<sup>6</sup> Patterson 1998, 2004; see in this volume papers by Messineo, Di Giuseppe, Volpe & Arnoldus Huydzenveld. 7 Scholars have estimated the dietary needs of ancient Romans based upon a variety of evidence ranging from the ancient sources to the daily nutritional targets established by organizations of the United Nations: Garnsey 1983,119; Tchernia 1986, 21–27; Amouretti 1986,177–96; Curtis 1991, 22–23. Estimates are, of course, subject to debate, but have been accepted by most economic historians given the absence of more reliable information.

and archaeological evidence, with one of the most common bodies of evidence being Roman pottery. Studies of large pottery assemblages excavated at Rome and Ostia have yielded crucial information for the shifting patterns of trade/supply during the imperial period.8 For example, we are well aware of the fact that oil was imported predominantly from Baetica in the first and second centuries AD and from North Africa in the late Roman period. Similarly, Panella and others have indicated broad shifts from Etruscan, Campanian and Gallic wine in the early imperial period to Umbrian and Adriatic wine in the middle imperial period and, finally, Calabrian and east Mediterranean vintages in the late Roman period.<sup>9</sup> More recently, studies based upon assemblages of pottery excavated in Rome and Ostia have refined our knowledge of supply trends somewhat.<sup>10</sup>

One of these pottery assemblages, which forms the basis of the present study, derives from the DAI/AAR excavations at Ostia Antica.11 These excavations, directed by M. Heinzelmann and A. Martin (1998-2001), resulted in the recovery of about 6000 kg. of pottery, a sub-section of which has been studied by the writer following the procedures established by D.P.S. Peacock, M. Fulford, J.T. Peña and others.<sup>12</sup> The pottery studied by the writer was sorted into classes based upon their provenience (identified through examination of the clay) and function (i.e., table/utilitarian wares, cookwares and amphorae). All pottery was quantified according to raw counts and weights of all sherds, minimum and maximum vessel counts and estimated vessel equivalents.13 The percent-

13 For a discussion of quantification in pottery studies, see

ages illustrated in this paper represent the average score of these counting methods.

In addition to advances in the methods of classification and quantification in pottery studies, one way by which our knowledge of trade and supply patterns of amphora-borne commodities can be refined is to distinguish between the proportions among amphorae found at a particular site or sites and the volume of the commodities that would have been supplied/traded. This is to say, rather than knowing the shifting percentages of amphora-types over time, it would be of considerable historical interest to indicate the differences in the volume of imported goods. Thus, what does it mean that 17.5% of all wine amphorae found in early second century contexts at Ostia are Gallic? How much wine was imported from Narbonensis at this time? We can begin to answer this question by considering amphora capacity, addressed by André Tchernia and J. Theodore Peña.<sup>14</sup> As is well known, the Romans adhered to strict volumetric and weight measurements in their calculation of the quantities of liquid and semi-liquid commodities,<sup>15</sup> a task overseen by figures such as the praefectus annonae ad oleum or the coacter vinarius.<sup>16</sup> The dimensions of the various classes of amphorae were, therefore, not decided casually by the potter, but were established on the basis of units of measurement.<sup>17</sup> A clear example of madeto-measure wine jars is attested in a series of papyri discovered at Oxyrhynchus.<sup>18</sup> These third century documents are contracts between villa owners and itinerant potters in which the former specify that several hundred ceramic vessels be fabricated in three distinct sizes (2-, 4-, and 8-choes).

<sup>8</sup> E.g., Whitehouse et al. 1982; Panella 1985, 1989; Anselmino et al. 1986; Carignani et al. 1986; Martin 1989.

<sup>9</sup> Panella 1985, 1989; Anselmino et al. 1986; Carignani et al. 1986.

<sup>10</sup> See also Peña 1999; Martin 2002; De Sena 2002, 2003; Rizzo 2003; Martin & De Sena 2005.

<sup>11</sup> For recent work and bibliography of the DAI/AAR excavations at Ostia Antica, see Martin et al. 2002.

<sup>12</sup> Archer Martin (AAR) is currently coordinating the study and publication of the whole pottery assemblage.

Orton, Tyers and Vince 1993, 166-181.

<sup>14</sup> Tchernia 1986, 309–20; Peña 1999, 191–198; see also Rizzo 2003, 203–28.

<sup>15</sup> Viedebantt 1917.

<sup>16</sup> Palmer 1980; Coarelli 1996; Peña 1999, 10-28.

<sup>17</sup> For units of measurement in antiquity, the classic study is Viedebantt 1917; for the procedures involved in regulating the measurement and transportation of olive oil, see Peña 1998b, esp. 153–170, and 1999, 20–28. 18 Cockle 1981.

	1	1	1	1	
Provenience	Raw values (%)	Capacity (sextarii)	Capacity (liters)	Adjusted Values (%)	Maximum volume of imports (liters)
West-central Italy	39.6	32	17.2	38.7	64,600,000
Naplés/ Phlegrean	1.9	54	29.1	3.1	5,200,000
Adriatic Italy	9.2	32	17.2	9.0	15,000,000
South Italy	1.6	16	8.6	0.8	1,300,000
Narbonensis	17.9	32	17.2	17.5	29,200,000
Tarraconensis	1.9	54	29.1	3.1	5,200,000
Tripolitania	0.8	24	12.9	0.6	1,000,000
Aegean – Crete	2.5	40	21.6	3.1	5,200,000
Aegean – Rhodes	1.9	40	21.6	2.3	3,800,000
Anatolia	8.4	12	6.6	3.2	5,300,000
Egypt	0.3	16	8.6	0.1	200,000
Unknown	14.0	32-54	23.1	18.4	30,700,000
Total	100.0	-	-	100.0	167,000,000
Provenience	Raw values (%)	Capacity	Capacity (liters)	Adjusted values (%)	Maximum volume of imports (liters)
Baetica (Dressel 20)	52.5	144 sext.	77.6	72.5	14,500,000
Lusitania	7.7	54 sext.	29.1	4.0	800,000
Zeugitana/ Byzacena	36.4	75-150 lbs.	32.9	21.3	4,300,000
Tripolitania	3.4	125 lbs.	36.4	2.2	400,000
Total	100.0	-	-	100.0	20,000,000

Tables 1a and 1b. Proportion and maximum volume of wine and olive oil imported annually to Rome based on ceramic evidence and considering amphora capacity (DAI/AAR excavations, AD 100–150).

In Roman Italy, the most common units of volume were the sextarius, the amphora, the metreta and the culleus. 48 sextarii were equivalent to 1 amphora (= 1 cubic foot; ca. 25.9 liters);<sup>19</sup> 1.5 amphorae were equivalent to 1 metreta. The most common multiples of the sextarius were 12, 16, 24, 32, 40, 48, 54 and 72, corresponding to ca. 6.5, 8.6, 12.9, 17.2, 21.6, 25.9, 29.1 and 38.8 liters. A single culleus is equivalent to 20 amphorae (ca. 517 liters). The contents of oil amphorae, particularly Baetican and North African amphorae, may have also been quantified according to weight and in this case 100 pounds (1 centenarium) was equivalent to 54 sextarii. Two recent studies calculate amphora capacity based upon

<sup>19</sup> Volumetrically, one amphora should be equal to one cubic Roman foot (Viedebantt 1917). Because there is some range to what scholars maintain comprised a Roman foot, there is also some range of volumes: Duncan-Jones 1982, 371-372, whereby 1 sextarius = 0.539 litres; Peña 1999, 194–197 whereby 1 sextarius = 0.546 litres; Jones 1964, xv whereby 1 sextarius = 0.57 litres.

geometric principals.<sup>20</sup> In his work, Peña calculated amphora capacity geometrically, but then relied upon the closest ancient unit of measurement for his final figure. He then used the resulting amphora capacities to determine the amount of wine, olive oil and fish sauce contained in the amphorae discovered at the Palatine East excavations. Giorgio Rizzo followed the same system to calculate the amount of amphora-borne commodities contained in the amphorae unearthed in several early-middle Imperial contexts in the centre of Rome. The same system is relied upon for the purposes of this study, but the capacities indicated by Peña and Rizzo are merged with the statistical evidence from the DAI/AAR excavations in order to determine the maximum volume of imported wine, olive oil and fish sauce to the cities of Ostia and Rome each year.

Tables 1a and 1b indicate that the capacity of most wine amphorae tended to fall within a rather broad range of sizes in the early Imperial period (16-54 sextarii = 8.629.1 liters). The capacity of amphorae used for the transportation of olive oil was not only larger, but the range of sizes varied considerably (48-144 sextarii). Containers manufactured in modern-day Tunisia were manufactured in a fairly broad range of sizes (75-150 lbs.).<sup>21</sup> The same tables illustrate the differences in proportions between amphorae when amphora capacity is considered as well as the maximum volume of importation. The overall proportions of wine are not significantly affected, except for wine from Anatolia and Calabria, due to the very small size of these wine amphorae compared to Italic, Gallic, Aegean and early Spanish containers. However slight, the differences should be viewed as being closer to ancient proportions than the raw amphora data. Alternatively, calculating the capacity of oil amphorae shifts the proportions radically. For example, according to the ceramic data alone, Baetican oil amphorae represent 52.5% of all oil containers, while oil amphorae from Zeugitana / Byzacena represent about 36.4%. When the capacity of these containers is considered, we note significant differences in the volume of Baetican and North African oil imported to Ostia and Rome (72.5% vs. 21.3%). If we assume that amphorae are an accurate reflection of supply trends, the same tables can be used to establish the maximum volume of wine and olive oil imported to Ostia and Rome from the Roman provinces and more distant areas of Italy. No matter how the ceramic evidence is considered or refined, there is still a conspicuous absence in these supply trends: Rome's immediate hinterland.

#### AN APPRAISAL OF ROME'S HINTERLAND

The immediate hinterland of Rome has been defined more than once, based upon geographical features, travel times and previous cultural boundaries (Fig. 1).<sup>22</sup> It is exponentially larger than a typical ager: a stretch of coastline roughly between Centumcellae to the north and Antium to the south that encompasses southern Etruria and the Pontine Plains in Latium, as well as the extended valley of the lower Tiber river up to the level of Falerii Novii and Forum Novum (c. 40 miles upriver from Rome) and an area around the Urbs ca. 30 miles along the consular roads to Sutri, Tibur, Praeneste, the Alban Hills. This territory comprises roughly 1900 square miles (ca. 5000 km<sup>2</sup>) in modern-day Lazio and would have provided Rome and Ostia with fresh alimentary goods, including dairy products, meat, fish, vegetables and fruit; preserved foods, including nuts, legumes, preserves, wine and oil; salt; timber and charcoal; as well as building material: volcanic tuff, limestone and travertine; clay, sand and gravel. Despite what the ceramic record sug-

<sup>20</sup> Peña 1999, 191-198; Rizzo 2003, 203-228.

<sup>21</sup> Peña 1999, 195-196.

<sup>22</sup> Walker 1967, 171–79; Morley 1996, 83–86; Peña 1999, 30.



Fig. 1. Rome's immediate hinterland (Drawing by E. C. De Sena, elaborated by J. P. Ikäheimo).

gests, there is ample evidence for the production of wine and olive oil in the territory surrounding Rome.<sup>23</sup> To begin, Tchernia conveniently provides a list of all ancient literary references that refer to wine from different cities in Italy, including 22 towns or territories within Rome's hinterland.<sup>24</sup> Three cities (Caere, Gravisca and Veii) were located in southwestern Etruria, while the remainder were on the Pontine Plain, in the Alban Hills, the upper Latina valley, or between the Monti Lucretili and the left bank of the Tiber River (lower Sabina). Nine of the localities are mentioned in both early and late Imperial sources, including the Price Edict of Diocletian (Tiburtini and Sabini).<sup>25</sup> Moreover, thousands of Roman 'sites', many of which are presumed villas, have been identified in southern Etruria, Sabina and the Latina valley by British and Italian researchers.

Of the known villas throughout Rome's

<sup>23</sup> Researchers from the BSR have noted amphora production in the middle Tiber valley (Arthur 1997; Patterson et al. 2003); however, Rizzo (2003,143) indicates that these amphorae were used for local purposes. Moreover, studies of large pottery assemblages in Rome and Ostia (Anselmino et al. 1986, Carignani et al. 1986, Peña 1999, Panella and Saguì 2000) have not revealed amphorae from the region in question.

<sup>24</sup> Tchernia 1986, 321–344; see also Carandini 1988, 339–58.

<sup>25</sup> Summarised by Peña 1999,16-17.



Fig. 2. Rome's hinterland with locations of villas (Drawing by E.C. De Sena, elaborated by J.P. Ikäheimo).

hinterland, at least 58 bear unequivocal evidence for olive oil and/or wine production (Fig. 2 and Appendix 1). No true patterns can be detected since there is considerable bias in the manner in which these sites were identified, published and reviewed for this study.<sup>26</sup> Despite the inadequacies of the distribution of sites, two general observations can be made: the sites are distributed throughout the arable areas of the hinterland and few zones are not represented. Chronologically, 12 have a Republican phase, 18 an early Imperial phase and 12 a late Roman phase, while the full chronology of most villas is unclear. It is likely that many of the hundreds of known villas and farms had similar facilities which have either been destroyed through subsequent land-usage or have not been identified and published by scholars. In the Ager Faliscus alone, 207 villas have

<sup>26</sup> The sites were generally discovered because of imminent building activity in certain suburbs of Rome and, hence there is a heavy concentration around what is now the Grande Raccordo Annulare. Of the many sites discovered, some Ispettori of the local archaeological superintendency report their work more often than others. There is also considerable bias as to what archaeologists have reported – many were primarily interested in reporting 'artistic' finds, while scholars such as Lorenzo Quilici reported in great detail the nature of utilitarian finds.

been associated with the early imperial period,<sup>27</sup> suggesting that the central Italian landscape was akin to the situation that Mattingly and Hitchner identified in North Africa whereby the density of oil presses was approximately 1 press for every 2 km2.<sup>28</sup>

The primary reason that the agricultural commodities produced throughout Rome's hinterland are not archaeologically apparent in the Urbs is because both the produce and the containers in which they were transported were perishable. There is an increasing amount of evidence that barrels (cupae) and skins (cullei/utres) were utilized for overland transportation in the Roman world.<sup>29</sup> Proof of such practices is in the form of literature, epigraphic records and examples of visual culture. Among the ancient writers who mention cupae, cullei and utres, Strabo describes the city of Aquileia as an emporium for the Illyrians who came for merchandise that traveled across the sea: "they put their wine in wooden barrels and load their carts" (Geography V.1.8). The same writer recounts having seen wooden barrels "larger than houses" for the great quantity of wine produced in the Po valley (Geography V.1.12). Cato illustrates the manner in which to construct a four-handled, presumably wooden, container that measures one culleus for the transport and decanting of wine (de Agri Cultura 154). In his analysis of 32 Imperial-period ostraka from North Africa, Peña notes references to two varieties of oilskins that were used to transport oil from inland centers of Byzacena to ports, where the contents were poured into amphorae for overseas transport.<sup>30</sup> The abbreviation as (possibly for ascopa or ascopera) refers to oilskins with a capacity of 504 pounds of oil (ca.182.7 liters); as a b/ (possibly standing for ascopera from Byzacena) refers to a smaller oilskin with a capacity of 72 or 75 pounds (26.2-27.3 liters) – roughly equivalent to one amphora.

In addition to these written references, there are also many artistic sources in which both barrels and skins are depicted. While the contents of barrels being transferred by soldiers on the Danube depicted on Trajan's Column are unknown,<sup>31</sup> the barrels represented on the funerary stele of L. Cantius Acutus, a wine merchant from Aquileia, were clearly used for wine.<sup>32</sup> The relief depicts a pair of men standing at opposite ends of a stack of barrels; they each hold a patera in their right hand, while Acutus also holds a small wine skin in his left hand. From the Bay of Naples are a series of bronze statues of satyrs and sileni discovered in the Villa of the Papyri in Herculaneum: a drunken satyr enjoys his debauchery whilst reclining upon a half-full utres; a pair of sileni hold small wine skins, possibly offering wine to the visitors of the villa; the most dramatic statue represents a silenus riding an overturned culleus.<sup>33</sup> It is presumed that substantial quantities of wine and olive oil were produced in the vicinity of Ostia and Rome and transported in perishable containers or re-used amphorae that are not obvious in the archaeological record. In order to compensate for the "invisible" portion of material culture, I shall rely upon model building.

# A MODEL FOR WINE AND OLIVE OIL PRODUCTION IN ROME'S HINTERLAND

Indeed wine and olive oil were produced in Rome's hinterland, but can we approach an estimate of the volume produced on an annual basis? Faced by the absence or lack of solid evidence, archaeologists have frequently built models or have posited numerical estimates of socio-economic systems.<sup>34</sup> It must be borne in mind that the

<sup>27</sup> Potter 1979, 125-40.

<sup>28</sup> Mattingly 1988; Hitchner 1989, 1993.

<sup>29</sup> Marlière 2002; Tchernia 1986,39 and 285-292.

<sup>30</sup> Peña 1998, 166-171.

<sup>31</sup> Settis 1988, 262, Pl. 4.

<sup>32</sup> Tchernia 1986, 288, fig. 4.

<sup>33</sup> Wojcik 1986,227–240, Figs. LIX, CXX, CXXI.

<sup>34</sup> See, recently, Aldrete and Mattingly 1999; De Angelis 2000.

more we extrapolate mathematically, the greater the risk of moving away from reality, but at least such estimates are targets that can be proved or disproved by future research. For the purposes of this paper, it is assumed that the density of vines and olive groves in Rome's hinterland was similar in both the Roman and modern periods. This assumption is based upon archaeological evidence gathered by British and Italian surveyors<sup>35</sup> as well as passages in the ancient sources.<sup>36</sup> If estimates of ancient yields of wine are based upon modern statistics,<sup>37</sup> we note that an average of 340 million liters of table wine is produced annually from 45,000 hectares of vines in modern-day Latium.<sup>38</sup> Considering that the immediate hinterland of ancient Rome accounted for about 65% of the land used in present-day Lazio for vineyards, we might expect an average of 221 million liters of wine produced on 29,000 hectares. Given the fact, however, that viticultural techniques are far more advanced today than in antiquity, this figure is probably an over-estimation of ancient yields. Perhaps a closer estimate can be extracted from Cato (de Agri Cultura 11). In his book on the equipment requirements for a 100 iugera vineyard, Cato mentions the need for 800 cullei that would be used to store five vintages. If 800 cullei amount to 413,600 liters of wine, then a single vintage from a 100 iugera estate would have consisted of 82,720 liters of wine. This figure is somewhat more than the annual yield that Andrea Carandini calculated for the Settefinestre villa. Carandini estimated that vineyards were planted on 230 iugera of the Settefinestre estate, producing 4600 amphorae (119,140 liters) of wine per year, or 51,800 liters

per 100 iugera.<sup>39</sup> Closer to Cato's appraisal, Potter estimated that villa 13 at Boscoreale, whose extent is unknown, could have produced about 93,800 liters, based upon the number of dolia found in situ.<sup>40</sup> Finally, excavations of a villa along the via Tuscolana in Rome (Rea 1985) revealed two large cisterns in association with a wine-pressing area whose combined capacity was 102,000 liters. The total extent of this estate's vineyard is unknown, but the similarity of this volume with that of villa 13 at Boscoreale and Cato's figure is interesting. If we employ Cato's figure, the 29,000 hectares (116,000 iugera) of vineyards in Rome's immediate hinterland would have yielded an average of 96,000,000 liters of wine per year - somewhat less than half the modern yield. While good and bad harvests occur today as they did in antiquity, the degree of fluctuation is not as great as that for olives.

Naturally, the producers would have consumed some portion of the wine and oil produced in this region. The population of Rome's hinterland is not known, but can be estimated. Many scholars suggest that the free population of Roman Italy in the first century AD was around 4.5 million and that the total population was around 7.5 million.<sup>41</sup> Subtracting 1,000,000 for Rome/Ostia and another 1,000,000 for the greater Bay of Naples region, if we assume that the remaining population was spread evenly over the ca. 125,000 square

<sup>35</sup> Supra note 1.

<sup>36</sup> The reader is directed to Tchernia 1986 and Brun 1986 for discussions of ancient texts mentioning the production of wine and olive oil.

<sup>37</sup> For the purposes of this study, it is assumed that the geographic and climatic conditions of ancient and modern Italy were comparable; for an excellent account of the geographic and climatic conditions of ancient Latium see Leonardi et al. 1998.

<sup>38</sup> Source: Istituto Nazionale di Statistica (www.istat.it).

<sup>39</sup> Carandini (1980, 4) suggests that somewhat less than half of the plantation was utilised for the cultivation of grapes.

<sup>40</sup> Potter 1987, 97.

<sup>41</sup> These estimates are based largely upon records from the Augustan census of 28 BC (see Jongman 1991,66–67 and Morley 1996,47), which have been interpreted variously. Beloch (1886, 388–443) assumed that this number included all citizens (male, female and children) but subtracted what he believed to be the population of Cisalpine Gaul and added 2 million slaves for a total Italian population of 5,500,000 in 28 BC. Brunt (1971, 124) assumed that a certain number of citizens did not register with the state and inflated the basic sum of citizens to 4,500,000 and assumed 3 million slaves See also Hopkins 1978, 68–69; Jongman 1991: 67; Morley 1996, 46–50.

Yield (x1000 lit.)	96,000
Producers' share (x1000 lit.)	42,000
Urban supply (x1000 lit.)	54,000
No. urbanites per year	323,000
Additional annual need	
(x1000 lit.)	113,000

Table 2. Model for regional wine production and<br/>urban supply

miles of peninsular Italy, we arrive at a figure of 44 people per square mile, or 118,800 people in the 1900 square mile region of Rome's immediate hinterland.<sup>42</sup> Population density may have been somewhat higher around Rome and, thus, for the sake of this paper this figure might be doubled to ca. 250,000. This figure is somewhat arbitrary, but when we consider that the average size of the 400 minor cities in Roman Italy mentioned by Morley was 2000 free inhabitants<sup>43</sup> and that there were no more than 70-100 minor cities in the region in question, an estimate of 250,000 seems reasonable and would also account for slaves. This figure also seems reasonable if we consider that the current population of the provincia di Roma, excluding the city of Rome, is about 1,250,000 (http:// demo.istat.it/bilmens2004). Modern-day Lazio is certainly more densely populated than the ancient Roman hinterland.

Table 2 presents a scheme for wine production and consumption in Rome's hinterland. Of the 96 million liters of wine produced each year, somewhat less than half of the wine would have been consumed by the 250,000 residents of this region. This left 54 million liters for the urban population of Rome and Ostia, meeting 32% of the urban demand for wine. There still would have been a need for about 113 million liters of wine from external sources.

Modern-day Latium hosts more than 86,000 hectares of olive groves that produce an average of 24,000,000 liters of virgin oil per year, with a ten-year low of about 15,000,000 and a ten-year high of about 37,000,000.44 The wide variation in yields is dependant upon many factors, including the amount of rainfall, the two-year cycle of olive trees, which will be productive in alternate years, and vegetal or animal infestations.45 Average, poor and bumper yields are normal in modern olive growing regions as was the case in antiquity. Statistical information regarding olive producing nations in the Mediterranean indicate that in recent decades, there are generally 3 poor yields, 2 bumper yields and 5 average yields.<sup>46</sup> The recent technological advances made in oil presses simply speed up the process rather than producing more oil from a set volume of raw produce.<sup>47</sup> Pliny (N. H. 15.4.14) reports that six Roman pounds of oil (1.96 kg) are generally extracted from one modius of olives (8.62 kg) for a yield of 22.7%. This figure is significantly higher than the average modern-day yield of 13-18%.48 Assuming, once again, that patterns of land usage were the same in antiquity as they are at present, the territory defined in this study would have had 56,000 hectares of olive trees and assuming that ancient and modern yields were essentially the same, we should expect an average annual yield of 15 million liters of oil in Rome's immediate hinterland.49

Jean-Pierre Brun, however, suggests a lower yield for Roman olive groves based upon yet another reading of Cato (de Agri Cultura 10).<sup>50</sup> Cato recommends that a 240 iugera farm should be furnished with 100 oil dolia, which measure

50 Brun 1986, 280.

<sup>42</sup> Cf. Morley 1996, 33-39.

<sup>43</sup> Morley 1996,182; for a recent paper on the population of Roman Italy, see Scheidel 2004.

<sup>44</sup> Source: Istituto Nazionale di Statistica (www.istat.it). 45 Mattingly 1988.

<sup>46</sup> Source: International Olive Oil Council – Economics Division (www.internationaloliveoil.org).

<sup>47</sup> Curci 2001, 143-147.

<sup>48</sup> For estimates of olive oil yields in RomanAfrica, see Mattingly 1993,484; for modern yields, see Curci 2001,31.49 This is equivalent to 268 liters per hectare or 67 liters per iugerum.

Year	Avg.	Low	Bumper
Yield (x1000 lit.)	9,700	6,000	15,000
Producers' share (x1000 lit.)	5,000	5,000	5,000
Urban supply (x1000 lit.)	4,700	1,000	10,000
No. urbanites per year	235,000	50,000	500,000
Additional annual need			
(x1000 lit.)	15,300	19,000	10,000

Table 3. Model for regional oil production and<br/>urban supply.

approximately the same as a culleus (c. 517 liters).

These dolia would, thus, store 51,700 liters of oil. Although specific mention is not made by Cato in this passage, Brun assumes that these dolia would store five-years worth of oil, just as the wine cullei in Cato's chapter 11 would store five vintages. This scholar's assumption may be supported by information from the early third century AD. Upon the death of Septimius Severus, the Horrea Galbana had been stocked with five-year's worth of oil (SHA: Severus XVIII,3; Severus XXIII,2; Clodius Albinus XII.7),<sup>51</sup> indicating that it would not have been unusual to plan so far into the future. According to Brun's estimates, a 240 iugera farm would produce an average of 10,340 liters of oil, or 43.1 liters per iugerum. If this estimate is multiplied by the amount of land in Rome's hinterland assumed here to have been planted with olive trees, an average yield would be

9.7 million liters. Based upon these estimates, we can work out a scheme (Table 3), which illustrates hypothetical yields in average, poor and bumper years with the number of people that the yields could satisfy in one year. Assuming that the producers of this oil (250,000 rural folk) kept enough oil for themselves (5 million liters), the surplus oil for the urban market would have been 4,700,000 liters in an average year, enough oil to satisfy the annual needs of 235,000 people in Rome and Ostia or the needs of 1,000,000 urbanites for about 12 weeks. With a bumper yield the surplus was 10,000,000 liters, which would have satisfied half the urban needs. Poor yields would have filled a far smaller portion of the urban demand. If the producers kept their share of the yield, only one million liters would have been available for the urban market (5% of the total demand); thus, nearly all the olive oil consumed in Rome and Ostia had to have been imported from extra-regional sources. Considering Brun's assessment, producers of olive oil in Rome's immediate hinterland may have stockpiled oil from bumper years in provision of poor yields.<sup>52</sup> In this way, they still may have been able to provide 4,700,000 liters of oil to the Urbs and its port city despite poor yields. Assuming that 4,700,000 liters was an annual target, this still left somewhat more than 75% of the urban supply to satisfy through importation.

When these estimates are confronted with the ceramic evidence from the DAI/AAR excavations at Ostia, the picture of supply trends is quite different (Figs. 3–4). Mathematically, the percentages of amphorae are repartitioned to account for the percentage not covered by regional production, namely 67.7% of the wine supply and 76.5% of the olive oil supply. In this way, the proportions among the amphorae remain constant, but the volume of imported commodities is reduced (cf. Table 1). As for olive oil, Baetica still appears as the principal supplier with nearly 12 million liters be-

<sup>51</sup> Reported by Andrea Carandini (1970, 99). There are, of course, difficulties with this source. As Allan Klynne (personal communication) has rightly indicated, if we take this passage at face value, the Horrea Galbana and other nearby facilities would have had to house 100 million liters of olive oil.

<sup>52</sup> Under normal conditions oil can be stored in closed containers for at least two years (Curci 2001, 182–183).


Fig. 3–4. Proportions of wine and olive oil consumed annually in Rome, AD 100–150, considering ceramic evidence and estimates of local produce.

ing imported to Rome/Ostia, while North African oil accounts for 3.5 million liters. As for wine, this experiment suggests that Rome's hinterland was actually the main source, while Tuscany/Umbria, Gaul and the northern Adriatic region were the principal suppliers with a combined 64 million liters imported each year to Rome/Ostia. These figures seem to corroborate estimates posed by scholars based upon a variety of factors. For example, Garnsey and Saller estimated that 4 million liters of Baetican oil (transported in 55,000 amphorae) were consumed annually in Rome based up the Monte Testaccio evidence.53 The authors did not take into account the fact that Dressel 20 amphorae were discarded in many other parts of Rome and Ostia; thus, we should take their estimate to be a minimum volume. In fact, Rodriguez Almeida estimated that in the second century AD 10 million liters of olive oil were imported to Rome on an annual basis.54 Moreover, Bruce Hitchner estimated that about 300,000 Dressel 20 amphorae were produced annually in the Guadalquivir region.55 When the 10-12 million liters of Baetica oil suggested in Fig. 4 are divided by the capacity of a typical Dressel 20 oil amphora, the result is that ca. 130-156,000 amphorae were required for the transport of oil to Rome/Ostia each year,

roughly 3350% of Hitchner's estimate (the remaining 144–170,000 amphorae would have been used to transport oil to other centers throughout the Mediterranean). David Mattingly suggested that 1 million liters of Tripolitanian oil were shipped to Rome each year,<sup>56</sup> whilst 300,000 liters are proposed here. This discrepancy may be due to the fact that Tripolitanian amphorae may be underrepresented at the DAI/AAR excavations, due to reasons such as the possibility that many body sherds may not have been distinguished from Tunisian amphorae. There are no comparable estimates for the volume of foreign wine to Rome in the archaeological literature.

# CONCLUSION

The immediate hinterland of Rome (Fig. 1, above), an area of some 5000 km2 between Centumcellae and Antium on the Tyrrhenian coast and the cities of Falerii Novii and Forum Novum in the middle Tiber Valley, was an important source of agricultural commodities for the city of Rome during the imperial period. Wine and olive oil were two goods produced in this broad region, yet these regional goods have been largely ignored by modern scholars in the light of the 'global' system of trade in the Mediterranean.

<sup>53</sup> Garnsey & Saller 1987, 58.

<sup>54</sup> Rodríguez Almeida 1984, 29.

<sup>55</sup> Hitchner 1993, 504.

<sup>56</sup> Mattingly 1993, 153.

This paper has sought to determine the volume of wine and olive oil that was produced in Rome's immediate hinterland at the height of the imperial period and to merge these estimates with ceramic evidence from recent stratigraphic excavations at Ostia Antica in order to propose a more nuanced vision of supply trends toward Ostia and Rome. A review of archaeological, textual and modern information suggests that the Roman hinterland was capable of producing 96 million liters of wine (54 million liters surplus for the Urbs) and 9.7 million liters of olive oil (nearly 5 million liters surplus for the Urbs). In the light of this volume dedicated to suburban villas one final calculation is posited: if we consider that a 100 iugera vineyard would have produced 82,720 liters of wine and a 240 iugera olive grove will produce 10,340 liters of olive oil, we should expect about 940 villas/farms involved in oil production and 1160 villas/farms involved in wine production in Rome's immediate hinterland. Of course, the villas/farms may have been one in the same, producing both wine and oil; thus, we should expect between 1160 and 2100 villas/farms in the region.

The estimates posited throughout this study are provisory, but are a further step in the direction of understanding the organization of agricultural systems in Roman Italy. The figures should be considered to be targets that can be refined through the continued programs of study which focus upon the remains of villas, landscape archaeology and archaeological materials. The application of GIS would be of particular importance in this regard in order to consider three-dimensionally the location and size of villas and farms over time, their produce, their access to roads and rivers, and even to calculate transport friction (the cost of transport considering factors such as terrain, road surfaces, river currents and type of vehicles).

# APPENDIX 1. WINE AND OIL PRODUCTION SITES

58 villas and farms surveyed or excavated within the immediate hinterland of Rome bear clear evidence of olive oil and/or wine production (Fig. 2, above). While it is beyond the scope of this paper to describe or even assess all evidence for villas within Rome's immediate hinterland, a documentary sampling procedure was followed. Rossiter listed all known wine and oil producing sites in this region that had been published up to the late 1970's - a total of 10 sites. For sites published after ca. 1980, a number of journals and other publications were browsed: Notizie degli Scavi, Bolletino Comunale, Archeologia Laziale and the Forma Italiae series. This list is not meant to be exhaustive, but indicates to some extent the geographic and temporal distribution of such sites in the Roman hinterland. Many additional villa sites were described as having "mill stones", but whether these stones were for grain or olives could not be determined from the brief descriptions and such sites are not included here.

1. Via Boccea (Casalotto) – wine or oil – several rooms of a villa rustica were excavated; one was a large storeroom containing 8 perfectly preserved dolia in situ; another dolium was discovered in an adjacent area; the contents of the dolia are unknown. References: Romanelli 1933, 246–48; Rossiter 1981.

2. Via Boccea (Casalotto) – wine – the pars rustica of a villa dating to the 2nd-4th centuries AD was excavated in the Casalotti district outside of Rome; the stone base of a torcularium was discovered in association with a basin and drainage channels. References: Santolini and Ciuferri 1986, 754–759.

3. Casale Ghella – wine or oil – large villa along the via Cassia dating generically to the Imperial period (a coin of Alexander Severus was found); the pars rustica contained basins lined with cocciopesto, related channels and the base of a torcularium. References: Messineo et al. 1985, 177–184; Messineo and Vigna 1987-88, 504–09.

4. Sutri (Poggiolo Suligano) – wine or oil – remains of a Roman villa; one area contained two large rectangular blocks of tuff carved in the centers – possibly the bases of arbores. References: Morselli 1980, n. 157.

5. Sutri (fattoria Contea Flacchi) – oil? – Roman villa; among the surface finds was a peperino millstone. References: Morselli 1980, n. 179.

6. Via delle Vigne Nuove – wine – early Medieval decanting tank discovered in a large villa with origins in the Roman period. References: Messineo and Sorella 1989–90, 218–222.

7. Castel Giubileo – wine – villa whose chronology appears to be limited to the 1st century AD; the pars rustica bears a floor paved in cocciopesto with depressions where dolia had been; traces of a torcularium with part of the ara preserved in association with a basin lined with cocciopesto. References: Ammannato and Belelli Marchesini 1987-88, 465–467.

8. Ager Capenas (Monte Canino) – oil – villa rustica with a roughly square plan dating between the early and late Imperial periods; rich decoration, including mosaics and marble architectural members and sculpture; a pair of at the west end contained a calcatorium paved in cocciopesto, a rectangular basin lined with impermeable plaster and the base of a torcularium, presumed for pressing grapes. References: Pallottino 1937, 7–28; Rossiter 1981.

9. Via Tiberina (Fosso di Valle Lunga) – oil – modest villa rustica with a well preserved atrium, bath complex and cisterns; dates from the Republican period until at least the 2nd century AD; a portion of the villa containing the base of a torcularium was renovated in the late 1st or early 2nd century; in addition to the torcularium, two sunken basins and associated channels were excavated as well as an inclined floor lined with impermeable plaster interpreted by the excavators as a calcatorium. References: Felletti Maj 1955, 206–216; Rossiter 1981.

10. Via Tiberina – wine – large villa dating to the 1st century BC to 5th/6th century AD; phase 4 (5th century) witnessed the construction or reconstruction of a treading floor (calcatorium) and a decanting basin; steps lead into the calcatorium and a hole at one end allowed must to drain into storage tanks; 11 dolia were discovered in situ – semi-buried – some of which may date to the Augustan period, suggesting that wine was always produced on this estate. References: Mancinelli 1989-90, 197–209.

11. Lucus Feroniae (Villa dei Volusii) -oil – a large and sumptuous villa whose main building had a surface area of about 6400 m2 stood in close proximity to the town forum; the villa was occupied between the mid first century BC and the fifth century AD; the pars rustica set apart from the main structure contained the base of an oil press; this villa has not been published in full and the working spaces not described in detail. Two other nearby villas discovered through salvage excavations also contained oil presses, but have not been properly published. References: Sgubini Moretti 1998, 29; Carbonara and Messineo 1994, 38–40; didactic panels in Lucus Feroniae Antiquarium.

12. Casali di Mentana – oil – surface remains of a villa, including the circular base (ara) of an oil press; no dates. References: Pala 1976; Rossiter 1981.

13. Nomentana/Saleria – wine – villa with construction/ habitation phases between 1st-4th centuries AD; contains the remains of a wine press, a rectangular basin with associated channels and at least 6 dolia in situ. References: Messineo and Perego 1987-88, 456–459.

14. Nomentana/Salaria – oil? – rectangular room of a villa containing a central row of pillars; six dolia found in situ in association with a basin lined in cocciopesto and bearing a drainage aperture; presumed for oil production; dated to the 4th or 5th centuries AD. References: Di Manzano 1984, 131-132.

15. Via Nomentana – wine – remains of a villa located 14 km outside of Rome near S. Alessandro; chronology spans the late Republican to late Imperial periods; area for wine pressing contained the base of the arbores, a circular ara with two channels leading into a series of decanting basins lined with cocciopesto, three of which were excavated; the wine pressing facilities may have been abandoned shortly prior to the complete abandonment of the villa in the 4th century. References: Staffa 1989-90, 189–212.

16. Ager Tibertinus (Granaraccio) – wine and oil – pars rustica of a partially excavated villa complex; a series of rooms contained a calcatorium or forum, the base of an olive mill and two torcularia in association with channels and basins; the excavators suggest that the torcularia were used contemporaneously; no dates are indicated. References: Faccenna 1957, 148–153; Rossiter 1981.

17. Ager Tibertinus (Guidonia) – wine and oil – portion of a villa rustica constructed in the 1st or 2nd century AD; large atrium with a black and white mosaic floor; suite of chambers used for wine and oil production abuts the north side of the atrium, but does not communicate with it directly; entrance to this suite from a courtyard to the west of the atrium; well preserved calcatorium or forum with a drainage channel leading into a basin set outside of the suite; circular base of the trapetum in association with two basins fed by channels. References: Caprino 194445, 39–51; Rossiter 1981.

18. Ager Tibertinus (Valle Pitella) – wine and oil – the pars urbana and pars rustica of a villa were excavated at the 24.8 km mark of the via Tiburtina; furnishings included mosaic and marble revetment; area G contained a paved opus spiccatum floor and the base of a press presumed to have been used for both wine and oil; channels lead from the ara to a large basin. References: Reggiani 1978, 219–225; Rossiter 1981. 19. Ager Tibertinus – wine or oil – Roman villa with stone base of an arbor. References: Mari 1991, n. 14.

20. Ager Tibertinus (Colle Lecinone) – oil – Roman villa dated 1st BC to 1st AD; surface finds included the ara of an oil press. References: Mari 1991, n. 18.

21. Ager Tibertinus (Colle Lecinone) – oil – surface remains of a Roman villa with a phase dated to the 2nd century AD; ara of an oil press. References: Mari 1991, n. 19.

22. Ager Tibertinus (ex Convento S. Angelo in Plaiule) – oil – so-called 'Villa of Catullus' with components of the structure ranging in date from the Republican to the Medieval periods; among the surface finds was the ara of an oil press. References: Mari 1991, n. 27.

23. Ager Tibertinus (Casale Imperi) – oil – remains of a villa with stone fragments of an oil press. References: Mari 1991, n. 45.

24. Ager Tibertinus (Quarto Pomata) – oil – remains of a Roman villa; one area contained stone fragments of an oil press as well as associated channels and a tank lined with cocciopesto. References: Mari 1991, n. 120.

25. Ager Tibertinus (casale S. Angelo) – wine or oil – among the remains of a Roman villa were two arae of wine and/or oil presses. References: Mari 1991, n. 127.

26. Ager Tibertinus (Colle della Foce) – oil – Roman villa with late Republican and early Imperial period phases; intact ara of a wine press. References: Mari 1991, n. 149.

27. Ager Tibertinus (Colle Bulgarini) – wine or oil – Roman villa dating between the 2nd century BC and the early Imperial period; fragments of a travertine ara. References: Mari 1991, n. 167.

28. Ager Tibertinus (Casalone) – wine or oil – Roman villa with an intact travertine ara. References: Mari 1991, n. 199.

29. Ager Tibertinus (Colle Merulino) – wine? – Roman villa with initial phase dated to

the 2nd century BC; a basin is presumed to have served for wine production. References: Mari 1991, n. 202.

30. Ager Tibertinus (Lunghezzina) – oil – remains of a Roman villa; stone components of an oil press with associated channels and basins. References: Mari 1991, n. 215.

31. Via Gabina – oil – villa 11, one of several villas surveyed along this road, was originally constructed in the later 3rd century BC with a 'U' shaped plan and an external hortus; major rebuilding in the early Imperial period (2nd c. AD) following the same general plan; oil pressing facilities dated to ca. AD 150-220/30, including the foundation of a press, floor paved in opus spiccatum, 6 sunken tanks and basins used to separate oil from amurca and to allow sediment to settle; abandoned sometime after AD 220/30. References: Widrig 1980; Oliver-Smith and Wid-rig 1981; Widrig et al. 1983; Rossiter 1981.

32. Via Prenestina – wine or oil – poorly preserved villa located just a few kilometers outside the Aurelian wall in Casal Bertone possibly dated to the Republican period; two basins lined with cocciopesto with a channel defined as a 'decanting channel'. References: Calci and Messineo 1989-90, 133–134.

33. Collatia – oil? – surface remains of a large villa, including the base of an oil press. References: Quilici 1974, n. 87.

34. Collatia (castello di Lunghezza) – wine and oil? – architectural remains and surface finds of a large Roman villa; rectangular block of granite served as the base of an arbor. References: Quilici 1974, n. 100.

35. Collatia (casale Benzone) – oil – surface remains of a Roman villa; ara of an oil press and two elongated basins. References: Quilici 1974, n. 106.

36. Collatia (13 km via Prenestina) – wine and oil – architectural remains and surface finds of a villa; two stone blocks served as the base of arbores associated with a pair of basins. References, Quilici 1974: n. 201.

37. Collatia – wine or oil – a basin within the confines of a Roman villa is presumed to have been used for either wine or oil production. References: Quilici 1974, n. 221.

38. Collatia (16 km via Prenestina) – wine or oil – surface finds of a Roman villa, including the peperino components of an wine or oil press. References: Quilici 1974, n. 229.

39. Collatia (fosso di Montegiardino) – wine or oil – remains of a Roman villa contained a basin presumed to have been used in the production of wine or oil. References: Quilici 1974, n. 241.

40. Collatia (collina di Riserva Nuova) – wine or oil -remains of a Roman villa contained a basin presumed to have been used in the production of wine or oil. References: Quilici 1974, n. 245.

41. Collatia (casale S. Ambrogio) – oil – imperial period villa containing the stone base (peperino) of an oil press. References: Quilici 1974, n. 248.

42. Collatia (16.5 km via Prenestina) – oil – surface remains of a Roman villa; stone base of an oil press in association with mill stones. References: Quilici 1974, n. 258.

43. Collatia (Castelaccio dell'Osa) – oil? – architectural remains of a Roman villa, including a basin assumed to have been used for the production of olive oil. References: Quilici 1974, n. 317.

44. Collatia (Castelaccio dell'Osa) – oil? – a basin and a millstone noted among the architectural remains of a Roman villa are presumed to have been used for the production of olive oil. References: Quilici 1974, n. 319.

45. Collatia (strada della Borghesiana) – wine? – Roman villa; among the surface remains was a basin presumed to have been used for wine production. References: Quilici 1974, n. 362.

46. Collatia (Tor Angela) – oil – elongated stone basin presumed to have been used for the production of olive oil discovered within a Roman

villa. References: Quilici 1974, n. 482.

47. Collatia – wine or oil – among the remains of a villa was a stone basin presumed to have been used for either wine or oil production. References: Quilici 1974, n. 444.

48. Collatia (fattoria delle Due Torri) – oil
– among the architectural remains of a Roman villa was the stone ara of an oil press. References: Quilici 1974, n. 456.

49. Collatia (Tor Carbone) – wine or oil – remains of a Roman villa; among the surface remains was the ara of a wine or oil press. References: Quilici 1974, n. 517.

50. Collatia (Torre Nova) – oil – remains of a Roman villa; ara of an oil press. References: Quilici 1974, n. 616.

51. Collatia (via di Tor Vergata) – oil – remains of a Roman villa; surface finds included the stone components of an oil press and basins. References: Quilici 1974, n. 618.

52. Collatia (casale La Barcaccia) – wine or oil – Roman villa containing a basin presumed to have been used for wine or oil production. References: Quilici 1974, n. 756.

53. Collatia (vigne Passo Lombardo) – oil
– remains of a Roman villa containing a basin presumed to have been used for oil production.
References: Quilici 1974, n. 761.

54. Collatia (casale Passo Lombardo) – oil – remains of a Roman villa containing the stone base of arbores. References: Quilici 1974, n. 779.

55. Casilina/Tuscolana – wine and oil – large villa complex with origins in the early 1st century AD; excavators reveals features related to both wine and oil pressing; a pair of sunken decanting dolia with related channels Bibliography found in association with two large cisterns with total capacity of ca. 102,000 liters (197 cullei), assumed to be for wine storage; the ara of an oil press were also noted. References: Rea 1985, 102–111.

56. Nemi – wine – recent excavations of a villa by Scandinavian archaeologists revealed the

foundation of a wine press and a calcatorium; the chronology of the villa is late Republican to middle Imperial. References: unpublished; personal communication with Dr. Eeva-Maria Viitanen (University of Helsinki).

57. Via Latina – wine and oil – salvage excavations of a villa located near the 7th mile of the via Latina at Casale di Leucite revealed a torcularium vinarium with 2 related basins and associated drainage channels; the villa dates to the late Republican and early Imperial periods; a large grinding stone of leucite lava is presumed to be part of an oil mill. References: Corrente 1987-88, 398–401.

58. Via Ardeatina – wine or oil – large villa located about 25 km outside of Rome that was occupied until at least the 4th century AD; pars rustica contained three cocciopesto-lined basins connected by channels; three dolia in situ. References: Scarnicchia 1987-88, 553–559.

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#### REZIME

# PROCENA PROIZVODNJE VINA I ULJA U ZALEĐU RIMA: KERAMIČKI NALAZI, LITERARNI IZVORI, IZVORI IZ ISTORIJE UMETNOSTI I SAVREMENI DOKAZI

Ključne reči: proizvodnja vina, proizvodnja ulja, zaleđe Rima, istorijski izvori, keramika, šeme snabdevanja.

Sa razvojem procesulane i post-procesualne arheologije, koji se dogodio u periodu od 1960-tih do 1980-tih godina, naučnici koji su se bavili keramikom rimskog perioda stavili su akcenat na spoznaju društveno-ekonomskih saznanja koja je bilo moguće dobiti analizom keramičkih grupa koje potiču sa višeslojnih nalazišta. Istraživači su počeli da primenjuju statističke metode na analize keramike, u pokušaju da dobiju modele vezane za trgovinu i snabdevanje. Osnovni princip takvih studija je bio mogućnost utvrđivanja porekla amfora za transport, zasnovana na vrsti gline od koje su izrađene i na hronologiji zasnovanoj na njihovim formama. Kada se vrše kvantitativne analize keramike nađene na višeslojni nalazištima, dobijaju se informacije vezane za dimenzije amfora, a tako i mogućnost procene količina određenih namirnica dopremanih u određeni grad. Do 2011.

postoji ogroman broj ovakvih studija.

Problem nastaje onda kada se uzme u obzir da amfore nisu predstavljale jedinu ambalažu za vino, maslinovo ulje, garum i druge proizvode. Postoji zapravo veliki broj podataka u literaturi i umetnosti koji ukazuje na to da je roba dopremana u velikoj buradi i mešinama, koji arheološki nisu potvrđeni. Autor ovog teksta je pokušao da nađe rešenje za ovu "izgubljenu proizvodnju" kroz razvijanje posebnog modela koji bi se mogao primeniti na bilo koji deo Rimskog carstva.

Ovaj tekst predstavlja model proizvodnje vina i maslinovog ulja u oblasti koja se smatra neposrednim zaleđem Rima. Tekst počinje pregledom najnovijih keramičkih studija koje ukazuju na načine snabdevanja Rima vinom i uljem. Na osnovu ovih keramičkih studija, ispostavilo se da postoje upadljive praznine u snabdevanju - čini se da u Rimu nisu konzumirani lokalno vino ni ulje. Pregledom pisanih izvora, izvora iz istorije umetnosti i arheologije, uočava se da je u zaleđu Rima zaista postojala ogromna proizvodnja vina i ulja, ali su ovi proizvodi "arheološki nevidljivi", s obzirom da nisu tranportovani u keramičkim amforama. Autor daje niz proračuna zasnovanih na Katonovim podacima, retkim arheološkim nalazima i savremenim podacima vezanim za proizvodnju vina i ulja, koji svi ukazuju na to da je čak do 33% vina i 25% ulja korišćenog u Rimu dopremano iz plodnog zaleđa.

## **NAPOMENA**

Ljubaznošću autora dopušteno nam je da objavimo rad koji je u originalu izašao u: Roman villas around the Urbs. Interaction with landscape and environment. Proceedings of a conference held at the Swedish Institute in Rome, September 17–18, 2004. Eds. B. Santillo Frizell & A. Klynne (The Swedish Institute in Rome. Projects and Seminars, 2), Rome 2005. www.svenska-institutet-rom.org/villa/ Saša Redžić Archaeological Institute, Belgrade sasa.redzic@gmail.com

Mladen Jovičić Archaeological Institute, Belgrade UDK 904:739.2"652"(497.11) 902.2(497.11) Original research article

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# UNPUBLISHED FINDS OF ROMAN FIBULAS FROM THE TERRITORY OF VIMINACIUM

# ABSTRACT

This paper deals with previusly unpublished finds of Roman fibulas lately discovered at Viminacium. The sites on which the finds were discovered include Kod bresta, Pirivoj, Pećine, Više grobalja, Na kamenju, Humka, Kastrum, Terme, Kod koraba, Stig, Rit and Nad klepečkim. The fibulas from the sites Kod bresta, Pirivoj, Pećine, Više grobalja and Kod koraba represent grave finds, while the rest of them represent finds from settlement areas.

#### Key words: Pest, fibulas, Viminacium, graves, settlement area.

The goal of this paper are the finds of Roman fibulas not previously published, which were discovered during the archaeological excavations of Viminacium. The sites they were found at include: Kod bresta, Pirivoj, Pećine, Više grobalja, Na kamenju, Humka, Kastrum, Terme, Kod koraba, Stig, Rit and Nad klepečkom. Most of the finds come from Roman cemeteries, but also within different parts of the settlement.

Most of the fibulas from our collection was made of copper alloy.<sup>1</sup> On some of these examples, spring and needles were made of iron, which should be understood as an attempt to strenght-

1 The example 18 was made of brass.

en these constructive parts, most vulnerable due to their function. Luxurious examples made of bronze include the numbers 19 and 20, decorated with enamel. The examples numbers 4, 5 and 24 were made of iron, while the numbers 21 and 22 were made of silver.

The examples with a hinge, similar to the Aucissa fibulas, are numerous at the territory of Viminacium, as well as on the whole territory of the Upper Moesia, but they are not very frequent at the territories of the Lower Moesia and Dacia (Redžić 2007: 15). According to the finds from Drobeta, A. Jovanović expresses the opinion that a workshop for their production operated in this

<sup>\*</sup> The article results from the project: *Viminacium, Roman city and military legion camp – research of material and non material of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalisation and 3D visualisation (no 47018)*, funded by Ministry of Education and Science of the Republic of Serbia.

town (Jovanović 1978: 54). Apart from the five examples (T. I/1-5), during the earlier Viminacium excavations, fifty examples of this type were discovered, all dated into 2nd and the first half of  $3^{rd}$  century.

Four examples of strongly profiled fibulas (T. I/6–9) were discovered. Two examples possess a support, while on the other two it is missing. An example of this kind was determined into type 13 (variants B and D) by S. Petković (Petković 2010: 77). The origin of the fibulas with the support is from Noricum and Pannonia and on these territories exactly the first examples developed during 1st century. Accordng to semi-fabricates discovered in Siscia, it can be concluded that this town was one of the centres for their production and distribution. Anothe fact is that even 440 examples of these fibulas were discovered within the area of modern Sisak (Koščević 1975: 55-56). Apart from Siscia, production centres of these fibulas were also found in the dacian towns of Porolissum, Napoca and Micia (Cociş 2004: 35-36).

Strongly profiled fibulas with a support are dated into  $1^{st}$  and the first half of  $2^{nd}$  century. Most of the examples without a support was discovered in Danubian provinces and they can be dated into  $2^{nd}$  and  $3^{rd}$  century.

Strongly profiled fibulas of the Pontic-Danubian type are typical for Danubian provinces, often found in Dacia, Pannonia, Upper and Lower Moesia. They were often found at the northern coast of the Black sea (where semi-fabricates were discovered as well) (Амброз 1966: 40, Т. 8/1-8, 10, 11), as in the Carpathian part of Moldova (2nd and 3<sup>rd</sup> century) (Bichir 1967: 205, fig. 24, 1, 4, 5, 7, 10). The greatest number of these fibulas was discovered in the Upper Moesia. Apart from the finds kept at museums in Belgrade, Smederevo, Negotin, Niš and Kragujevac (Bojović 1983: 41), apart from the here presented four examples (T. II/10–13), at the territory of Vimnacium another 63 examples of this type were discovered, which indicates that within the Vimnacium area there could be a workshop in which they were produced (Redžić 2007: 78). This type of fibulas is dated from the end of 1st to the middle of  $3^{rd}$  cenutry.

Knee-shaped fibulas with a support and a spring are here divided into two variants. The first one is a variant with a semi-spherical support (T. II/14–15), sometimes decorated with zig-zag shaped carvings along the edges, like the example number 14. Under the support, there is a spring, mostly made out of eight windings. The here presented examples, as well as the other 27 previously published examples from Viminacium, possess an outer winding, typical for Pannonia, Noricum, Dacia, Upper and Lower Moesia (Redžić 2007: 33). Contrary to these, the inner winding is typical for Raetia, Germania and Britania (Böhme 1972: 19–20). This specifica connected to the position of the windings can also be noticed on other types of fibulas. A somewhat less frequent variant includes fibulas with an angeled support (T. II/16). Within the Viminacium area, sixteen examples were discovered so far, inclding the here presented example. Apart from the Upper Moesia, the fibulas of this variant are often encountered in Pannonia and Dacia.

In the cities from the provinces mentioned, like Brigetio, Flavia Solva, Siscia and Napoca, semi-fabricates of moulds for production of knee-shaped fibulas with a spring opruga were discovered. The finds of such fibulas from Viminacium shall be dated into  $2^{nd}$  and the first half of  $3^{rd}$  century, supported with the find no. 15 from the cremation grave  $G_1$ -66 together with a coin of Faustina the Elder.

The knee-shaped fibulas from Viminacium include 56 examples, including the here presented one (T. II/17). Such fibulas are typical for the eastern provincies, especially for the Upper Moesia, in which they represent the most numerous type. D. Bojović names 55 examples kept at the Belgrade City Museum (Bojović 1983: 58–61, T. XXIII-XXVII, 211–266). Apart from the Limes finds, such fibulas are also discovered in the inland. Their number within the province of the Upper Moesia, indicate the existence of a production centre in this area, maybe Viminacium itself. Apart from the Upper Moesia, such fibulas are also encountered in Dacia and the Lower Moesia.

The finds from Viminacium deny D. Bojović's dating of this fibula type into the period from 2<sup>nd</sup> to 4<sup>th</sup> century. According to grave finds, the beginning of their production was in the middle of 2nd century but they went out of use at the beginning of the second half of 3rd century. The youngest reliably dated fibula of this type was found in the grave no. G-1006 from the site "Pećine", dated with one coin of Emilianus and three coins of Gallienus (Redžić 2007: 78).

Five examples of the fibulas with spirally bent bow were discovered at Viminacium (including the fibula T. II/18). This type of fibulas belong to the D. Bojović's variant 17 within his division of knee-shaped fibulas with a hinge (Bojović 1983: 61, T. XXVIII, 265–267). S. Petković describes these fibulas as type 20 and dates them from the second half of 2nd to the end of 3<sup>rd</sup>/beginning of 4<sup>th</sup> century (Petković 2010: 155–158). The basic spreading areas of these fibulas are the provinces along the Danube valley. According to the earlier finds from Viminacium, the author suggests their dating from the second half of 2<sup>nd</sup> to the second third of 3<sup>rd</sup> century.

Along with the here presented examples (T. II/19–20), 18 plate fibulas were discovered at Viminacium, often decorated with enamel or a middle tutulus shaped bulge, like on some of the here presented examples. The oldest enamel decorated examples of Roman fibulas appear during the last third of 1<sup>st</sup> century in Western Europe. They are most numerous in Gaul, Germany and Pannonia, slightly less in the Upper Moesia.

According to the division by S. Rieckhoff, the Viminaicum plate fibulas belong to her group C, consisting of pieces enameled in the millefiori technique, as well as examples of different shapes decorated with inlayed semi-precious stones or a tutulus in the middle, made in the striking technique. This group is dated from the middle of 2nd to the middle of  $3^{rd}$  century (Rieckhoff 1975: 64–69).

In Viminacium, 17 plate-shaped fibulas made in the striking technique were discovered, including the three here presented examples (T. II/21–23). It should be mantioned that the examples no. 21 and 22 were made of silver. The decoration of such fibulas was made by striking through the plate-shaped body. A. Böhme considers them remains of a Celtic artistic tradition (Böhme 1972: 44). Celtic influences are to be recognized in the usage of carnyx motives on the example no. 21, often encountered on fibulas and belt-parts during the second half of 2nd century.

Such fibulas are often found along the Rhine and the Danube Limes, much less in the inland. Numerous finds come Pannonia, Dacia and the Upper Moesia. In the Lower Moesia, they represent rare finds. Examples identical to the fibula no. 23 were previously already discovered at Viminaicum cemeteries (Redžić 2007: 48–49, T. XXIII/250–254), but also on some other sites in Serbia. It should be mentioned that an example was discovered at the Sarmathian site "Najeva ciglana" near Pančevo, which could indicate that the Sarmathians were the ethnic element using this fibula type.<sup>2</sup>

S. Rieckhoff-Pauli determined this fibula type into the already mentioned group C, dated from the middle of 2<sup>nd</sup> century (Rieckhoff-Pauli 1977: 21). A. Böhme also dates them from the middle of 2<sup>nd</sup> to the beginning of 3<sup>rd</sup> century (Böhme 1972: 44). After the Viminacium finds, the latest examples of plate-shaped fibulas made in the striking technique should be dated into the middle of 3<sup>rd</sup> century.

A. K. Ambroz considers that two-ankled fibulas with an upturned foot (T. III/24) originate

<sup>2</sup> During the visit to the Vršac museum, our colleague Miodrag Aralica showed me some unpublished fibulas of this variant coming from Sarmathian sites and I hereby wish to thank him for his kind help.

from the territory of the southeastern Baltics and the lower Visla, brought by the Goths to the territory of the Chernyachow-Sintana-de-Mures culture at the end of 2<sup>nd</sup> and at the beginning of 3<sup>rd</sup> century (Амброз 1966: 94). D. Bogdan and Cocis date them into 3rd century, claiming that a great number of these fibulas was discovered at the territory of Dacia and considering that they were produced within this province and distributed in the neighbouring ones (Bogdan, Cociş 2006: 223-224). Gh. Diaconu considers such fibulas Roman provincial product (Diaconu 1971: 240). This fibula type is quite numerous at the territory of the Roman province of Upper Moesia, but also in the neighbouring provinces (Dacia, Lower Moesia). depending on the variant, they are dated from the second half of 3<sup>rd</sup> to 6<sup>th</sup> century. Similar examples found during previous excavations of the "Pećine" necropolis were dated into the second half of 3<sup>rd</sup> century according to numismatic finds (Redžić 2007: 56, T.XXVI/291-292).

The here presented "T"-shaped with a spring (T. III/25) was made of bronze and has a spring made of iron with a lower spring and a foot decorated with facceting. This type of fibulas developed from the earlier fibulas of Middle- and Late Iron Age schemes. The area from which such fibulas originate is the area of the Middle Danube valley and the territory of the Pzevorsk culture. Within the area of the Chernyachow-Sintana-de-Mures, they are dated into 3<sup>rd</sup> century. S. Petković dated them depending on the variant, generally from the second half of 3rd to the first half of 5th century (Petković 2010: 227-234). The previously discovered example of such a fibula was discovered at the site "Pećine", within the grave G-294. According to the find of a belt buckle and a ring from the same grave, it should be dated into the second half of 3<sup>rd</sup> century. The fibula no. 25 should be dated into the second half of 3<sup>rd</sup> century, since there are no older graves at this part of the "Pirivoj" cemetery.

In this collection there are 37 "T"-shaped fibulas with a hinge (including the here presented example T. III/26). At the end of  $3^{rd}$  and at the beginning of 4th century, cross-shaped fiblas developed from the "T"-shaped ones (Jobst 1975: 88). The fibulas of this type are often found along the Limes, beginning with the German and the Raetian ones, over the Danubian, all the way down to Euphrates, indicating that they were worn by soldiers. In the Saalburg and Zugmantel fortresses, 126 examples of this type were found (Böhme 1972: 22-23). D. Popescu lists the finds of these finds in Dacia (Popescu 1945: 494-498, Abb. 6, 59-67, Abb. 7, 70-72). A great number of "T"shaped fibulas were found at Dura Europos, being connected to the transfer of military units during the reign of Septimius Severus (Jobst 1975: 87). Fibulas of this type are often encountered at the territory of the Upper Moesia.

Although D. Bojović dates this fibula type from the end of  $2^{nd}$  to the beginning of  $4^{th}$  century (Bojović 1983: 78), the author presumes that, according to the finds discovered so far at Viminacium, their dating should be reduced to  $3^{rd}$  century.

The example no. 27 possesses a double fork-shaped bow ending with a cylindrical hull, in which there is an iron spring. This kind of fork-shaped fibulas with a spring in the hull was previously not discovered at Viminacium. The examples with a spring, either placed in a hull or being freely positioned, are typical for the Upper German and Raetian limes, are therefore considered as import from these provinices. Contrary to these, fork-shaped fibulas with a hinge are typical for Pannonia and the provincies to the east from it. This fibula type is dated at the end of 2<sup>nd</sup> and into the first half of 3<sup>rd</sup> century.

Cross-shaped fibulas represent the most numerous type at Viminacium, which is represented with 79 new finds, apart from the here presented examples (T. III/28–29). Typologically, both examples can be ascribed to the variant 3 of the cross-shaped fibulas from the Viminacium area (Redžić 2007: 68). P. M. Pretel included these fibulas into his type 3/4, divided into four variants (A-D) according to the foot decoration. His variant A is dated into the second quarter of 4<sup>th</sup> century and possesses geometrical ornaments on its foot (no. 28). Variant B, dated into the second half of 4<sup>th</sup> century, possesses circular decoration on its foot (no. 29) (Pröttel 1988: 359–364). This variant is encountered at Viminacium and dated into the period from the fourth to the seventh decade of 4<sup>th</sup> century. E. Keller determins these fibulas as types 3 (from 340 to 360) and 4 (from 350 to 380) (Keller 1971, 35, Abb. 12).

In this paper, 29 fibulas are presented for the first time, discovered during the latest Viminacium excavations. Included in the Viminacium fibula typology, it can be said that the here presented fibulas already appeared during the previous excavations. The only exception is the fork-shaped fibula with a string in a hull (no. 27), which is unique among the Viminacium fibula collection.

# CATALOGUE

Bronze fibula with a fragmented needle.
 Finding place: "Kod bresta", 1997, C-1129.
 Length: 6.2 cm
 Dating: 2<sup>nd</sup> and the first half of 3<sup>rd</sup> century.
 Unpublished.

Bronze fibula with a missing needle.
 Finding place: "Na kamenju", 2007, C-102.
 Length: 7 cm
 Dating: 2<sup>nd</sup> and the first half of 3<sup>rd</sup> century.
 Unpublished.

3. Bronze fibula with a missing needle.
Finding place: "Kod bresta", 1997, C-1109.
Length: 5.5 cm
Dating: 2<sup>nd</sup> and the first half of 3<sup>rd</sup> century.
Unpublished.

4. Iron fibula with a missing needle
Finding place: "Više grobalja", 2009, C-12315.
Length: 4.9 cm
Dating: 2<sup>nd</sup> and the first half of 3<sup>rd</sup> century.
Unpublished.

5. Iron fibula with a fragmented needle.
Finding place: "Pirivoj", 2006, C-958.
Length: 5.3 cm
Dating: 2<sup>nd</sup> and the first half of 3<sup>rd</sup> century.
Unpublished.
Found in the skeletal grave G-339.

6. Bronze fibula, completely preserved.
Finding place: "Kod koraba", 2007, C-468.
Length: 4.5 cm
Dating: 1<sup>st</sup> and the first half of 2<sup>nd</sup> century.
Unpublished.

7. Bronze fibula, preserved completely.
Finding place: "Na kamenju", 2007, C-36.
Length: 6.6 cm
Dating: 1<sup>st</sup> and the first half of 2<sup>nd</sup> century.
Unpublished.

8. Bronze fibula, preserved completely.
Finding place: "Kod koraba", 2006, C-342.
Length: 3.3 cm
Dating: 2<sup>nd</sup> and 3<sup>rd</sup> century.
Unpublished.
Found in the cremation grave G<sub>1</sub>-106, along with the fibula 11.

Bronze fibula, preserved completely. The lateral sides of the foot are decorated with carvings.
 Finding place: "Nad klepečkom", 2008, C-20.
 Length: 5.3 cm
 Dating: 2<sup>nd</sup> and 3<sup>rd</sup> century.
 Unpublished.

10. Bronze fibula with a missing needle. Finding place: "Terme", 2007, C-353. Length: 3.5 cm Dating: End of 1<sup>st</sup> to the middle of 3<sup>rd</sup> century. 16. Bronze fibula, completely preserved. Finding place: "Rit", 2004, C-35. Unpublished. Length: 3.6 cm Dating: 2<sup>nd</sup> and the first half of 3<sup>rd</sup> century. 11. Bronze fibula with a missing needle and a part Unpublished. of the spring. Finding place: "Kod koraba", 2006, C-337. Length: 3.5 cm 17. Bronze fibula, preserved completely. Dating: End of 1<sup>st</sup> to the middle of 2<sup>nd</sup> century. Finding place: "Na kamenju", 2007, C-115. Unpublished. Length: 3.7 cm Dating: Middle of 2<sup>nd</sup> to the third quarter of 3<sup>rd</sup> Found in the cremation grave G-106, along with century. the fibula 6. Unpublished. 12. Bronze fibula with a missing needle. The middle part of the foot is decorated with punctuated 18. Brass fibula with a fragmented needle. ornament. Finding place: "Više grobalja", 2009, C-12312. Finding place: "Kod humke", 2004, C-13. Length: 3.4 cm Dating: the second half of 2<sup>nd</sup> and the second third Length: 4.3 cm Dating: End of 1<sup>st</sup> to the middle of 3<sup>rd</sup> century. of 3<sup>rd</sup> century. Unpublished. Unpublished. Found in the skeletal grave G-339. 19. Bronze fibula with a missing needle. The 13. Bronze fibula with a missing needle. plate-shaped body of the fibula is decorated with Finding place: "Kastrum", 2002, C-23. enamel in the *millefiori* technique. All four sides of the square body were decorated with changig Length: 3.3 cm Dating: End of 1<sup>st</sup> to the middle of 3<sup>rd</sup> century. white and black lines along the edges. In the cor-Unpublished. ners there are black squares with white flowers in the middle. In the middle fibula part, there is a 14. Bronze fibula, preserved completely. The edge black square with white flowers in each corner. of the semi-circular supporting greda decorated Finding place: "Pećine", 2007, C-13558. with a carved zig-zag line. Length: 2 cm Dating: second half of 2<sup>nd</sup> and the first half of 3<sup>rd</sup> Finding place: "Na kamenju", 2007, C-79. Length: 3.7 cm century. Dating: 2<sup>nd</sup> and the first half of 3<sup>rd</sup> century. Unpublished. Unpublished. Found in the skeletal grave of a child G-5628. 15. Bronze fibula, preserved completely. 20. Bronze fibula with a fragmented edge, deco-Finding place: "Kod koraba", 2005, C-208. rated with carved concentric circles. The middle Length: 3.8 cm part is lifted and button-shaped, with a top deco-Dating: 2<sup>nd</sup> and the first half of 3<sup>rd</sup> century. rated with blue enamel. Unpublished. Finding place: "Više grobalja", 2009, C-12322. Found in the cremation grave  $G_1$ -66, along with a Length: 3.6 cm coin of Faustina the Elder. Dating: the second half of  $2^{nd}$  and the firts half of

3<sup>rd</sup> century. Unpublished. 21. Silver fibula, completely preserved.
Finding place: "Stig", 2002, C-1.
Length: 4 cm
Dating: the second half of 2<sup>nd</sup> century.
Unpublished.

22. Silver fibula with a missing needle.
Finding place: "Kod koraba", 2005, C-33.
Length: 3.9 cm
Dating: the second half of 2<sup>nd</sup> century.
Unpublished.
It was found in a group (-12)

It was found in a cremation grave  $G_1$ -13, along with a worn-out coin minted during the reign of the Flavian dynsty, most likely being in a prolonged cirrculation.

23. Bronze fibula with a missing needle.
Finding place: "Kod bresta", 1997, C-1094.
Length: 3.3 cm
Dating: the second half of 2<sup>nd</sup> and the first half of 3<sup>rd</sup> century.
Unpublished.

24. Iron fibula with a missing needle.
Finding place: "Pirivoj", 2007, C-1076.
Length: 7.3 cm
Dating: the second half of 3<sup>rd</sup> and 4<sup>th</sup> century.
Unpublished.

25. Bronze fibula with a fragmented iron needle.
Finding place: "Pirivoj", 2006, C-828.
Length: 4.8 cm
Dating: the second half of 3<sup>rd</sup> century.
Unpublished.
It was found in a skeletal grave G-280. At this part of the cemetery, only graves from 2nd and 3rd century were discovered.

26. Bronze fibula with a missing needle.
Finding place: "Pirivoj", 2007, C-1042.
Length: 5.5 cm
Dating: 3<sup>rd</sup> century.
Unpublished.

27. Bronze fibula with a missing needle.
Finding place: "Pećine", 2007, C-13559.
Length: 6.3 cm
Dating: the end of 2<sup>nd</sup> and the beginning of 3<sup>rd</sup> century.
Unpublished.

28. Bronze fibula with a missing "onion-head".
Finding place: "Pirivoj", 1997, C-20.
Length: 8.1 cm
Dating: second half of 4<sup>th</sup> century.
Unpublished.
Found in the skeletal grave G-7.

29. Deformed bronze fibula, preserved completely. Finding place: "Pirivoj", 2006, C-954. Length: 6.3 cm Dating: second third of 4<sup>th</sup> century. Unpublished.

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# REZIME NEPUBLIKOVANI NALAZI RIMSKIH FIBULA SA TERITORIJE VIMINACIJUMA

Ključne reči: fibule, Viminacijum, grobovi, naseobinske celine.

Predmet proučavanja ovog rada predstavljaju do sada nepublikovani nalazi rimskih fibula koje su nađene prilikom arheoloških istaživanja Viminacijuma novijeg datuma. Lokacije sa kojih potiču pomentuti nalazi su: Kod bresta, Pirivoj, Pećine, Više grobalja, Na kamenju, Humka, Kastrum, Terme, Kod koraba, Stig, Rit i Nad klepečkim. Prezentovane fibule su nalažene u grobovima, ali i unutar naseobinskih celina. Gledano iz ugla već postojeće tipologije fibula nađenih na prostoru Viminacijuma, skoro svi primerci su više ili manje frekfentno zastupljeni među pokretnim arheološkim nalazima nađenim tokom ranijih iskopavanja. Jedini izuzetak čini viljuškasta fibula sa oprugom u čauri (br. 27) koja u viminacijumskoj zbirci fibula predstavlja unikatni nalaz.



















T.I/1-9, Razmera 1:1 





































T.II/10-23, Razmera 1:1

















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# SUPPLYING AND TRANSPORT ALONG DANUBE LIMES IN THE UPPER MOESIA

# ABSTRACT

This paper deals with supplying Roman troops along the Limes and in the hinterland of the province Upper Moesia. The system of supplying and distributing of goods was conducted both on river and land communications throughout the entire Roman period.

According to the archaeological evidence, apart from larger supply units, in which food supplies were kept for further distribution (Porečka reka, Horreum Margi), forts along the Limes also had buildings intended for keeping food supplies, which again could satisfy needs of soldiers for a certain period of time.

## Key words: supplying, supply centre, the Danube Limes, river port, Upper Moesia.

Since historical evidence about supply of Roman troops along the Limes, but also in the hintreland of the province, are poor, archaeological data gain on importance. By relying on them, we shall attempt to reconstruct ways of supplying and transporting goods in this region, which was of the highest importance during Roman times.

During the last decades, within Roman provincial archaeology, great attention has been paid to supplying army – both units stationed within permanent camps, as well as troops during military campaigns. Here, this question was not studied enough and therefore the results gained are very modest so far. In this sense, this paper could represent an introduction to further study of supply and transport of goods and other products. Durign the past few decades in Serbia, the question of supplying Roman troops was most studied by Petar Petrović (Петровић 1980; Петровић, 1983; Петровић, 1991).

Troop supply represents a complex problem (Roth 1999; Breeze 2000; Thomas and Stallibrass 2008; Kehne 2007; Herz 2007). In this paper, no problems shall be analyzed related to supply during marches, outside camps and on hostile territories. We will deal with supply of

<sup>\*</sup> The article results from the project: *Viminacium, Roman city and military legion camp – research of material and non material of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalisation and 3D visualisation (no 47018)*, funded by Ministry of Education and Science of the Republic of Serbia.

garrisons and units stationed in their permanent camps. Actually, unit supplying during marches and on hostile territories represents a study of a different kind and could be an object of study of some paper in the future.

When the Limes of Upper Moesia is concearned, two aspects can be analyzed:

- the first concearns geographical regions and is directly related to relief of the terrain:

a) the area from Singidunum to the Iron Gates, b) the Iron Gates themselves and c) the area downsream from the Iron Gates.

- the second concearns troop supplying according to their ranking - legions or auxiliary troops;

When geographical aspect is concearned, one can clearly distinguish three regions along the Danube Limes, each of them possessing its own specific features (Map 1.).

The first region includes the territory from *Singidunum* (Belgrade) to the *Cuppae* (Golubac), at the entrance of the Iron Gates. This area is plain, convenient for agriculture and concentration of large military formations. At this territory, both legions forming the main defence of the Up-

per Moesia were stationed. In other words, the nucleus of defence was concentraded exactly where it was easy to supply large numbers of troops and even more, part of supply was conducted by legions themselves. Of main importance was that the area was of agricultural character. Around each and every legionary camp there was a so called *territorium*, land given to legions so that they could fulfill their basic needs, first of all food production, but also building material (bricks). Prata legionis was also mentioned in sources and inscriptions, used by a legion for its purposes, but it remains unclear whether *prata legionis* represents the same thing as territorium legionis (Mocsy 1967: 41; Mocsy 1972: 133-168; Zaninović 1985: 63–79; Mason 1988: 163–189).

From a series of possible explanations given by Bohec, one can sort one out, also expressed by Schulten (Bohec 2000: 219), that the *prata legionis* included pastures, forests and fertile fields, clay deposits etc., while *territorium* includes the complete area under legion's supervision and which practically formed an military administrative unit. In this sense, a *territorium* would include *canabae* and workshops which were built outside



Map 1. Danube *Limes* in Upper Moesia (Moesia Superior)

the camps. Finaly, altough *canabae* were settlement of civilians and *territorium* could spread around civilian settlements these were strictly under military government.

The problem of military territories is most of all present in bordering areas, actually Limes along the Rhine and the Danube, where numerous camps were built with large number of soldiers who needed to be supplied with food, weapons, equipment and other goods.

In this sense, the question of the area covered by a *prata legionis* or a *territorium legionis* arises. In the first place, the size of legion's territory depended on the number of soldiers for which supplies were needed, but for which exercising area was needed as well. According to a milestone, one found out that the *Prata legionis* of the legion III Macedonicae in Asturia measured about 560 km<sup>2</sup> (Mason 1988: 164). *Prata legionis* did not supply soldiers only with grain. Each legion had a squad of about 120 cavalrymen plus additional mules and oxen used for transport of legionary supplies. Food for animals was not less of a problem. It was partly solved due to the fact that military also controlled numrous pastures which usually included several hundreds of hectars. According to some authors, livestock could have included up to several thousands of animals (riding horses, workhorses, pulling animals: mules, oxen, for food: sheep and goats) (Zaninović, 1985: 67).

Livestock was concearn of special services in particular legions *pecuarii* and *veterinarii* (*CIL III 11215 i CIL XIII 8287*; Tacit, *Annales* XIII, 55: *pecora et armenta militum*). Agriculture and stock-breeding as a part of activities of non-military character surely reduced supplying and costs. Grain, as main food, was mostly grown on legionary fields. Soldiers could have also bought food from numerous land-owners of the fields around *Singidunum*, *Margum* or *Viminacium*.

Vicinity of rivers was a great advantage for all of the camps built along the Limes, since it made fishing possible. Still, *annona militaris* and the principle of legionary supplying from civilian sources in the form of taxes collected in goods was of main importance, because it was not possible to produce enough food from the *prata legionis* alone.

The second geographic region includes the Iron Gates (Map 2.). In this area, military units were stationed up to the rank of a cohort. The



Map 2. Fortifications along Danube limes in the Iron Gate (П. Петровић 1981, fig. 1)

gorge itself did not represent an area adequate for agriculture, so, apart from Porečka reka, the needs of these units had to be satisfied by transporting food from supply centers situated mostly in the hinterland (Horreum Margi). Smaller number of soldiers within such a unit was an advantage, but the size of fortifications (quadriburgium, specu*lum*) represented a problem, since they, apart from several exceptions, were very small and did not possess a granary or any other similar building suitable for keeping food supplies for a longer period of time. This led to regular, short term, food supplying in which supply centers were permanently engaged, while each fortification was supplied periodically. One could of course presume that the vicinity of rivers made fishing possible, but one can only conclude this freely, since there are no data about it in written sources.

The third geographic region included the area downstream from the Iron Gates, in which again larger fortifications were built (*Statio Cataractarum Dianae, Pontes, Egeta*). This area was not suitable for long-term stationing of legions, since around these military camps there were not enough fields for crop growing. Units up to the size of a *cohors militaria* could have possessed a equivalent of *territorium* around their camps.

Speaking about other aspects of supplying, it is certain that they depended on rank and size of a military unit. Due to a large number of soldiers, legionary units were supplied with much more food and other goods needed for active service. Legionaries comparing to auxiliary soldiers were also entitled to a larger amounts of provisions.

The system of supplying the military with food arises many questions concearning mostly the problem whether food was brought from distant areas or areas in vicinity, ie. from the local population. There is no doubt that olives, oliveoil, garum, better quality vine and tropical fruits were brought from distant areas, because amphora-finds throughout the Empire give testimony about it (Bjelajac, 1996: 109).

The question of a supplying strategy also arises, i.e. whether the military took part in tax collecting (most of all in goods collected as taxes), bought directly for its needs or had contracts according to which needs were satisfied. No matter how food was obtained for each Roman soldier, it is most likely that the basic food and drinking supplies were of the same kind throughout the Empire. Data from written sources or archaeological finds from other provinces could help in making the picture of food supplying in the Upper Moesia complete. Egyptian papyroi from 6<sup>th</sup> century give data about daily needs of an average Roman soldier from about 3601 (Jones 1973: 628; Campbell 1994: 18-185). The sorts of foods and their ammounts do not differ from those from the time of the Principate<sup>2</sup> (Davies 1989: 187, 191; Kehne 2007: 326). The authors support Roth's opinion, according to which the quantity of food stated in written sources was the one a soldier could claim, but not always the one he would receive, because it could have been substituted with something else – other goods or money. At the same time, according to the same sources, the cavalrymen, centurions and other officers were given greater ammounts of food, which could just be imaginary, since the quantity of food gained by both was most likely the same (Roth 1999: 15).

The suplying responsibility for soldiers in provincies lied in the hands of a province's governor (*legatus Augusti*). Province's governors were connected to military procurators (*frumentarii*). A *frumentarius* was first a soldier in charge of supplying military with grains, but later on, this function became connected to military intelligence service of Rome in provincies.

In *Historia Augusta*, such men often appear as spies or assassins. In time, their reputation became so bad that in 4th century, their titles were

<sup>1</sup> Daily supplies of a soldier included: 3 libras of grain, 2 libras of meat, 2 pints of wine, 1/8 pint of oil.

<sup>2</sup> Vegetius dedicated a whole chapter of his work De re Militari to the question of supplying the Roman military, in which he named basic logistic principles.

changed from *frumentarii*, (*pestilens frumentariorum genus* – called "filthy merchant kin" by the local populationod) to *agentes in rebus* (secret military intelligence) (Nelis-Clement 2000: 118).

At the territory of Viminacium, a monument was discovered with the name of a *frumentarius* (Mirković 1986: inscription no. 47, 84). One can still not say whether he was connected to grain supplying of the military in this area or played a role of a spy sent from Rome.

While discussing the problem of supplying and transporting goods for Roman troops, D. Breeze tried to give an answer by stating a hypothesis about four ways of food supplying (Breeze 2000: 59–64).<sup>3</sup>

When supplying Roman fortresses along the Limes in the Upper Moesia, about which there is the most data so far, there is an opinion among authors who dealt with this problem that such a supplying was pretty much organized from other towns in the hinterland of the province (Петровић 1981: 53–62; Петровић 1983: 285–291).

Horreum Margi<sup>4</sup> could have represented such an important point for gathering and distributing food, most of all grain, owing to its position on the main crossroad, which made access to important centres within the province easy, but also to the fortresses along the Limes. Therefore it is not strange to think that Horreum Margi was in charge of supplying troops along the Iron Gates Limes. On the other hand, it is certain that withing military camps or in their vicinity there were storage buildings, mostly grainaries, but also for other supplies intended for nourishmen of the soldiers.

The quantity of food to be stored and kept depended mostly on size and number of soldiers

stationed within a camp, but also on structure and durability of the food stored. According to P. Petrović, the number of soldiers stationed along the Iron Gates Limes between Golubac (Cuppae) and Karataš (Diana / Caput Bovis) was 2000-3000 men (Мар 2.) (Петровић 1981: 54). Still, even thorugh the number of soldiers stationed in the camps, the quantity of food which was kept was much greater than the needs of each and every soldier and it was therefore necessary to build bigger storage buildings on different locations. Granaries must have existed in all legionary camps that supported smaller forts along the Limes. Such legionary camps were in Singidunum (IV Flavia) and Viminacium (VII Claudia). The question of river ports on these location arises as well.

The fortified port of Singidunum was not excavated because in 1875, the Serbian Royal Army filled in the complete Belgrade Danubian port basin. This was mentioned by Kanitz who saw these works during his travels across Serbia (Kanitz 1892: 5). This port was most likely fortified at the same time with the camp, thus making it a single fortified complex. M. Popović stated a hypothesis about certain parts of the Danubian fleet stationed in Singidunum, although there is no mention of these in written sources (Поповић 2006: 39). According to Popović, the position of fortification walls reaching downhills towards the river bank is similar to defensive systems applied on some of the fortresses of the Iron Gates Limes (Diana, Egeta).

Geophysical surveys of Viminacium offered plenty of data about the position of *principium*, buildings and barracks inside legionary camp, but without excavations, neighter of these at the momment cannot be designated as granary.

Presence of fleet is confirmed at Viminacium in *Notitia Dignitatum – Prefectus Classis Histricae*, and several inscriptions. River port at Viminacium is logical and necesary. It is still discussed wheather there is one or two ports whose locations are suggested after remote sensing and

<sup>3</sup> About the municipium or a colony collecting and transporting supplies with their own means or engaging transporters for military purposes and about military which collects and transports supplies on its own or engages private transporters, although the author himself admits that there are no reliable evidence whatsoever, especially for the last way of supplying.

<sup>4</sup> The site *Horreum Margi* will be spoken of further on in the paper.

field surveys. Unfortunatelly only future excavations on these points can reveal exact situation.

Buildings discovered at the mouth of the Porečka river offer some more data about the problem of supplying along the Upper Moesia Limes (Петровић 1981: 53-62; Петровић 1983: 285-291). The site is situated on a very convenient position, in the vicinity of one of the biggest camps of the Danubian Limes - Taliata (Veliki Gradac), which had soldiers stationed permanently throughout the Roman and Early Byzantine periods (Поповић 1984: 265-282). At the same time, Porečka reka represented an important crossroad on this Limes part. There was a road which lead towards the east, over Miroč and a station called Gerulata (in the Tabula Peutingeriana), to Egeta and after that connected to the Lower Danube valley, going around the cataracts of the Iron Gates (Tabula Peutingeriana segm. *VI*). The road towards the south lead to the Timok valley. It is most likely that there lied the border of the two Late Antique provinces: Moesia Prima and Dacia Ripensis (Острогорски 1959: 54-56; Мирковић 1994: 93).

The mouth of the Porečka river was closed with a stone wall, while on the right river bank, there were two rectangular towers (Fig. 1.). The most interesting features are two broad buildings of approximately the same size. Building A was made of bricks and stones, with no inner walls, with a broad entrance facing the south, while the building B was made of stone, with two pillars in its interior (Fig. 2). The building was filled with huge ammounts of debris, with bricks on which fire traces were visible. Shards of larger pottery vessels were also found, used for transporting and storing food: pithoi and amphorae. Metal objects were also numerous: three bronze bells, a sickle, an ax, a bigger iron spoon and other tools.

Inside of this complex, a *quadriburgium* was errected close to the wall which closes the river valley (Петровић 1981: 57–61, сл. 4, 5). On the south side there was a broad main entrance,

while there was a narrower one in the north, towards Danube. No objects or other archaeological finds were discovered within the fortress, except for the larger ammount of roof-tiles next to the eastern wall, which could indicate existance of an object close to this side. Sporadical amphorae fragemnts are the only archaeological material discovered inside the forts walls.<sup>5</sup>

Regarding hisotrical context and changes which took place during the Late Antiquity, it is possible to determine the function and chronological frame of the objects described above.

The objects A and B can be dated into the first half of 4<sup>th</sup> century, which is supported with coins of Constantine, Constantius, Valens and Valentinianus (Петровић 1981: 57). Such a conclusion is also supported with the fact that there are no older building phases of these objects, nor later reconstructions of the same. The fortress was most probably built earlier, during Diocletian's great building activity and his attempts to consolidate the Limes throughout the Empire (Alföldi 2001: 154–167).<sup>6</sup> Still, archaeological research conducted at this site<sup>7</sup> showed that during the second half of 4th century, the fortress lied in debris, since in its southeaster part, thermae were build upon the tower (Петровић 1983: сл. 6). Although the building period of the thermae is not certain, it is possible to determine its period of collapsing, since a smaller hoard was discovered in a sooth layer upon the thermae. The youngest one among the coins were those from 378. This date can be considered as terminus ante quem for its dating.

<sup>5</sup> Since the western wall could not be detected and since there was no archaeological material or cultural layers, it was presumed that the river destroyed the most part of the fort.

<sup>6</sup> One should also mention Diocletianus' ravels along the Iron Gates in 294, from *Singidunum* to *Ratiaria* and further on down the Danube. The building activity was confirmed on numerous inscriptions discovered in forts along the lower Danube valley, errected most likely in the period from 298 to 299.

<sup>7</sup> Field survey of the site began already in 1962 and the systematic excavation took place between 1967 and 1970. The excavation was conducted by D. Vučković-Todorović.



Fig. 1. Porečka reka fortification complex (П. Петровић 1981, fig. 3)



Fig. 2. Building B in fortification complex Porečka reka (П. Петровић 1984, fig. 7)

Reforms of Diocletianus also regarded the question of military supplying. Construction of a building related to supplying happened simultaneously with introducing military taxes (annona militaris). In imperial edicts which regard these questions, preserved within the Codex Theodosianus, supplying and distributing food was organized by the officers (primipilares) (Jones 1973: 626 with named sources). They were in charge of the horrea outside the military camps, which represented supply centers from which food was distributed. Some of these granaries were located in the neighbouring towns, on greater or smaller distances from the border. There were also other buildings for supplying (loca) mentioned by Amianus Marcellinus (XIV 2, 13), representing isolated fortified centers on the border itself. It was most likely that the mouth of the Porečka river represented such a supply center from which further distribution was done. This conclusion is supported with the position of the fortification close to important military camps along the Danubian Limes. Apart from that, the buildings discovered definitely had an economic function as well. According to its plan, the building B could have been a horreum, most likely also the building A. Sporadical finds of amphorae fragments in the inside of the fortress, with no dwelling traces, indicate food storage. In the Roman Empire, examples are known of storage buildings surrounded with walls (Rickman 1971: 266-267, fig. 66).

Two other sites are considered to have been logistic centres at the Danubian Limes in the Upper Moesia: Kurvingrad and Konopište near Kostol (*Pontes*) (Popović 1996: 101–103).

There are very few archaeological data for both sites. At the site Konopište, 3 km upstreams from Trajan's brigde and the fort *Pontes*, foundations of irregular rectangular buildings were discovered (Popović 1996, fig. 1). In the eastern part of the excavated area, a smaller building was discovered. Another one was explored to the west that was divided into five rooms. These buildings were made of stone and mortar. A small number of archaeological finds, mostly amphorae shards from 1<sup>st</sup> and 2<sup>nd</sup> century, were found within these buildings, as well as a good preserved sestertius of Nerva from 97 AD that give data about chronology (Popović 1996: 102–103).

The site Kurvingrad, today under water, was located one kilometer downstream from Konopište. At the excavated area, buildings used for storing and keeping grain and other goods were discovered. Dimensions of the *horreum* could not be determined because of erosion. Few finds included amphorae shards, also from the end of 1<sup>st</sup> and the beginning of 2<sup>nd</sup> century (Popović 1996: 103).

These two buildings represented a unique complexes errected by the Romans upon the Danubian terrace in the area from Konopište to Kurvingrad.

The remains of these buildings indicate that there was a horreum in this area and other buildings used for storing food, as well as barracks for the soldiers (Fig. 3.).

Amphora shards, as well as coins, indicate dating from the end of 1<sup>st</sup> to the beginning of 2<sup>nd</sup> century, actually a time when Trajan's bridge was built and when accomodation and food supplies were needed for its builders. Since most of them were brought from different parts of the Empire and were stationed here only temporarily, the buildings in which they dwelt were not of permanent character and built of short-lasting material, mostly wood, so their remains were not preserved. It is possible that convoys with food supplies were sent along with military units and builders.

*Horreum Margi* is mentioned as an important supply and distribution center of food (Petrović 1979: 57–61; Vasić 1990). Its municipal status indicates its basic function in a way (*CIL* III 7591. *CIL* VI 2388, no. 8).<sup>8</sup> It was built in the Morava valley, situated at the mouth of the river

<sup>8</sup> An inscription from 224 indicates that the town was a municipium already.



Fig 3. Plan of complex in Konopište (Popović 1996, fig. 1)



Fig. 4. Tabula Traiana, image taken on original location

Ravanica into Morava. It was well known from earlier itineraries and from Notitia Dignitatum.9 It was positioned at the main road from Singidunum towards Naissus, one of the main centres for the whole Balcan region and next to Velika Morava, flowing towards the north i.e the Danube, close to Viminacium, the capital of the province (Korać, Golubović and Mrđić 2009). Because of this, already in 1<sup>st</sup> century, the settlement grew very quickly from a small town into an ideal place for a supplying centre for military campaigns. Later on, it became the main base for grain distribution which was sent to smaller logistic centres along the Danubian Limes (Rickman 1971: 318). It kept its basic function as a supply center for military garrisons in the later period, even though the town grew bigger and became a municipium. In the Notitia Dignitatum, Scutaria Horreomargensis is mentioned as one of the important centres in Illyricum, under the command of Magister Officiorum (Not. Dign. Or. XI 39). Remains of a bridge over the Morava, mentioned by Kanitz (Kanitz 1892: 68-71) testify about the importance of this area for the Empire.

Apart from major supply centers, in which food was kept for further distribution, forts along the Limes had to have their own buildings intended for food storage for the soldiers stationed in them. According to *Tacitus*, the *horreum* of each camp was built and constructed in such a way to hold a one year food supplies for soldiers stationed there. Althought these data regard fortifications in Britain during the second half of 1<sup>st</sup> century, it can easily be presumed that the same principle was valid throughout the Empire (Tacitus, Agricola - http:// www.sacred-texts.com/cla/tac/ag01020.htm).

Such measures were needed in cases of inconvenient circumstances along the Limes or bad weather conditions which could cause problems in food transporting. Several *horrea* were discovered along the Upper Moesian Limes, within fortifications of different sizes and shapes: in Sapaja (Димитријевић 1984: 29–71), Čezava (*Novae*) (Васић, 1984: 91–122), Boljetin (*Smorna*) (Зотовић 1984: 211–225), Veliki Gradac (*Taliata*) (Поповић 1984: 265–282). Forts of smaller dimensions did not have enough room for such buildings.

Transportation along *limes* had to be combined: over land and river communications. The system of supplying over land was well-developed, with a wide network of roads. Problems regarded small weights carried by animals and charts. On the other side, dangers along land-roads could have been caused by robbers (latrones) or barbarian intruders in wartimes. Therefore each valuable transport had to be escorted. The main communication was the road along the Danube, connecting all of the Limes fortifications, and special importance was given to the road through the Iron Gates (Fig. 6), made in extreme conditions and praised on several imperial tablets. These tablets (Fig. 4) celebrate the legions involved in cutting the road through the Iron Gates and later also in its improvement and repairing (Петровић 2004: 71-95; Šašel 1961: 156–164). The importance of tranport and supply is indicated with extreme attempts to enable passage on and along the Danube. Building of the Sip canal near Diana (Statio Cataractarum Dianae) under the reign of Trajan was praised as an incredible effort, since only with this canal, the Danube became fully navigable, since the dangerous cataracts were avoided (Петровић 1972: 31-39).

Whenever it was possible, transport of food and other goods was performed over river. Rivers were used, connected with canals or pulling service for upstream navigation. It is regarded that provincial fleets also transported supply for the ground troops (Breeze 2000: 59; Kehne 2007: 328–329). Supplying was done along all of the major rivers within the Empire: the Rhine, the Danube, the

<sup>9</sup> Ptolemaius mentioned this place under the name of *Orrea*, among the cities in *Moesia Superior (Ptolem. Geogr.* III 9,4); It is also well known from the itineraries and *Notitia Dignitatum: Tab. Peut. segm. VI; Itin. Ant.* 134, 3; *Itin. Hieros* 565, 6–7; *Not. Dign.* Or. XI 39.




Nile, the Euphrates etc. Transport along the Danube can also be seen on Trajan's column (Fig. 5). We can also presume that to the already mentioned great storage building in Porečka river and other Danubian forts, supplies were brought from other parts of the Empire, as well as from the hinterland of the province, mostly along rivers. Actually, the main feature of all of the fortifications along the Danube was river transport. In accordance to this, all of the fortifications had to have a port or any kind of dock, out of which only a few were investigated during the great protective excavations of the Iron Gates (Петровић 1990: 207–216).

A certain *Ulpius Antonius Quintus* is known as *aedilis* and *questor* of the *municipium* in Drobeta, who decorated the port (*portus*) in Tekija (*Transdierna*) with Iuno's sculpture (Петровић 1990: 208 with earlier literature).

As ports of the Upper Moesia, Margum (*Classis Stradensis et Germensis*), Viminacium (*Prefectus Classis Histricae*), Egeta (*Classis Aegetensium Sive Secunda Pannonica*) and Ratiaria (*Classis Ratiarenses*) are mentioned in *Notitia Dignitatum*. The fleet was confirmed only in 92 (CIL XVI 37), although it most likey existed in the previous decades as well (Петровић 1991: 207–208). The existence of Neptune's temple as a feature directly related to the river and river transport was confirmed on several monuments discovered in *Viminacium* (Mirković, 1986: 75).

The most important ports were those next to the legionary camps in *Singidunum* and *Viminacium*, about which there is very few information. Smaller ports were located in Tekija (*Transdierna*), Čezava (*Novae*), Hajdučka vodenica, Karataš (*Statio Cataractarum Dianae*), Brza Palanka (*Egeta*) and Kusjak near Prahovo (*Aquae*). *Viminacium*, *Aquae* and *Novae* had ports separated from the main fortification, while on the other sites ports were situated next to the fortifications and were protected with perimetral walls relying on the main defensive wall of each of the fortifications. Such a positioning of ports is known from Singidunum, Hajdučka vodenica, *Diana, Egeta.* In German literature, such fortified ports are described as Landeburg and they are often encountered along the Rhine, although less along the middle and the lower Danube valley (Петровић 1991: 207–216).

\* \* \*

The complex system of supplying and distributing of goods at the territory of the province of Upper Moesia, later First Moesia, was conducted along land - and river communications throughout the Roman period. Unfortunatley, possible river ports and stations are archaeologically very poor documented.

Apart from greater supply centers, in which food supplies were stored and kept for further distribution (Porečka reka, Horreum Margi), according to the archaeological data preserved, forts along the Limes also had their own buildings intended for keeping and storing food for the soldiers stationed within them for a certain period of time. The supply system used by the Roman army and the way of collecting supplies within greater supply centers indicate that the quantity of grain produced in the province of the Upper Moesia was not sufficient for all of the inhabitants and soldiers stationed at its territory. This lack was covered with the import from the neighbouring provincies, from the areas around the Black Sea and Dacia, but also from distant parts of the Empire.

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# REZIME SNABDEVANJE I TRANSPORT NA DUNAVSKOM LIMESU U GORNJOJ MEZIJI

# Ključne reči: snabdevanje, sabirni centri, Dunavski limes, rečna pristaništa, Gornja Mezija.

Snabdevanje i distribucija namirnica tokom rimskog perioda na teritoriji provincije Gornje Mezije obavljani su i vođenim i kopnenim putevima. Kada govorimo o limesu Gornje Mezije, problem možemo analizirati sa dva aspekta:

- jedan se odnosi na geografske celine, odnosno na prostor između Singidunuma i Đerdapa, samu Đerdapsku klisuru i prostor nizvodno od Đerdapske klisure.

- drugi je snabdevanje vojske prema rangu jedinica, odnosno legija ili pomoćnih, auksilijarnih, trupa.

Sistem snabdevanja vojske hranom otvara mnoga pitanja koja se tiču pre svega načina njene nabavke iz udaljenih područja ili iz regiona, odnosno nabavka od lokalnog stanovništva.

Snabdevanje vojnih logora na gornjomezijskom limesu u znatnoj meri je organizovano iz drugih gradova u unutrašnjosti provincije. Horreum Margi je mogao biti jedna takva važna baza za prikupljanje i distribuciju prehrambenih proizvoda, pre svega žitarica, zahvaljući povoljnom položaju na glavnim komunikacionim pravcima, kako suvozemnim tako i rečnim, što je omogućavalo lak pristup važnim centrima i đerdapskim utvrđenjima. S druge strane, sasvim je izvesno da su se i u logorima ili njihovoj neposrednoj okolini nalazila skladišta, u prvom redu žita, a potom i drugih namirnica namenjenih ishrani vojnika. Za sagledavanje problema snabdevanja na gornjomezijskom limesu nešto više podataka pružaju objekti otkriveni na ušću Porečke reke. Locirana na izuzetno povoljnom geografskom položaju, u neposrednoj blizini jednog od najvećih logora na dunavskom limesu - Velikog Gradca (*Taliata*), Porečka reka je predstavljala i važnu raskrsnicu puteva u ovom delu Limesa. Pored ovog lokaliteta, kao mogući logistički centri na gornjomezijskom delu Dunavskog limesa pominju se i Kurvingrad i Konopište kod Kostola (*Pontes*). Osim velikih sabirnih centara u kojima su bile smeštane i čuvane zalihe hrane za dalju distribuciju, tvrđave na limesu su morale imati i sopstvene objekte namenjene odlaganju i čuvanju namirnica koje su mogle za izvesno vreme da zadovolje potrebe vojnih posada smeštenih u njima.

Način dopremanja namirnica morao je biti kombinovan, odnosno kopneni i rečni.

Sistem snabdevanja kopnenim komunikacijama bio je dobro razvijen, a mreža puteva razgranata. Osnovna komunikacija bio je put duž Dunava koji je povezivao fortifikacije na limesu, a poseban značaj imao je put kroz Đerdapsku klisuru prosecan u ekstremnim uslovima čiju gradnju slavi niz carskih tabli. Transport namirnica i ostalih proizvoda obavljan je vodenim putevima kad god je to bilo moguće. Rečni tokovi su bili maksimalno korišćeni, često povezani kanalima ili vučnom službom. Smatra se da su provincijske flote prevozile namirnice za rimsku vojsku. Okosnicu snabdevanja fortifikacija na Dunavu činio je rečni transport, tako da su fortifikacije morale imati neki oblik pristaništa, ali samo nekoliko je istraženo u okviru velikih zaštitnih iskopavanja Đerdapa. Kao luke na prostoru Gornje Mezije pominju se Margum, Egeta i Viminacium.

Na kraju možemo da zaključimo da sistem snabdevanja koji je koristila rimska vojska i način stvaranja zaliha unutar većih sabirnih centara, upućuje na to da proizvodnja pre svega žitarica, ali i drugih životnih namirnica u oblasti Gornje Mezije nije bila dovoljna za ishranu stanovništva i vojske stacionirane na njenoj teritoriji. Taj nedostatak je najverovatnije nadoknađivan uvozom iz susednih provincija, iz oblasti oko Crnog mora i Dakije, ali treba računati i na uvoz iz udaljenih oblasti Carstva.



Fig. 6. Roman road cut into the rocks of the Iron Gate gorge

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# DEVELOPMENT AND CHANGES IN ROMAN FASHION SHOWCASE VIMINACIUM

# ABSTRACT

Long-term researchs on Viminacium provide ample findings according which we can follow the fashion trends of the Roman Empire. We provide the best picture performance from the coins, and needles, combs and beauty accessories speak to the fact that the Viminacium took account of the appearance. Discovered sculptures, reliefs and sarcophagi, show what clothes people were wearing then, and the attachments in the graves, and what jewelry had been used.

Key words: Viminacium, coins, hair pins, hair styles, sculpture, fibulae, necklaces, earrings, bracelets, rings.

During the last few decades of the Viminacium excavations, a great number of finds was discovered that indicates that its inhabitants followed "fashion" and paid great attention to their appearance and outfits. Cosmetic plates, bone needles and combs, as well as lead mirrors show the investigators how everyday life of an average Roman citizen looked like. If one adds frescopainted tombs, reliefs on stone sarcophagi, images on coins and high-quality luxurious jewelry, the picture becomes much clearer. Relying on Viminacium finds, this paper represents an attempt to make an overview of development and changes in hair-styling and fashion, as well as to determine which kind of influence the capital of the Empire, Rome, had on the capital of the province of Upper Moesia.

The most numerous material offering information about such changes are silver and bronze coins, because not only Roman emperors depicted on them, but also members of their families. On obverses, there are emperors depicted with their wives, mothers, sisters, brothers, sons and daughters. Pictures of Roman empresses are of special importance for an analysis of hair-styles. They are so precisely depicted, that one can track down changes in hair-styling and wearing, since hair-styles are an inevitable part of fashion. Hair-

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styles differ from one period to another, depending on taste and tradition, geographic and social conditions. From early times onwards, people attempted to stress their originality with unusual hair-styles. It is exactly this element of hair-styling on portraits that helps precise dating of mints. By following images on coin obverses, frescos or modelled portraits, one can also determine which hair-style was in at the time. Handcraft and artistic expression were on a high level. The spirit of time and the look of a lady was reflected in them. Artists managed to depict the simpliest hair-styles, but also the most complicated ones. An empress or not, an average woman spent a long time doing her hair. There were hair-dressers (ornator or ornatrix) working either in their houses as slaves or as independent hair-dressers in their own salons (Lalović 2007). They were able to form three main hair-styles: 1. hair, freely falling, with curls, 2. hair simply lift into a vertical bun and 3. round bun put in a net (reticulum) on the back of one's head. For all of the hair-styles it was necessary to have thick and shiny hair. Hair growth was impelled by rubbing it with fired donkey's hoof, while it was given shine with liquid soap mixed with different oils. Different combs, hairpins and ribbons were also necessary for hair- styling. During archaeological excavations in Viminacium, over 1,700 bone needles and pins were discovered, as well as 43 combs.<sup>1</sup> Combs (pecten) were made of bone or wood and some of the examples were richly decorated (site Više grobalja, C-1229) (Fig. 1. and 2.). The simpliest models were single jagged, while the most frequent were double jagged, one side being more dense than the other. The less dense side was used for combing and the other one for hair-modelling. Sometmes they were also used for lifting hair. Pins that were discovered were used for separating locks, making parts and holding hair. They were usually made of bone or horn (acra discriminalis). Pins with sim-



Fig. 3. Drawing of a needle, site Kod koraba C-446



Fig. 4. Photo with a cameo, (Spasić – Đurić, 2002: 92)

<sup>1</sup> It needs to be stressed that research of the city only began, while before only Viminacium cemeteries were investigated.



Fig. 5. Metal needle, site Pećine C-684



Fig. 6. Sabina, site Više grobalja C-10004, ref. RIC II 1023



Fig. 7. Faustina Senior, site Više grobalja C-5269, ref. RIC III 1187



Fig. 8. Faustina Junior, lok. Više grobalja C-3298, ref. RIC III 1389a

ply decorated heads were used for twisting and curling hair (acus discerniculum), while the richly decorated ones were used as hairpins (acus crinalic, comatoria, crinale). (Fig. 3.) Apart from bone and wood, they were also made of metals: bronze, silver and gold (site Amfiteatar 2011, C-3030).

On Roman republican silver coins found at Viminacium (sites Kod Koraba, Na Humci etc.) one can tell that men previously wore long hair and only later it became fashion to wear short hair. Young girls wore smoothly combed hair down to their necks and bound with ribbons and pins, or formed into a braid or a bun. Married Roman women wore their hair lifted into a hairdo named tutulus. During this period, hair-styles were simple, since hair was tied at the back of one's head with ribbons and pins - hair-pins or formed into a braid out of which a bun was made. Sometimes, thin locks were left, falling slightly over the forehead. On a trifoil ellyptic cameo found in Viminacium, a woman whose face is framed with spiral locks is depicted, while she wears a laurel wreath on her head. According to a characteristic profile and the way of combing, the picture on this cameo was determined as a portrait of Agrippina the Elder (Srejović 1987: 162). (Fig. 4.) At the beginning of the Imperial age, hair-styles were simple. Hair is of middle length, part is in the middle and hair falls symetrically around the face, with a lock or two, ending with buns or braids. Such hair-styles were worn by Livia (Sear 1974: 89/447; RIC I: 46)<sup>2</sup> and Octavia, Augustus' wife and sister. Later on, hair-styles become much more complex and even hair inserts were added. For fixing such inserts, bronze or bone pins were used, decorated on both ends. (Fig. 5.) Inserts or complete wigs were made out of slaves' hair and were available in two colours: blond and black. It was also possible to dye hair using different mixtures of plants and ashes. Such hairdos were voluminous, made even more outstriking when pins, flowers, wreaths etc. were added. They were usually worn by matrons at the court and during festivals.

Extreme and complex hair-styles, becoming fashionable in 1st century A.D., consisted of curls arranged on forehead, thus forming voluminous appearance of the whole hairdo. Different pins, flowers, wreaths and diadems contribute to even greater voluminosity. On extremely rare golden aurei<sup>3</sup>, the empress Martiana died in 114 (Sear 1974: 133/966), sister of emperor Trajan (Markus

<sup>2</sup> At Viminacium site Više grobalja, C-1121, ob. IVSTITIA.

<sup>3</sup> Numerous coins (mostly made of bronze and silver) with images of empresses discovered at Viminacijum are poorly preserved, so apart from them and their readings, photographs of coins on which the hair-stylings are clearly visible are given in this paper.

Ulpius Traianus, 98-117), was depicted with high lifted hair and a wreath above her forehead. The same hair-style is shown on the portraits of Sabina<sup>4</sup> died in 136 (RIC II: 1023), the wife of the emperor Hadrian (Publius Aeilus Trajanus Hadrianus, 117–138). This style shows many variations (Fig. 6.). Apart from simply cotted hair, hairdos decorated with diadems or veils were very common. Faustina Senior, died in 141 (RIC III: 1187),<sup>5</sup> the wife of Antoninus Pius (*Titus Aurelius Fulvus Boionius Arrius Antoninus*, 138–161) was well-known because of her beauty and wisdom. (Fig. 7.) When her husband was enthroned, she became an "Augusta", and on the mints from that period, she was depicted as a middle-aged woman. Numerous coins with her portraits depict her with high combed hair, decorated with pearls tied into a wreath, but sometimes also with hair covered with a veil. Coins with her image, both with and without a veil, are the most numerous ones at Viminacium. In 145, the daughter of Faustina Senior, Faustina Junior died in 175, (RIC III: 1389/a)<sup>6</sup>, married the young emperor Marcus Aurelius (Marcus Aurelius Antoninus Augustus, 161-180) (Fig. 8.). She was very similar to her mother and well-known for her beauty. On coins, she was depicted as a younger woman, with her hair always tied in a bun. Instead of a diadem, her wavy hair was divided with a braid. The same hairdo, hair divided into numerous small braids, all tied in a bun at the back of the head, was also worn by her elder daughter Lucilla (RIC III: 1752 and 1743)<sup>7</sup> (Fig. 9.). This can be seen on numerous coins discovered at Viminacium cemeteries. Comodus (Lucius Aelius Aurelius Commodus 177-192) wife, Crispina<sup>8</sup> (RIC III: 672a) (Fig. 10.) also liked this hair-style. The names and images of the empress Manillia died in 193 (Sear 1974: 174/1614) and her daughter Didia Clara (Sear 1974: 175/1621) are known to history only from a small number of coins, minted during the sixty days of her husband Didius Iulianus' rule in Rome in 193 (Marcus Didius Julianus 193). On a golden coin, her bust was depicted with her hair tied in a big bun, which separates her from other empresses. During the first half of 3rd century, Iulia Domna died



Fig. 9. Lucilla, site Više grobalja C-12268, ref. RICIII 1752



Fig. 10. Crispina, site Više grobalja C-12637, ref. RIC III 672a



Fig. 11. Iulija Domna, site Više grobalja C-8825, ref. RIC IV 1.527

<sup>4</sup> Site Više grobalja, C-4805, 5389, 6407, 6436, 10004, ob. [SABINA AVGVS-TA HADR]IANI AV[GPP].

<sup>5</sup> Site Pirivoj, C-274, 584; Na kamenju, C-71; Na Klepečkoj, C-66, 81, 363, 366. Site Više grobalja, C-2862, 2888, 2969, 3083, 5269, ob. DIVA[F]AVS-TINA.

<sup>6</sup> Site Pirivoj, C-363; Na kamenju, C- 61; Na Klepečkoj, C-663; Više grobalja, C-2495, 2666, 3793, 3928, ob. FAVS[TINAA]VG[VSTA].

<sup>7</sup> Site Više grobalja, C-479, 1575, 1653, 1948, 3456, 4752, 9390, 12268, ob. LVCILLA AVGVSTA.

<sup>8</sup> Site Više grobalja, C-1996, 4701, 5218, 8839, 11642, 12637, ob. CRISPINA AVG[VST]A.



Fig. 12. Portrait of Plautilla's head, Viminacium

in 217(RIC IV: 1.572; 1.574; 1.536)<sup>9</sup> (Fig. 11.), the wife of the emperor Septimius Severus (*Lucius Septimius Severus* 193–211), introduced new fashion in hair-styling, as well as new customs in court. She did not originate from Rome, but from the town of Emes in Syria. She was a daughter of Bassianus, the priest of the sun, which can clearly

<sup>9</sup> Site Pirivoj, C-66; Nad Klepečkom, C-222; Više grobalja, C-262,678, 8825, ob. [IVLIA AVG]VSTA.



Fig. 13. Iulija Mamea, site Više grobalja C-9816, ref. RIC IV 2.341

be seen on her portraits and especially reflected in her unusual hair-style. Long, voluminous hair is divided in the middle, freely falling down the shoulders and then combed backwards. There are over 300 different portraits of her, either on coins or carved in stone. Among coins with pictures of empresses, her coins are the most numerous in Viminacium. Iulia also had a sister, Iulia Maesa (Sear 1974: 206/2089) a very powerful woman, who had strong influence on her daughters' marriages to Roman emperors. From the end of 2nd and during 3rd century, it was considered noble to frame one's face with slightly wavy hair. The rest of the hair was tied into a bun or braid, made in the shape of a diadem and twisted around one's head. A portrait of a young woman, discovered in Viminacium, shows a typical hairdo with hair formed in melon-slice-like parts and therefore named "melon" (Fig. 12.). The "melon-slices" are tied in a bun at the back of her head, while



Fig. 14. Otacilla, site Pirivoj C-234

short wavy locks were depicted in shallow relief and left infront of her ears. For a long time, such hair-styles were worn by unmaried girls. The head is damaged (Tomović 1986: 31-32), but it can be supposed who was depicted. An identical portrait was discovered in Solin (Cambi 1987: 74 and 76), and although there are no closer data about its discovery, it was dated at the beginning of 3rd century. After analogue depictions on coins, this portrait was ascribed to Plautilla Fulvia (Buzov 2008: 473-488), Caracalla's (Lucius Septimius Bassianus 211-217) wife. He was nick-named after a Gaulish tunic, which he introduced to the Roman fashion. It is known that Caracalla visited Viminacium on two occassions, but it is also known that he did not love his lawful wife. She was murdered after his order and was condemned to damnatio memorie, meaning that every memory of her had to be destroyed. Only from 202 did her images appeared on coins, and in January 205 Caracalla divorced and expelled her. Her portraits are found



Fig. 15. Helena, lok. Kod Koraba C-459

on some of the coins from the Viminacium cemeteries (RIC IV: 1.366).10 Iulia Maesa (RIC IV: 2.272; 2.268; 2.249)<sup>11</sup> had a daughter Iulia Mammea (RIC IV: 2.358; 2.351; 2.347; 2.341)<sup>12</sup> (Fig. 13), who was depictd on well-preserved sestercii found on several sites in Viminacium. Therefore, we were able to conclude that up to the thirties of 3rd century, a low diadem formed of hair divided into locks was in fashion again, also worn by Alexandar Severus' wife Orbiana (Sear 1974: 213/2202).

On one of the sites, Pirivoj, a silver Antoninianus with Otacilla's portrait was discovered at site Pirivoj (C-234) (Fig. 14.), the wife of the emperor Philipp I, (Marcus Julius Philippus 244-

<sup>12</sup> Site Pirivoj, C-321, 695; Nad Klepečkom, C-416; Više grobalja, C-2849, ob. ΙΟΥΛΙΑ ΜΑΜΑΙΑ ΑVΓ, BMS 105; C-4, 8837, 7345, 9186 ob. [IVLIA MA]MAEA.



<sup>10</sup> Site Više grobalja, C - 8989, ob. [...]ΠΛΑΥΤΙΛΛΑ CEB; C- 8323 ob. PLA[VTILLAE] AVGVSTAE.

<sup>11</sup> Site Više grobalja, C-423, 679, 8643 ob. [IVL]IA MAESA [AVG] .



Fig. 16 Fresco with a girl

249). She was usually depicted as a younger or an elderly woman, with her hair traditionally divided into horizontal braids reaching her neck and then lifted to the back of her head. During the sixties of 3rd century, Salonina (RIC V: 1.5), Gallienus (*Publius Licinius Egnatius* 253-260) wife, wore the same hair-style, with her whole hair divided into small braids lifted to the back of her head, while there is a low diadem on her head as well. Such hair-styles are encountered on Viminacium coins up to the time of the empress Galeria Valeria died in 315 (Sear 1974: 304/363), the daughter Diokletianus' (*Gaius Aurelius Valerius Diocletianus* 284-305) and the wife of Galerius Maximianus (*Gaius Galerius Valerius Maximianus* 

305-311). On coins, she was depicted as a young woman with straight combed hair and a small diadem decorating her head. From that period there is also a silver coin with the image of Constantine's first wife Helen<sup>13</sup> (Fig. 15.) and a fresco-painted tomb from Viminacium (site Pećine, G-2624), in which a portrait of a young woman with oval face, big eyes and long neck was discovered. Her brown hair is falling down to her chin and combed backwards, with a net over it (Korać 2007: 104). (Fig. 16.)

Men paid much less attention to thier hairstyles. Some had their personal barbers (tonsores), some went to barber-shops, but no-one shaved on

<sup>13</sup> Site Pirivoj, C-472; Kod Koraba, C-459.

his own. They spent much time in such places, because of great numbers of customers and companions who gathered there, but also because of the shaving process itself, which was long and rather painful. It was done with iron or bronze blades (novacula) sharpened with whetstones. Blades were either with fixed handles (site Pirivoj, C-593; Rit, C-15), or with a flexible handle (Fig. 17.), but in both cases the procedure was long and unpleasant, because the skin was wettened only with water and it often led to cuts. Bleeding was stopped with a bundle of spider's web soaked into oil and vinegar. In order to avoid painful and long shavings, men rubbed themselves with resins, mixture of white grape-vine, ivy liquid or, in drastical cases, bat's blood. There was also a way to cover scars using small textile bundles. Most of men were probably relieved when emperor Hadrian introduced wearing beards, because he himself wanted to hide scars on his face. Much attention was paid to beards, which can also be recognized in a festival organized for young men and their first shaving (Petronije: 45). Fashion in beard-wearing can also be followed owing to depictions on coins. One can tell that beards were differently stylized for a century and then they were again replaced with smoothly shaved male faces. Hair cutting was done with scisiors<sup>14</sup> (forfex), consisting of a pair of blades conected with joints or with a simple bow-mechanism (Fig. 18.). Hair-cutting with such scissors was rather uneven. In order to make uneven cuts less visible, hair was curled with an iron bar warmed up in live coals. Such a treatment was conducted on men with thin hair who wanted to make it more voluminous. The simpliest male hair-style was named after emperor Titus (Titus Flavius Vespasianus 79-81). Hair was combed from a point on top of one's head towards forehead, ears and neck. There were, of course, more intriguing hairdos, consisting of rows of curls spread in different ways and fram-



Fig. 18. Scissors, site Više grobalja C-1286



Fig. 19. Man's head, Viminacium

ing one's face. Several sculptures were discovered in Viminacium (Tomović 1986: 31-39). One of them shows a man with a high forehead, sideburns and wrinkles. His hair and beard were done in locks. His eyes are outstriking, while his beard is of decorative character. According to its style, this portrait can be dated in the middle of 3rd century, while it is believed that it was made in one of the better provincial workshops. (Fig. 19.) In a cameo made of two-coloured onyx a man is depicted, with smoothly shaved face and outstriking lips. His short hair frames his face, leaving one ear visible. The hair is depicted in the form of small rectangles, resembling a honeycomb. The man wears a cloak with edges around his neck done in relief. According to its characteristics, this cameo can be dated into the period of early tetrarchy, around 300 A.D. (Srejović 1987: 239/232).

<sup>14</sup> Found at some of the sites: Više grobalja, C-960, 1286, 1296; Nad Klepečkom, C-974; Lugovi, C-14.



Fig. 20. Terracotta of a female statue, site Amfiteatar C-430

After doing her hair, a woman needed to choose what to wear. Apart from underwear, consisting of a pair of clothes tied around her waist (subligaculum) and a ribbon for holding and fastening her breast (strophium), the main part of woman's clothing was a tunic (Beatson 2004). Tunic is a dress made out of a rectangular piece of textile, fastened at the ends and thus forming short sleeves. There were two kinds of tunics, both overtaken from Greek fashion. One of them was a peplos, made out of two rectangular pieces of textile and sawn at the tops, leaving openings for the arms and the head. It is fastened on the shoulders with ribbons and pins, thus forming sleeves. A more commonly worn kind of female tunic was similar to a Greek chyton. Two pieces of textile were also sawn together and pulled over one's head. A belt was tied either high or low and by combining it, several models of the same dress were obtained (Schneider 2005). Tunics were of differet colours and textile types, depending on

social status and wealth. A decorated stola was worn over the tunic, reaching down to the ankles. Over the stola, a long scarf (palla) was worn, which was wrapped around one's body, while one ending could have been put over one's head. If they were about to take part in a religious feast, matrons covered their heads with a rectangular scarf made out of purple or blue textiles decorated with fringes. Among the terracottas discovered during the excavations in Viminacium, one often comes across figures of young women ascribet to female deities. Apart from them, statues of young women were found, dressed in long dresses and with sandals on their feet, which, along with other finds, belong to the middle of 3rd century (site Amfiteatar, C-430, 518) (Fig. 20.). As the power of the Empire grew, more and more luxurious clothes were used, imported from the newly conquered provinces of the Empire. In some of the written sources there is some iformation that a kilogram of silk was just as valuable as a kilogram



Fig. 21 Photo of shoes, Viminacium



Fig. 22. Sarcophagus from Požarevac, photo by I. Bogdanović

of gold. Not all of the women were as modest as Augustus' wife Livia, who made clothes out of the clothes she personally weaved, so wealthy Roman citizens had difficulties in their attempts to impress their wives or mistresses. Not even Tiberius' (*Tiberius Claudius Nero* 14-37) decrees were of much help, although tried to make up means of the state treasury caused by exadurated import of luxurious goods. A discovery in the year 1982 of a lead sarcophagus shows that Viminacium women had their share of good taste in choosing textiles and in fashion (site Pećine, G-2047). Skeletal remains of a woman, who wore a linen shirt and over it a dress or a cloak made of purple brocade with golden threads were discovered in it. On her feet, there were socks made out of white cotton and shoes made out of brown leather. Around her feet, there were remains of seven pairs of shoes, all made of brown leather, as well as several soles made of folded cork (Golubović 2000: 83–93). The upper shoes' edges were jagged and decorated with preforations under the edge. The shoes were tied with thin belts. (Fig. 21.) The investigators were able to tell that all of the shoes were of different sizes, which led to a hypothesis that the deceased did not want to dispose some of her favourite footwear even after she grew out of them.

This leads to the question of footwear. Both men and women mostly wore sandals, whose soles were tied aroud ankles with belts. Boots were worn outdoors, reaching up to the calfs and having openings on the sides. They were also tied with belts wrapped around one's calfs. They were mostly made of leather, sometimes decorated with pearls and precious stones. The colour of boots indicated the social status. When people were visiting someone, they brought their sandals with them and put them on, because it was not apropriate to walk inside one's house in outdoor footwear. Deeper boots were designed for hunting and boots with stronger soles for the military. Provincials wore peasant shoes. The poor wrapped their feet into furskins or woolen rags. On one of the frescos there is a young man depicted, carrying plate with offerings, but it can also be seen how young men were dressed. His shoes are especially well shown. During modern excavations, the only remains of footwear found are shoe-nails, and in some cases the whole print of a shoe stamped into clay out of which bricks were made. Apart from the lead sarcophagus, several stone with reliefs were also discovered in Viminacium. On one of them, today in the City Museum of Požarevac, on the lid, a woman with a child is depicted. (Fig. 22.) The same person is depicted on the shorter, lateral side, sitting and moarning. It is considered



Fig. 23. Funeral stele, photo by N. Mrđić

that the inspiration for such images is to be found on Greek gravestones. The reliefs made on the lateral side and on the lid were added later on in a local workshop (Tomović 1991: 74). According to parallels, the sarcophagus was dated into the second half of 2nd century. Such pictures of women were also found on some sculptures from Singidunum (Srejović 1987: 227–208). A grave-



Fig. 24. Sawing needle, site Pirivoj C-77

stone discovered in 1987 at the Viminacium site Pećine (C-12736) bears a relief in its upper part showing a married couple to whom the stele was dedicated. Within the aedicula with portraits there is a woman depicted on the left side, wearing a dress and wrapped into a cloak, while on the right there is a man wearing a tunic with a toga with voluminous folds. In his left hand he holds a roll. Woman's hair is divided in the middle and falling over her ears and then bent low at the back of her head. The stele is dated into the period of the emperor Antoninus Pius (Milovanović, Mrđić 2008) after the jewelry on woman's left and around her neck. (Fig. 23.).



Fig. 25. Quartzite bust, site Amfiteatar C-2499, photo by I. Bogdanović

Men also had their dressing rites. The Romans mostly wore a tunic and a toga. A classical toga is a special Roman dress worn only by Roman citizens. It was a large cloak made out of almost 9 m of textile. Since they were voluminous and unpractical, they were soon determined for wearing only on special occasions. During Augustus' time, a moral code existed and togas were worn in all spheres of public life. In time, social traditions changed and various influences came, so the rules were changed. Tunics became more comfortable and covered with a cloak called lacerna, which became common for all kinds of socializings. Not all of the togas looked alike and one was abe to tell the social status of Romans.

The most known togas were: virilis, praetexta, pulpa, candida and picta. No matter what was the piece of clothes, sawing tools were needed for making them (Fig. 24.). On all of the investigated sites, many bone and bronze needles were discovered with perforated heads, thus used for sewing. Their length varies from 4 to 20 cm. One of the sites on which

there were many needles discovered is near the Pirivoj necropolis (Raičković, Milovanović 2009: T. XVI-XVII).

Tunic was a short woolen dress with short sleeves. It was worn at home. Members of high class wore tunics made of white wool or expen-



site Nad klepečkom C-136

sive linen, while the poor ones wore tunics made out of materials they could afford. Several sculptures and grave-steles were discovered in Viminacium, showing men in togas and tunics. Among the latest discoveries is a figurine made of quartzit, excavated near the amphitheatre (C-2489), whose head is missing, but according to folds, it can be seen that a person depicted is a man in a tunic and a long folded toga. (Fig. 25.) Some other sculptures discovered in Viminacium also show men in long tunics and richly folded togas, so one cannot follow the fashion of making togas shorter and







Fig. 26. Terracotta of a torso, site Nad klepečakom C-745



Fig. 28. Fibula, site Pirivoj C-560



Fig. 29. Fibula, site Kod koraba C-208



Fig. 31. Pincette, site Više grobalja C-1199

then abandoning this fashion completely. One of the reasons could be that there are only officials depicted in marble sculptures. The other, more plausible reason, is that only lately the area of the city was excavated and new finds of sculptures can be expected, offering new details. Changes in male fashon in Viminacium can be traced down on terracottas, but here again one comes accross cloaks, which were part of the military uniform and did not belog to everyday clothing. (Fig. 26.)

Clothes were fastened with different pins - fibulas, (Fig. 27-30), which are chronologically very sensitive. In excavated areas, they are found in a great number, divided into 36 types (Redžić 2007: 81-86). The three most numerous types include: 1. Fibulas with hinges similar to Aucissa fibulas, 2. strongly profiled fibulas of Ponto-Danubian type and 3. knee-shaped fibulas with hinges. They were usually made of bronze, rarely covered with gold, but some examples were also made of silver.<sup>15</sup> Some fibulas are considered to belong to female fashion exclusively, contrary to some other types, exclusively brought in connection with the military. Riots, which took place in the Balkan provincies during the middle of 3rd century, brought poverty, decerease of imported raw materials and goods and finally led to abandoning certain types of fibulas.

After doing their hairs and dressing up, Viminacium women put their make up. Some of the images are shown on several frescos. On an already mentioned fresco from the tomb G-2624 a young woman, with outlined eye-brows and lashes is depicted (Korać 2007: 105). Viminacium's women and girls used all of the cosmetics also available today, only back at that time they were all of natural origin. White tan was acomplished by putting up chalk or lead powder. There was also a dip made of calves' hoofs, which was cooked on fire for forty days. Teeth were expected to look like two rows of pearls, which was

<sup>15</sup> An especially interesting example was made of bone and carved in the shape of a pigeon.



Fig. 31. Pincette, site Pirivoj C-375



Fig. 31. Pincette, site Amfiteatar C-1054

achieved with rubbing with triturated cornelian cherries. A more unusual and horrifying variant was a triturated bone of ram's tail or powder made of deer's horn. White faces with red cheeks and black eye-brows and lashes were appreciated. Eye-brows were done with tweezers,<sup>16</sup> (Fig. 31.) and then covered with black powder gained from soot and antimony powder. A "pen" was used for drawing lines around the eyes. Even then, men noticed that women did not sleep with their faces, which they have deposited in hudreds of jars. Such jars are often found at Viminacium. (Fig. 32-34.) The reason for this is that until now, mostly the cemeteries were excavated. Since it was common to give personal belongings as grave-goods, many of the jars became grave-goods after their owner passed away. Cremes and perfumes were kept in vessels made of stone or lead, in order to stay fresh as long as possible. Such vessels were of long shape with a narrow openning and they were very expensive, because they were mostly imported.17 They were often replaced with cheaper vessels, made of clay or glass. They came in different shapes. Refreshment face masks, whitener and make up bases were kept in pyxides, mostly made of bone, (Fig. 35.) but also of many other materials. They consisted of three parts: a cylindrical body, bottom and lid. They were either simple or richly decorated with relief ornaments showing plants or figures. In long, narrow cylindrical vessels made of amber or glass found at site Pirivoj (C-383), blackener for the eyes was kept. It was put on eye-lashes with a thin stick made of wood or bone. In order to get all these cremes and powders out of the jars and boxes, spoons were needed, made out of different materials. Stone palettes were used for mixing (site Nad Klepečkom, C-74) and if something needed to be

<sup>16</sup> Found also on sites Livade kod ćuprije, C-10; Velika kapija, C -187; Pećine, C- 435, 503; Više grobalja, C-400, 1303, 1314, 2503; Pirivoj, C-375; Amfiteatar, C-1054.

<sup>17</sup> Sites Više grobalja, C-1470, 2048, 3138; Pećine, C-664, 1579, 1801, 2241, 2261, 2355, 2440; Nad Klepečkom C-70, 121, 299.



Fig. 32. Glass, site Pirivoj C-409 Fig. 33. Glass, site Pirivoj C-245



Fig. 34. Glass, site Pirivoj C-260

crashed, a marble mortar with a pestle (mortarium and pistillum) was used. A woman kept all of her make-up in a square wooden box (arcula) with a lid, which was either separated or connected to the box with hinges. During the excavations, hinges and applications, handles and locks are the most commonly discovered parts, while one can only guess what was kept inside of the boxes (site Nad Klepečkom, C-73, 124, 203, 299). (Fig. 36–38)

In order to see how they looked like, Romans used different mirrors (speculum). The technique of making mirrors was overtaken from



Fig. 35. Bone pixyda, Viminacium (Спасић-Ђурић 2002).

Greeks and Etrurians. There were hand-mirrors, or those hanging on walls and standing, mirrors with lids or mirrors on boxes. They were also of different sizes, from miniature to man-size. They were made of bronze with a high percentage of tin, zinc and lead. Discs were made on a turning lathe - whetstone, and then smoothened by polishing. In order to get a reflecting surface, mirrors were painted with a layer of amalgam (mixture of mercury and gold). Apart from simple, undecorated examples, there are those decorated with relief. Reliefs were done by punching bronze sheet on a matrix, and then they were covered with gold or silver. Such metal sheets were glued to the back of a bronze disc with a special white paste. One of the first mirror-makers was a Greek sculptor and toreut Passiteles (1st century A.D.), who stamped his mirrors (Plinius 45: 9). The most famous centre in which bronze mirrors were made was in Brindisi in the South of Italy. Simple examples made of silver and bronze were sometimes only decorated with encarved concentric circles, punctuated along the edges (site Viminacium, Nad Klepečkom, C-528, Fig. 39.). The most luxurious



Fig. 36. Remains of a trunk, site Nad klepečkom C-203



Fig. 37. Remains of a trunk, site Nad klepečkom C-73

mirrors from Viminacium were made of bronze with golden reliefs at the back side. They were found in graves at the site Pećine and Više grobalja (C-1769/R, G1-119, Fig. 40; C-6329, Fig. 41). Reliefs at the back side of the mirrors show mythological scenes like: Dionysus and Ariadne, Venus Victrix with three Graces or Proserpine. These examples belong to the time between the end of 2<sup>nd</sup> to the middle of 3rd century (Спасић-Ђурић 2001: 159-178). Apart from metal mirrors, there were also mirrors made of glass. They were first mentioned by an ancient author Alexander from Aphrodysios (3<sup>rd</sup> century A.D.). The first mirror made of glass was discovered in Salzburg, dated according to Hadrain's coins. The Romans also used small convex glass mirrors. A plate of blown glass was glued (with a kind of resin) to a plate of tin, silver or gold, in order to get a reflecting surface. There was another, simplier method, which included a



Fig. 38. Remains of a trunk, site Nad klepečkom C-123

bottle's side made of blown glass, out of which a circular or polygonal part was cut and a layer of melted lead was poured inside the concave part (Veličković 1959: 69-70; Спасић 1995-996: 40). In time, glass mirrors prevailed, because they offered a better reflection. Only since imperial times did the Romans use small lead mirrors (DAGR 1918: IV, 1429). Glass mirrors (with diameters from 1 to 3,5 cm) with lead frames (Спасић 1995-1996; Milovanović 2008: 45) represent numerous finds on Viminacium (sites Nad Klepečkom, C-17,

Fig. 42; Amfiteatar, C-1626, Fig. 43.). They are mostly round, with a handle, and rarely square. This type of mirrors, with rich geometric, floral or zoomorphic relief decoration on the frame, is of cultic purpose. Frames were casted, in single or double moulds. They are dated the period from the second half of 2<sup>nd</sup> to the middle of 4<sup>th</sup> century. They are mostly found accidentall, and only a small number was discovered in graves. Mirrors as grave goods can be brought in connection with the cult of Venus Funeraria. Venus was the only



Fig. 39. The bronze mirror.

Fig. 43. The mirror with lead frame.

goddess who knew Persephone's way out of Hades and she was able to make a symbolic return from the Underworld into a new life (Јовановић 2000: 18). It is considered that, apart from their practical purpose, miniature mirrors also possessed a symbolic value, given ex-voto to Venus, Dionysus, Nymphs (temple at Sucidava), Hera and Dea Syria (Tudor 1959: 415-432).

At the beginning of the imperial period, Roman women appreciated jewelry more if it was heavy and massive. This was achieved by inlaying precious stones, pearls and glass



Fig. 42. The mirror with lead frame

paste or often by combinig them. It was important to be showy. Such a style was popular in the middle of 2nd century and especially in 3rd century, when it was also known as "the polychrome style" (uniones) (Поповић 1996: 14, 57). Apart from metal, jewelry was also made of precious stones, bone, glass paste or jet (natural resin).

One of the favourite kinds of jewelry were necklaces made of double or multiple twisted chains, like fox-tails. They appear throughout the whole Antiquity, often worn with pendants (crescents, coin-pendants



Fig. 40. The bronze mirror with golden reliefs of Dionis at the back side.



Fig. 41. The bronze mirror with golden reliefs of Proserpine at the back side.

or bulls). Combined articulated chains made of parts in the shape of an "8" and connected with loop-shaped wires and pearls were named hormoi, because they were made out of pearls of different materials and colours (glass paste, pearls, precious stones, golden tin, bone). Some examples have heart-shaped pendants with a pearl in the middle (site Pirivoj, C-349, G-134, Fig. 44). Luxurious and heavy necklaces made out of paste pearls, jet or gold, with massive and heavy pendants medallions, gemmes or cameos, were produced from the second decade of 3rd century and they are typical for late Antiquity (Поповић 1996: 37-38, type IV). The Viminacium examples chronologically correspond to this period (site Pirivoj, C-846, Fig. 45). Pendants were mostly worn on necklaces, but sometimes also on bracelets. They were mostly made of metal combined with precious stones, although there are some examples made of bone and glass paste.

A typically Etrurian pendant, also worn by the Romans, was a bull, actually two metal calottes put together, carried on a ribbon. In time, bulls became symbols of Romans born as free cit-

izens. During the early imperial period, they were worn by children and young girls. In Viminacium, they were found in graves of newborns, one-yearolds and of a fifteen-year-old girl (Pirivoj, C-295, Fig. 47). Under hellenistic influences, crescentshaped pendants reach their peak during Roman times. Metal crescents with a hooks were worn as amulettes and were often given as birthday gifts. From the first half of 1<sup>st</sup> to 4<sup>th</sup> century, they were worn on chains and torqueses. Examples from Viminacium are numerous (sites Više grobalja; C-4112, G-596, Fig. 48). In the middle of 2nd century, pendant – medallions with gemmes and cameos were worn, also dominant during 3rd century. They were worn on chains and necklaces, but they could also build parts of earrings. Female profiles with precisely depicted hair-styles or Medusa's head were common images depicted on cameos (site Pirivoj, C-846, Fig. 46). A great number of examples found at Viminacium indicates that there was a workshop in which gemmes and cameos were produced (Поповић 1989: 11).

Apart from necklaces, earrings (inuares) were also worn by Roman women. After hellenis-



Fig. 44. The necklace with a heart-shaped pendants with a pearl in the middle.



Fig. 45.The necklace made out of paste pearls with massive pendant-medallion with cameo.



Fig. 46. The pendant – medallions with cameo.

tic traditions, the Romans developed this type of jewelry into a new style, developing in such a way a greater typological variety. Viminacium earrings can be divided into thirteen types, with numerous variants and sub-variants (Milovanović 2003: 131-143). The basic division is achieved according to the principle of closing and so there are earrings made as simple rings (with opened or closed endings) and those with an "S"-shaped hook for fixing. Pendants can be added to both of the types (Milovanović 2007: 11). Luxurious Viminacium examples were made of gold with precious stones in gouging, perforating and bending techniques (sites Pirivoj, C-913, Fig. 49, C-843, G-290, Fig. 50, C-487, Fig. 51). Such examples are dated into  $2^{nd}$  and  $3^{rd}$  century, while the ring-shaped earrings were less luxurious and they were worn until the end of Antiquity (sites Pirivoj, C-164, Fig. 52).

Armrings (armillae) were usually worn around wrists or, in some cases, around upper arms or ankles. Apart from their decorative function, in the military they also played a role of military insignia, together with torques and phalerae. Massive armrings were given to soldiers as dona militaria (Petrović 1991: 67). They were made out of metal, glas paste, jet and bone. They are divided into two main groups: armrings with closed and with opened endings. The earliest examples known from this region were made of silver and bronze, with overlapping and twisted endings. Chronologically, they belong to the second half of 1<sup>st</sup> century (Viminacium site Pećine, C-342, Fig. 53). One of the examples from Viminacium has a bull as pendant (site Pećine, C-2337, G1-173). Armrings closed with a hook and a loop were variously decorated. They were made out of smooth or twisted wire (site Pirivoj, C-314, Fig. 54) and dated into 3<sup>rd</sup> and 4<sup>th</sup> century. The most numerous are the armrings with opened endings, which were decorated with carvings, broadened or narrowed (site Pirivoj, C-343, G-135, Fig. 55) or ending in the shape of snake-heads. Examples with snake's head on one and tail on the other ending are some-



Fig. 47. The bronze bull.

what older (they date from 2<sup>nd</sup> to the first half of 4<sup>th</sup> century), while only later, the type with snake's heads on both endings prevail. It is actually a Greek-hellenistic form, which was broady accepted by the Romans (Поповић 1996: 50-51). Finds of this kind are rather numerous in Viminacium (site Pirivoj, C-683, Fig. 56). Apart from smooth bracelets, there were also massive examples made out of twisted wire (sites Pirivoj, C-685, Fig. 57). Two bracelets with lion's heads on endings were also discovered at Viminacium. One was made out of twisted bronze wire with lion's heads formed afterwards (site Pećine, C-2168, G-633), while the other was made of thick bronze wire around which a thinner bronze wire was twisted (site Pećine, C-2168, G- 633). They are dated at the end of 3<sup>rd</sup> and the beginning of 4<sup>th</sup> century (Радуловић 2006: 361-362, Type VI, Fig. 2e, ж).

Rings consisting of pearls are typical examples of polychrome style, worn as necklaces and earrings in  $2^{nd}$  and  $3^{rd}$  century. Pearls were made of glass paste or jet, smooth or carved. They are usually found fragmented and pearls are scattered around the hands of the deceased, indicating that they once were armrings. Armrings made of bone belong to rare finds. Several fragmented or



Fig. 48. The bronze crescents with a hooks.

whole examples were found at Viminacium. They are usually smooth or decorated with horzontal canelures. Bone armrings with overlapping endings and closed with bronze buttons belong to common finds (Pirivoj C-433, Fig. 58). Closed armrings can be ring-shaped, made of thick or thin wire. Simple examples were not decorated, while most of them have carved or perforated decoration (sites Pirivoj, C-754, Fig. 59). Chronologically, they mostly belong to 4<sup>th</sup> cenutry.

First fingerrings were used as stamps. In Greek, Hellenistic and Roman times, fingerrings became a part of fashion and were produced in different shapes. The Romans accepted the tradition of wearing fingerrings from the Etrurians (Поповић 1992: 9). During the time of the Republic, iron fingerrings were worn, while golden examples represented dignity and were worn only by the wealthy and their heirs. In time, wearing golden fingerrings was also allowed for the first eight centurions. At the beginning of the Empire, golden fingerrings were still a feature of patritii only, but with an imperial permission, such a privilege was sometimes also given to some of the lower ranking persons. Only did Hadrian allow the usage of golden finderrings to broader masses, with the exception of slaves. Septimius Severus allowed his soldiers to wear golden fingerrings (Поповић 1992: 7).

In 1<sup>st</sup> century B.C., some of the Romans posessed collections of fingerrings and precious stones (gemmes and cameos). The first collection of this kind was established by Sulla's son-in-law, Marcus Aemilius Scarus. Later on, Pompeius and Iulius Caesar also established such collections. The first Roman emperos, Octavian Augustus, first wore a fingerring with a gemme with an engraved sphinx and later on a gemme with the image of Alexander the Great. Massive and heavy fingerrings were appreciated very much (Поповић 1992: 7).<sup>18</sup>

Shapes of fingerrings depended on their purpose. If they were meant for stamping, they had to be massive, in order to endure the pressure, but if it was just a decorative ring, it was finer and less heavy. Fingerrings of the same shape were made of different kinds of metal (gold, silver, bronze and iron) and decorated with encarving different motives or inlaying paste or precious stones (Поповић 1992: 9). Fingerrings often bore heads with inlayed gemmes or, less commonly, cameos, such examples were found at Viminacium (sites Pirivoj, C-751, G -212, Fig. 60). Simplier examples had inlayed glass apste instead of precious stones (site Pirivoj, C-848, Fig. 61). None of the forms were exclusively made of one kind of metal. Apart from stamp-fingerrings, there were also engagement rings (anulus pronubus), which did not differ much from other kinds of rings (site Više grobalja, C-2945, G1-345, Fig. 62). Examples of fingerrings made of glass paste are known, imitating metal fingerrings (site Pećine, C-201, Fig. 63), but there are also examples made of precious stones, amber and bone. Here ends the journey through the fashion of Viminacium, with hope that future excavations will offer even prettier finds. Such finds will show that this city was not just the place of many workshops, but also a city whose inhabitants had sense for fashion and beauty.



Fig. 49. The gold earrings with a "S"-shaped hook for fixing.



Fig. 50. The gold earrings with a "S"-shaped hook for fixing.



Fig. 51. The gold earring with a "S"-shaped hook for fixing

<sup>18</sup> Speaking about certain Zoil, Martial mentions that he wore such massive rings, as if they were meant to be worn on toes.



Fig. 52. The gold earrings with a ring-shaped hook for fixing.



Fig. 53. The bronze armring with overlapping and twisted endings.



Fig. 55. The bronze armring with opened endings.



Fig. 56. The armring with ending in the shape of snake-heads.



Fig. 54. The bronze armring closed with a hook and a loop.



Fig. 57. The bronze armring of twisted wire.



Fig. 58. The bone armring.



Fig. 59. The closed armring with carved decoration.



Fig. 60. The silver fingerring with gemme.



Fig. 61. The gold fingerring with rubin.



Fig. 62. The gold stamp-fingerring.



Fig. 63. The glass fingerring.

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# REZIME RAZVOJ I PROMENE U RIMSKOJ MODI – PRIMER VIMINACIJUMA

KLJUČNE REČI: VIMINACIUM, NOVAC, IGLE ZA KOSU, SCULPTURE, FIBULE, OGRLICE, NAUŠNICE, NA-RUKVICE, PRSTENJE.

Rad je pokušaj da se uz pomoć viminacijumskog materijala napravi pregled razvoja i promena u stilu frizura i odevanju, kao i da se utvrde uticaji koje je prestonica Carstva ostavila na glavni grad provincije Gornje Mezije.

Najbrojniji materijal koji nam pruža informacije o tim promenama su srebrni i bronzani novčići. Najbolje informacije dobijaju se preko aversnih predstava rimskih carica jer se po formi njihovih frizura mogu pratiti promene u modnim trendovima. O velikoj brioju frizura govori i činjenica o preko 1700 koštanih igala i 43 češlja, otkrivena prilikom arheoloških iskopavanja.

Na srebrnom novcu iz perioda rimske Republike nađenom na Viminacijumu muškarci su predstavljeni sa dugom kosom, kasnija moda diktirala je kratku. Mlade devojke nosile su kosu glatko začešljanu do vrata i povezanu trakama i ukosnicama, upletenu ili vezanu u punđu. Udate rimske žene imale su podignutu kosu. Na trolisnoj elipsoidnoj kameji pronađenoj na Viminacijumu predstavljena je žena koja je po profilu i načini češljanja opredeljena kao predstava Agripine Starije. Početkom Carstva frizure su jednostavne, kosa je srednje dužine, razdeljak je na sredini i kosa pada simetrično oko lica sa ponekim uvojkom, a završava se punđom ili pletenicama.

Osim jednostavne upletene kose, veoma su česte frizure ukrašene dijademama ili velom. Faustina Senior je na kovanicama prikazivana kao sredovečna žena. Brojni novčići sa njenim portretom prikazuju je visoko začešljane kose, ukrašene biserima vezanim u venac, a ponekad je glava pokrivena velom. Julija Domna uvela je tokom prve polovine III veka nove modne trendove

u načinu friziranja i nove običaje u carskom dvoru. Duga gusta kosa je razdeljena po sredini i slobodno padala na ramena, da bi se tek onda savila pozadi. Od kraja II i tokom III veka bilo je otmeno da se lice uokviri blago zatalasanom kosom koja je zatim skupljena u punđu na potiljku ili pletenicu koja se u obliku dijademe obavija oko glave. U taj period datovan je portret mlade žene, otkriven na prostoru Viminacijuma, sa karakterističnom frizurom kod koje je kosa oblikovana poput kriški dinje i po čemu je nazvana Melonen tip frizure. Na jednoj od istraživanih lokacija, na Pirivoju, nađen je i srebrni antoninijanus sa portretom Otacile. Uobičajeno je prikazivana kao mlađa ili kao zrela žena sa kosom tradicionalno raspoređenom u horizontalnim pletenicama koje dopiru do vrata pa se skupljaju i podižu na teme. Salonina, šezdesetih godina III veka, praktikuje istu frizuru sa celom kosom upletenom u sitne pletenice koje se potom podižu na teme dok je niska dijadema na glavi. Na ovakvo predstavljanje frizura na viminacijumskom novcu nailazimo sve do carice Galerije Valerije, koja je na novcu prikazivana kao mlada žena sa ravnom začešljanom kosom i malom dijademom koja krasi glavu. Iz tog perioda su i srebrni novčić sa predstavom Konstantinove prve žene Helene i jedna fresko oslikana grobnica na Viminacijumu u kojoj je otkriven portret mlade žene izduženog lica, krupnih očiju i dugog vrata. Kestenjasta kosa koja pada do brade savijena je i zabačena unazad, a preko nje je postavljena mrežica.

Najjednostavniji oblik muške frizure dobio je naziv po caru Titu. Kosa je češljana od jedne centralne tačke na temenu prema čelu, ušima i vratu. Postojale su i maštovitije frizure koje su činili redovi uvojaka raspoređenih na razne načine da uokviruju lice. Otkriveno je nekoliko skulptura koje se po stilskim karakteristikama datuju u sredinu III veka, a sam rad se pripisuje nekoj boljoj provincijskoj radionici.

O modi na Viminacijumu svedoči i otkriće jednog olovnog sarkofaga u kojem su nađeni

skeletni ostaci ženske osobe koja je na sebi imala lanenu košulju, a preko nje haljinu ili ogrtač od ljubičastog brokata, protkanog zlatnim nitima. Na nogama su bile čarape pletene od belog pamučnog konca i obuća izrađena od mrke kože. Na jednoj od otkrivenih fresaka na kojoj je mladić koji prinosi tacnu sa darovima, vidi se kako su bili obučeni mladići, a posebno lepo su predstavljene čizmice. Jedna od otkrivenih nadgrobnih stela u svom gornjem segmentu sadrži reljef koji prikazuje bračni par kome je stela i posvećena. U edikuli sa portretima na levoj strani predstavljena je žena odevena u haljinu i obmotana ogrtačem, a na desnoj je muškarac u tunici sa togom koja pada u bogatim naborima. Ženina kosa je podeljena po sredini temena i spuštena preko ušiju, a potom zavijena nisko na potiljku. Nakit na njenoj levoj ruci i ogrlica oko vrata uz ostale detalje sa stele, datuju je u vreme cara Antonija Pija.

Otkriveno je i više skulptura i nadgrobnih stela koje nam prikazuju muškarce u togama i tunikama. Među najlepšim spada i figurina od kvarcita otkrivena na prostoru amfiteatra kojoj nedostaje glava, ali se po naborima odeće vidi da je predstavljena muška osoba u tunici i dugačkoj smotanoj togi. Odeća se pridržavala različitim fibulama. One su hronološki osetljive i na svim istraživanim lokacijama nalazimo ih u velikom broju, a razvrstane su u 36 tipova, dok su tri tipa najbrojnija: 1. Fibule sa šarnirom slične Aucissa fibulama, 2. Izrazito profilisane fibule crnomorsko - podunavskog tipa i 3. Kolenaste fibule sa šarnirom.

Da su se stanovnice Viminacijuma šminkale pretpostavljamo po otkrivenoj fresci iz grobnice gde je mlada ženska osoba prikazana našminkana i to sa naglašenim rumenilom na obrazima i iscrtanim obrvama i trepavicama. Potvrdu za to nalazimo i u brojnim arheološkim nalazima koji se opredeljuju kao kozmetički pribor.

Za ogledanje na raspolaganju su imali i različita ogledala. Koristili su ručna, zidna, stona, kao i ogledala sa poklopcem ili ogledala na toaletnim kovčezima. Najluksuzinija ogledala pronađena su u južnim viminacijumskim nekropolama i na njima su reljefne predstave sa mitološkim scenama.U velikom broju javljaju se i staklena ogledala sa olovnim okvirom.

Nakit se osim metala, izrađivao od dragog kamenja, kosti, staklene paste i gagata. Omiljena forma nakita kod Rimljana su ogrlice od dvostruko ili višestruko upletenih lanaca omčastog tipa. Privesci su obično krasili ogrlice, ali ima slučajeva gde su otkriveni na narukvicama. Uglavnom su izrađivani od metala u kombinaciji sa dragim kamenjem, mada nailazimo i na primerke od kosti i staklene paste. Veliki broj primeraka privezaka medaljona nađenih na Viminacijumu omogućava nam da ovde lociramo radionicu za produkciju kameja i gema.

Pored ogrlica, naušnice predstavljaju omiljeni tip nakita kod Rimljanki. Naušnice sa Viminacijuma mogu se razvrstati u XIII tipova sa brojnim varijantama i podvarijantama. Osnovna podela naušinica zasniva se na principu zakopčavanja, tako da se razlikuju naušnice tipa karičice (otvorenih ili zatvorenih krajeva) i one sa tzv. "S" kukicom za fiksiranje.

Osim estetske uloge, narukvice su imale posebnu ulogu u vojsci jer su pored torkvesa i falera imale funkciju vojničkih insignija. Izrađivane su od metala, staklene paste, gagata i kosti. Podeljene su u dve osnovne grupe: narukvice zatvorenih i otvorenih krajeva. Najranije narukvice na našim prostorima su od srebra i bronze prevučenih i spiralno namotanih krajeva. Narukvice koje se zatvaraju kukicom i petljom različito su ukrašene. Izrađene su od glatke ili upletene žice, a datovane su u III i IV vek. Najbrojnije i najraznovrsnije su narukvice otvorenog tipa čiji su krajevi ukrašeni urezima, prošireni ili suženi ili se završavaju zmijskim glavama.

U doba Republike nošeno je gvozdeno prstenje, dok je zlatno bilo odlika dostojanstva. Forma prstena je zavisila od njegove namene. Prstenje istog oblika izrađivano je uglavnom od različite vrste metala i ukrašavano urezivanjem različitih motiva ili umetanjem paste ili dragog kamenja. Često je prsten imao glavu sa ufasovanom gemom ili ređe kamejom. Navedene primerke možemo ispratiti prikazom pojedinih tipova sa Viminacijuma. Jeftiniji primerci umesto dragog kamena imali su ufasovanu staklenu pastu. Osim pečatnog, postojalo je vereničko prstenje koje se nije bitno razlikovalo od ostalog prstenja.

Očekujemo da će buduća iskopavanja pružiti još lepše nalaze koji će Viminacijum potvrditi ne samo kao radioničarski centar više zanata, nego i kao grad u kom su stanovnici negovali i imali smisao za lepo.
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# PROVINCIA CAPTA AND PROVINCIA FIDA ET PACATA AS REVERSE MOTIVES ON ROMAN IMPERIAL COINS FROM THE TIME OF PRINCIPATE

## ABSTRACT

One group of reverse images showing relationships of Romans with occupied tribes included into the state provincial system shows pictures of defeated tribes. Two groups can be sorted out: the first one (capta) shows Roman victories and conquering of new territories; the second one (fida et pacata) is a group showing personifications of pacified and more or less Romanized provinces. Pictures of province personifications illustrate a conception about the Roman world and inner state policy built by specific emperors. Using coins as a powerful mean of propaganda, emperors advertised their ideas, trying to modell a user's way of thinking in an adequate way.

KEY WORDS: PRINCIPATE, REVERSE IMAGES, PROVINCES.

Images on Roman imperial coins represented a powerful mean of propaganda among the contemporaries, whom the emperors wanted to show the highlights of their rule. A need for using coins as a mean of payment, the speed of their production, big amount and currency were advantages compared to other advertising means. On the other hand, a great variety of reverse types offered a possibility to influence practically every segment of the society. By analyzing the frequency of reverse types from the rulers of the late Republic and later emperors during the principate one can realize that the strongest mechanism of ideological influence, through advertising on coins, was directed towards the army, as the main support of power.

At the end of 2nd century, Roman expansion policy led to major changes in the organization of the state and army. On one hand, the Roman state became the greatest empire in the Mediterranean, spreading on three continents. At the same time, on the other hand, the social layer of farmers was destroyed, poverty grew, and the power was concentrated in the hands of the optimates, leading the existing system to a serious and long lasting crisis. During 1st century B.C, the authority of military

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leaders grew enormously due to their victories and division of land and money. Popularity of leaders was supported with his personal qualities but also with the fact that he was chosen and under protection of a deity. In the eyes of soldiers, all of this turned the person of a military commander into a charismatic leader. Soldiers were prepared to support such a leader not only during wars, but also his political ambitions in the inner policy. Since then, connections of soldiers with the civitas grew weaker, and at the same time, their dependence on leaders grew stronger. The connection between the traditional understanding of "soldier" and "citizen" was broken (Абрамзон 1995: 101). The idea of concentrated power in the hands of military leadres became popular among soldiers, offering a perspective of sigle rule among leaders. Still, even after the establishment of single rule, moral values were kept preserved for a long time, in the traditional understanding of res publica and libertas. Of course, they needed to be adapted accoridng to new social and political circumstances. The earlier archetype of an ideal Roman, a man, based on the mos maiorum, showing earned hegemony of the oligarchs and the web of law, duties and moral obligatories, binding citizent to the state - also needed to be adapted (Santosuosso 2004: 23).

Generally, reverse motives are an interesting historical source, offering a detailled studying of aspects of inner and foreign affairs. One group of reverse motives showing relationships of Romans with conquered nations included into the system of the state are personifications of provinces. In course of time, these motives go through different phases, from *capta* to *fidem*, from conquered and still unpacified to romanized and incorporated into the administrative, military and politic life of the Empire. According to that, we can separate two groups of reverse motives on coins: the first one (capta) illustrates Roman victories and conquering of new territories; the second (fida et pacata) group includes personifications of pacified and more or less romanized provinces.

#### **PROVINCIA CAPTA**

Motives of trophies and captives can be ascribed to this group, as well as motives of the emperor and the captives. They are mostly represented with stereotype iconographic shemes showing captured trophies and captives or the emperor himslef and representatives of captioned nations, who kneel humiliated infront of the powerfull conqueror. The motives mentioned appear on reverse sides of coins as a result of triumph reached due to the virtues of the emperor himself and to power and capability of the Roman army.<sup>1</sup> The captives represent personifications of conquered nations or rebelling provinces. Each of these personifications is determined with attributes in shapes of national clothes and weapons or animals and plants typical for this region.<sup>2</sup> Although there were attempts to canonize personifications of provinces, they mostly referred to specific time periods and were never completely traditionalized.

The first motives representing captured nations occured on Caesar's coins and later on the coins of Marcus Antonius at the end of the Republic. As a revesre motive of Caesar's denar from 48-47 B.C. there is an image of a trophy with a Gallic shield and a battle-trumphet (*carnyx*), on foot of which there is a long haired and bearded Gaul with hands tied behind his back (Fig. 1) (RRC I: 467, no. 452/4).<sup>3</sup> On the reverse side of Marcus Antonius denar there is an Armenian tiara, a symbol of Armenian kings, under which there

<sup>1</sup> Motives and legends on coins are connected to propagand idea and are complementary to one another. Legends are often there not to explain the motive, but to spread the idea depicted. This is how we find examples of Augustus' mintings on with Victoria is depicted connected with the legends ASIA RECEPTA (RIC I: 61, no. 276) and ARME-NIA CAPTA (RIC I: 83, no. 514). As it is stated in the text body, the images from the group provincia capta are closely connected with other motives connected with victories won, which would not be the matter of discussion here. 2 For example: palm-trees are connected with Judaea, spear and a hexagonal shield with Germania, bowed sword with Dacia, bow, quiver and tiara for Armenia etc. 3 Illustration taken from Burns and Overbeck1987: 35,

cat. 65.

are bow and arrows in a quiver, tending to represent Armenians as a militant nation (Fig. 2) (RRC I: 537, no. 539/1; RRC II: 743).<sup>4</sup> It was minted after Anthony's "victory" in Armenia in 36 B.C., after which a gloriuos triumph was celebrated in Alexandria in 34 B.C. (CAH X: 76-80, 82).<sup>5</sup> On another example of Anthony's minting from 32 B. C. there are Armenian symbols. The legend is ANTONI ARMENIA DEVICTA and Marcus Antonius bust is depicted with an Armenian tiara behind it (RRC I: 539, no. 543/1; RRC II: 743).<sup>6</sup>

The Actium victory, which specified not only Augustus' career, but also destiny of the whole Roman state, takes a specific place in his minting and was shown on different motives on coins. Directly connected with this is also the conquering of Egypt and its turning into a Roman province. On coins, this event was depicted simbolically, with Egypt incorporated into the images of a crocodile and a hippo, with the legend AEGIPTO CAPTA (Fig. 3) (RIC I: 61, no. 275; 86, nos. 544-546).<sup>7</sup> In minting propaganda, most attention was given to Augustus' diplomatic success in solving problems with Armenia and Parthia, which, as we can see on coins, was depicted just like any other victory won with weapons.<sup>8</sup> In

18 B.C., Augustus mints coins with the legend CAESAR AVGVSTVS SIGN RECE, celebrating re-capturing of previously lost Roman standards. A bearded Parthian is depicted, dressed in traditional clothes, kneeling and humiliately giving away the military insignia (Fig. 4) (RIC I: 62, no. 287).9 In this series there is also a minting with the legend CAESAR DIVI F ARME CAPT and the image of an Armenian, dressed in a national costume with a tiara on his head, kneeling with his ams stretched in an obedient gesture, expressing the actual position of his country, which on the other hand confirms the Roman domination by crowning a vasal king in Armenia (Fig. 5) (RIC I: 62, no. 290).<sup>10</sup> On the same occasion, coins with a tiara, bow and a quiver motive were minted, traditional Armenian symbols, with the legend ARME-NIA CAPTA (RIC I: 83, no. 515) or ARMENIA RECEPTA (Fig. 6) (RIC I: 83, no. 517),11 along with an image of an Armenian standing frontally and wearing a cloak, a spear in his right hand and leaning his left on a bow, with the legend CAE-SAR DIVI F ARMEN CAPTA IMP VIIII (Fig. 7) (RIC I, p. 83, no. 519).<sup>12</sup>

<sup>4</sup> Illustration taken from RRC Pl. LXIV, 539/1.

<sup>5</sup> In the first campaign against Parthia in 36 B.C. Marcus Antonius chose the way over Armenian mountains, did not show much success and returned with great losses; the second campaign in 34 B.C. was limited to Armenia, where he did not even meet any resistance.

<sup>6</sup> Naturally, this was rather shocking for the Roman public, just as much as Cleopatra's image on the reverse side of this coin with a ship bow, along with an enigmatic legend CLEOPATRAE REFINAE REGVM FILIORVM REGVM. Grant even states that there were opinions that one was here dealing with propaganda of the opposite side, since Cleopatra was not depicted in a nice manner (Grant 1958: 46-47). About details on Armenian symbols depicted on mints of Marcus Antonius, Augustus and Marcus Aurelius cf. Matevosyan 2000: 27-32.

<sup>7</sup> Illustration taken from BMC I, Pl. 16.1.

<sup>8</sup> The dispute between Rome and Parthia dates from the time of Pompeius' actions in the East and it got worse after the interventions of Crassus and Marcus Antonius. But there was a permanent reason for mutual animosity and that was the Roman protectorate over Armenia. Augustus

at his time was in position to leave Armenia to Parthia and take all the necessary precaution to protect the borders. At the time, no vital interest of Rome was endangered, because Parthia indeed was no seriuos threat to Rome, not without a radical transformation of the state, which was unlikely. On the other hand, the abandoning of Armenia was a bad political move, because national dignity could not be easily broken. With smart diplomatic action in 20 B.C. Augustus succeeded in returning the earlier captured standards and survived captives. On this occassion, he was proclaimed an emperor for the ninth time and his diplomatic victory was celebrated as a victory won in the battle-field (CAH X: 255-256, 260-263; Sutherland 1987: 13-15).

<sup>9</sup> Illustartion taken from Burns and Overbeck1987: 36, cat. 68.

<sup>10</sup> Illustration taken from BMC I, Pl. 1.10.

<sup>11</sup> Illustration taken from BMC I, Pl. 16.17.

<sup>12</sup> Illustration taken from BMC I, Pl. 2.4; Spannagel (Spannagel 2000: 622-629) studied the chronology of these as well as the Augustus' emissions signis receptis by following the appearance of legends, their changing from recepta to capta, as well as their shortening from capta to cap, and finally the disappearance of the legend next to the Mars Ultor temple, on which there is only an insignia

In Augustus' mintings, we find a great number of different types with images of conquered nations, and so, next to the mintings dedicated to Parthia and Armenia, there are also other motives of defeated Germans. Celebrating victories of Tiberius and Drusus in Germany, in 12 B.C. Augustus minted coins with an image of a German kneeling and giving away a vexillum (Fig. 8) (RIC I: 74, no. 416).<sup>13</sup> The German is depictied with long hair and beard, in a cloak and wearing trousers. This picture has its prototype in a kneeling Parthian from 18 B.C.

One more motive should be added to this group, on which Augustus himself was depicted. The victory of Tiberius in 7 B.C. in Germania, won under Augustus' auspiciae, resulted, among other thing, in surrendering the captives (BMC I: cxvi), which was illustrated on aurei and denarii with a scene in which a barbarian, dressed in a cloak, gives a child to Augustus, sitting on a platform (Fig. 9) (RIC I: 55, nos. 200-201).<sup>14</sup> There is an opinion that this scene is ceremonial and stressing Augustus' mild rule, inspiring the barbarian to give him his child to protect. This would more correspond to Augustus' real policy towards the provinces and wishes after Tiberius' German triumph. The free will of the barbarian is depicted in his unforced gesture and upright position (Brilliant 1963: 76).

From the establishing of principate and the reign of Octavian Augustus, when civil wars, which lasted for decades, were over and the border of the Roman state was consolidated in wars with barbarians in the East and the West, there was a time of peace, without bigger military campaigns. This period lasted until the civil war in 68/69, along with which there were mutinies in some provinces. The biggest problem was the rebellion in Judaea, which lasted for four years and in which war operationswere conducted by Vespasianus and Titus. After great efforts, the Romans succeeded in conquering Jerusalem and finaly end the rebellion in the year 70. After that, the father and the son celebrated their triumph in Rome. This victory was much reflected in the mintings of Vespasianus and Titus, just as in pictures of defeated Jews in several similar composition schemes.

Along with the legend IVDAEA CAPTA, a palm-tree in the middle of the composition is depicted, a Jewish woman sitting on the ground and mourning, either left or right from the tree and a Jewish man standing with his hands tied behind his back, surrounded with captured weapons (Fig. 10-12) (RIC II: 68, nos. 424-426 (Vespasianus); RIC II: 86, no. 608 (Titus)).<sup>15</sup> Along with these there are also motives with the emperor. Vespasianus is depicted as Virtus – he is a victor holding a parasonium and a spear, stepping on a helm and standing next to a palm-tree under which there is a Jewish woman sitting and mourning, with the legend IVDAEA CAPTA (Fig. 13) (RIC II: 68, no. 427).<sup>16</sup> Titus was depicted in a similar way, as a victor in Judaea and the conqueror of Jerusalem, standing in a military siut, with his foot on a bow of a ship, infront of him a Jewish man and a woman with their arms stretched in a begging gesture. Behind the captives there is a palm-tree (Fig. 14) (RIC II: 89, no. 638).17

Within indepenent mintings of Titus and especially Domitianus, the tradition of showing defeated uprising provinicies continues. On Titus' mintings from 79, minted after Agricola's success in Britannia, there is a trophy infront of which there is a caprive kneeling, with his hands tied behind his back (Fig. 15) (RIC II: 116, nos. 1-2).<sup>18</sup> Later on, for several years, Domitianus minted coins celebrating his triumph over the Hattes in 83, which followed the examples of Vespasian's

inside the temple.

<sup>13</sup> Illustration taken from Burns and Overbeck1987: 36, kat. 69; The leginary eagle of the V legion was lost under the command of M. Lolius in 16 B.C, although there are no data that it was re-captured by the time of these mintings (CAH X: 360-363).

<sup>14</sup> Illustration taken from BMC I, Pl. 12.13.

<sup>15</sup> Illustrations taken from BMC II, Pl. 20.9, 20.7, 20.4.

<sup>16</sup> Illustration taken from BMC II, Pl. 20.10.

<sup>17</sup> Illustration taken from BMC II, Pl. 26.2.

<sup>18</sup> Illustration taken from BMC II, Pl. 8.2

Ivdaea capta types. A central spot in these compositions is taken by a trophy (instead of the former palm-tree), next to which there is a German woman mourning and a Geman man standing with his hands tied, both surrounded with captured weapons, along with a legend GERMANIA CAPTA (Fig. 16) (RIC II: 186, no. 252; 189, no. 278; 194, no. 312; 197, no. 341).<sup>19</sup> On the same occasion of Domitianus' triumph, he minted aurei and denars with a new reverse motive, on which there is a personification of Germania. A female figure, naked down to her waist, sits on a hexagonal shield mourning, and under the shield there is a broken spear (Fig. 17) (RIC II: 161-4, nos. 66a, 69, 77, 83, 90; 167, no. 111; 169, no. 127; 173, no. 164).<sup>20</sup> Along with these, there are two other iconographical types with the picture of the emperor himself, both on the same occassion. On the first, there is Domitianus shown wearing a military suit, holding a parasonium and a spear, with his right fot stepping onto the lying personification of the Rhine (Fig. 18) (RIC II: 187, no. 259; 190, no. 286; 194, no. 319; 197, no. 345; 199, no. 362),<sup>21</sup> while in the second case, he is shown as a dignifying, gracefull victor, who accepts the pleas of a defeated German, who kneels infront of him, offering him a shield (Fig. 19) (RIC II: 187, no. 258; 190, no. 285; 194, no. 318).<sup>22</sup> The motive of a kneeling captive has its prototype in Augustus' Parthian, although in this case the whole picture is dominated by a glorifying fugure of the emperor. The cennection of the heriozed source of victory with the conventional picture of a captive is an attempt to underline Domitianus as a figure. Even more, the psychological character is shown through the humble position of the German, who is focused watching the emperor, who, on the other hand, holds his right arm bent and placed over the chest, in his dignity, holds the right to

step aside from the direct involving in this historical event (Brilliant 1963: 97-98).

Trajan's military success can be followed on different reverse motives on coins, from the first and the second Dacian war to the campaign against the Parthians. The conquering of Dacia is still the greatest success during the reign of Trajan, won after two military campaigns. The coins with COS III within the legend are the only ones that can with certainty be connected to the first campaign, while those with COS V and COS VI point out to the second campaign or the war in the whole (RIC II: 238). According to that, among all of the pictures of captured Dacians, only one can be ascribed to the first campaign. A naked man is shown (Virtus Augusti ?) holding a trophy, under whom there is a naked Dacian lying, lifting his right hand in a begging gesture towards the main figure (Fig. 20) (RIC II: 249, no. 70).<sup>23</sup> Although there are opinions that determined the naked male figure as an image of Trajan (Strack 1931: 107, ref. 419),<sup>24</sup> we would rather agree with Mattingly's opinion, who considers that this figure can under no circumstances be Trajan depicted in his »heroic nakedness«, because the tradition of the early imperial art knows no such pictures of emperors. The closest analogy to this picture was an example of Galba, on which Virtus is also shown not as a warrior-goddess, but a naked warrior, i.e. the conception of manhood (BMC III: lxix; RIC I: 233, no. 12).

All the other pictures of captured Dacians on Trajan's mintings are dated widely from 103 to 111 and can be brought in connection with the second Dacian war or the conquering of Dacia in general. On aurei and denars, there is a figure of a Dacian, with a traditional conical cap, dressed in a long-sleeved tunic and trousers, sitting on an oval shield in a mourning gesture, and under the shield there is a sica (Fig. 21) (RIC II, 250, no. 89,

<sup>19</sup> Illustration taken from BMC II, Pl. 70.8.

<sup>20</sup> Illustration taken from BMC II, Pl. 62.11.

<sup>21</sup> Illustration taken from BMC II, Pl. 76.7.

<sup>22</sup> Illustration taken from BMC II, Pl. 73.1.

<sup>23</sup> Illustration taken from BMC III, Pl. 11.11.

<sup>24</sup> RIC II: 249 again identifies the naked figure with Trajan.

258, nos. 216-219).<sup>25</sup> This motive has Domitianus' Germania for its prototype. Along with this, there are also other pictures of captured Dacians, dressed like on the example mentioned, with the legend DAC CAP: a captive is sitting, hands tied behind his back, on a pile of weapons and military equipment (Fig. 22) (RIC II: 250, no. 96);<sup>26</sup> sitting mourning on a pile of weapons, leaning his head on his arm (Fig. 23) (RIC II, 251, nos. 97-98);<sup>27</sup> a captive standing, his hands tied on the front, around him there are shileds, sicae and a spear (Fig. 24) (RIC II, 251, no. 99);<sup>28</sup> a Dacian, naked down to his waist, wearing trousers, hands tied behind his back, kneeling on a pile of weapons (Fig. 25) (RIC II: 288, no. 620).<sup>29</sup> There are examples on which the legend DAC CAP was left out: a Dacian sittin mourning at the bottom of a trophy (RIC II, p. 251, nos. 220-221); sitting on a pile of weapons and military equipment, leaning his head on his hand, with a trophy infront of him (Fig. 26) (RIC II: 283, nos. 560-562);<sup>30</sup> a Dacian sitting on shileds and holding a trophy, infront of him there are hexagonal shields (RIC II, p. 284, no. 566).

In the official propaganda policy, Trajan declared himself as an *optimus princeps*, daring to use one of Jupiter's epithets, considering that he undoubtfully made contribution to bringing the state into the *optimus status rerum*.<sup>31</sup> Trajan, the powerful conqueror, who held the destiny of the world in his hands, showed good relationship with the senat on a picture on which he brings a kneeling Dacian and handed him over to one of

the senators (Fig. 27) (RIC II: 258, no. 215).<sup>32</sup> This represents an expression of Trajan's legalism in his relationship with the senat, according to the traditional right of making peace with foreign lands. Since the coins cannot precisely be dated, according to this, we can conclude that this scene is related to the end of the first Dacian war, since after the second war, Dacia no longer existed as a state. The next scene is surely connected to the end of the campaign and the final conquering of Dacia. Trajan is shown in his military suit, holding a spear, stepping with his foot on a Dacian, of whom only his head and his shoulders are visible (Fig. 28) (RIC II: 258, no. 210; 282, n. 547).<sup>33</sup>

The Parthian campaign from 115 to 117 found less expression in Trajan's mintings, but there are still aurei and denars with motives of captives and a legend PARTHIA CAPTA. Two captives are shown sitting at the bottom of a trophy, dressed in a kind of dress with long sleeves and trousers, leaning their heads on their hands and infront of each captive there is a bow and a quiver (Fig. 29) (RIC II, p. 267, nos. 324-325).34 After Dacia and Arabia, Trajan added two more provinces to the empire - Mesopothamia and Armenia. On the coins with the legend ARMENIA ET MESOPOTAMIA IN POTESTATEM P R RE-DACTAE Trajan is shown in supernatural size, as a heroic example of Virtus, with a spear and a parasonium, stepping onto two river-gods (Tigrus and Euphrates), and in the middle there is Armenia sitting and mourning (Fig. 30) (RIC II: 289, no. 642).<sup>35</sup> The emperor is shown in great dignity with a parasonium, the amblem of Virtus' authority, whose divine character he takes over.

During Hadrian's reign, there was an attempt to canonize pictures of provinces' personifications, but they belong to the group of *fida et pacata* provinces, which will be a matter of discussion in the next chapter. On some mintings of

<sup>25</sup> Illustration taken from BMC III, Pl. 11.20.

<sup>26</sup> Illustration taken from BMC III, Pl. 15.14.

<sup>27</sup> Illustration taken from BMC III, Pl. 15.15.

<sup>28</sup> Illustration taken from BMC III, Pl. 15.13.

<sup>29</sup> Illustration taken from BMC III, Pl. 35.9.

<sup>30</sup> Illustration taken from BMC III, Pl. 28.7.

<sup>31</sup> The legend on th coins S P Q R OPTIMO PRINCIPI is rather exceptional. After the first Dacian war, the senat brought a decision in which it expressed its respect, loyality and gratitude to Trajan for his virtues and success. On the coins it appears between 104 and 111. Dative shows that coins were not minted after emperor's orders, but in his honour and glory (BMC III: lxx).

<sup>32</sup> Illustration taken from BMC III, Pl. 13.14.

<sup>33</sup> Illustration taken from BMC III, Pl. 30.3.

<sup>34</sup> Illustration taken from BMC III, Pl. 20.6.

<sup>35</sup> Illustration taken from BMC III, Pl. 42.8.

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Antoninus Pius Britannia is shown as a »pacified« province. The personification is shown sitting on a rock, leaning her head sadly on her hand, next to her there is an oval shield and aquila or vexillum (?) (Fig. 31) (RIC III: 142, nos. 930, 934).<sup>36</sup> These coins were minted in 154/155, on the occassion of successfull defeat of barbarians and the end of errecting the second wall, to the north from Hadrian's wall, for a better protection of the border. On the coins, saddness is pointed out in the gesture of the personification, which can be connected to the atmosphere brought by the barbarians from the north, since Britannia is shown armed and protecting the border (the wall) of the province (CAH XI: 337; RIC III: 11-12). Since already in Hadrian's times, and during Antoninus Pius, Britannia was already defined and depicted as a provincia fida, the "pacified" Britannia now represents a "bordering" case between the *capta* and *fida* provinces.<sup>37</sup> In the same manner, the personification of Africa is shown on a medallion after the successfull defeat of the rebellion in Mauretania.<sup>38</sup> According to the motive shown, one can conclude that the problem was more complicated than the one in Britannia. The emperor is represented wearing a military suit with a spear, opposite of him lies Africa and in the middle of the picture there is Victoria, placing a shield on a trophy (Fig. 32) (Gnecchi II: 12, no. 25).<sup>39</sup> The personification of Africa on this medallion reminds iconographically on Hadrian's Africa from his series provincia fida.<sup>40</sup> One cannot

conclude that the figure of the personification is especially sad and if there were no representations of the emperor, Victoria and the trophy, one could presume that it represents a picture of a *provincia fida*.

During the common reign of Marcus Aurelius and Lucius Verus, one comes accross pictures of captives again. The superior command in expeditio orientalis was given to Lucius Verus, while Marcus Aurelius stayed in Rome (CAH XI: 346). For both emperors, the same types of reverse motives were minted, with the personification of Armenia who sits mourning. Infront of her there is a shield and a standard, ande behind her there is a trophy, with the legend ARMEN (Fig. 33) (RIC III: 219-220, nos. 78-85; 222, nos. 121-122 (Marcus Aurelius); RIC III, p. 322, nos. 1364-1369 (Lucius Verus)).<sup>41</sup> Apart from this scene, on the mintings of Lucius Verus there are also some other, similar pictures with the same legend. The differences include details surrounding the personification, who always sits mourning (RIC III: 254-255, nos. 498-509). On medallions, one comes across new motives. Lucius Verus is shown lifting a trophy, and next to his feet kneels the personification of Armenia in a begging gesture; the legend is AR-MENIA (Fig. 34) (Gnecchi II: 45, no. 5).<sup>42</sup> Next to Armenia there are also pictures of a captured Parthian who sits with his hands tied behind his back, next to his feet there are a bow, a quiver and other weapons (RIC III: 257, nos. 539-542, 258, nos. 547-548). There are also several variations of the personification who sits surrounded with weapons and the image of a trophy (Fig. 35) (RIC III: 326, nos. 1429-1435).43

<sup>36</sup> Illustration taken from BMC IV, Pl. 48.14.

<sup>37</sup> The personification is sitting mourning, but still partly armed and sitting on the wall – border towards the barbarians.

<sup>38</sup> From Antoninus Pius and during the time of his heirs, ending with Commodus, one comes accross a greater number of captives on medallions. From 144 to150, the Bellum Mauricum took place (Kienast 2010: 134); The seriousness of clashes that took place there is best represented with the fact that the Legio VI Ferrata was sent from Judaea to help, as well as the cavalry units from Spain, Germania and Pannonia (CAH XI: 336-337).

<sup>39</sup> Illustration taken from Gnechi II, Tav. 47.2

<sup>40</sup> Africa from the series provincia fida of Antoninus Pius is in an upright position.

<sup>41</sup> Illustration taken from BMC IV, Pl. 76.7A; Matevosyan (Matevosyan 2000: 27-32), while studying state symbols of Armenia on Roman coinage, on one of these examples (BMC IV, Pl. 58.3), next to the personification of Armenia, who sits mourning, he recognizes the picture of an eagle on a bow. In such a way, he finds sources for the modern appearance of the Armenian emblem.

<sup>42</sup> Illustration taken from Gnecchi II, Tav. 72.4.

<sup>43</sup> Illustration taken from BMC IV, Pl. 79.3. On coins of Marcus Aurelius there is a picture of three trophies, which

During the single reign of Marcus Aurelius, he minted numerous examples marking victories in Germania, with similar motives and with the legends GERMANIA SVBACTA, GERMANICO or DE GERM: The personification of Germania sits at the bottom of a trophy, surrounded with different weapons (RIC III: 234, nos. 277-280; 235, nos. 289-291; 294-295, nos. 1021-1027); she sits surrounded with weapons, without a trophy (RIC III: 297, nos. 1053-1056; 300, nos. 1094-1095); in the middle there is a trophy, to the left there is a German woman sitting on two shields, to the right there is a German with his hands tied behind his back (Fig. 36) (RIC III: 297-298, nos. 1058-1068; 306, nos. 1179-1182);<sup>44</sup> two captives sitting at the bottom of a trophy, with their hands tied (RIC III: 239, no. 339). The victory over the Sarmatians is especially pointed out and depicted with the same motives. Only the legend is different and it says DE SARM, appearing both on Marcus Aurelius' and Commodus' mintings, who was proclaimed augustus (Fig. 37) (RIC III: 239, no. 340; 240, nos. 341-342; 241, no. 364; 306-307, nos. 1185-1189 (Marcus Aurelius); RIC III: 339, n. 1571-1575 (Commodus).<sup>45</sup> On a sestertius from 171/172, Marcus Aurelius was depicted wearing a military suit, holding a spear and accepting a shield from a kneeling figure (?), most likely Germania. The legend is CLEMENTIA AVG and appears together with GERMANIA SVBACTA types, so that one can presume that one is dealing with the personification of Germania. With this legend, the emperor attempts to stress his mildness and mercy towards the defeated enemy (Fig. 38) (RIC III: 294, no. 1019).<sup>46</sup> Marcus Aurelius also marks his victories in Germany with pictures on medallions with the legend GERMANIA SVBACTA. The emperor is depicted wearing a

military suit, holding a spear and standing infront of a trophy. At its bottom, there are two captives sitting, while Victory on the other side places a shield onto the trophy (Fig. 39) (Gnecchi II: 27, no. 7).<sup>47</sup> During the single reign od Commodus, only once, on a medallion, a picture of captives appears, who loose their national characteristics, resembling small figures at the bottom of a trophy. On the other hand, Commodus is shown wearing a military suit, with a spear, placing a trophy (Fig. 40) (Gnecchi II: 68, no. 153).<sup>48</sup> Since there is no legend that would point out which one of the victories is depicted and since the medallion is dated into 183, we can presume that is shows a military intervention at the border with Dacia, which began the year before (CAH XI: 379).

Septimius Severus illustrated his victory in the civil war against Pescenius Niger with the motives already known: a trophy and a captive sitting at its bottom (Fig. 41) (RIC IV.1: 97, no. 55; 98, no. 63; 149, nos. 432-434; 185, no. 690)<sup>49</sup> or captives sitting on shields, with their hands tied (Fig. 42) (RIC IV.1: 98, no. 62),<sup>50</sup> along with the legend PART ARAB PART ADIAB.51 After the clash with Albinus in the west, in 197 Severus returned to the east in order to solve the Parthian problem, which he had to postpone. A brief and successfull military operation was preformed and Ktesiphones was taken already by the end of October of the same year (Kienast 2010: 156). The legends PART MAX or PART MAXIMVS are written on pictures of trophies and captives, which are iconographically identical to the previous ones (RIC IV.1: 110, no. 153; 114, no. 176; 115, no. 184; 158, nos. 494-495; 161, no. 512).<sup>52</sup>

should mark three victories won in the East: the Armenian, the Parthian and the Median one (RIC III: 288, no. 947). 44 Illustration taken from Burns and Overbeck1987: 54, cat. 120.

<sup>45</sup> Illustration taken from BMC IV, Pl. 88.6.

<sup>46</sup> Illustration taken from BMC IV, Pl. 82.8.

<sup>47</sup> Illustration taken from Gnecchi II, Tav. 59.9.

<sup>48</sup> Illustration taken from Gnecchi II, Tav. 88.6.

<sup>49</sup> Illustration taken from RIC IV.1, Pl. V.15.

<sup>50</sup> Illustration taken from BMC V, Pl. 8.14.

<sup>51</sup> The victory over Pescenius Niger was won at the beginning of 194, bringing to Septimius Severus in August 195 the titles parthicus arabicus and parthicus adiabenicus. In January 198, the parthicus maximus was added.

<sup>52</sup> The same motive appears on Caracalla's mintings under Severus (RIC IV.1: 220, no. 55; 222, nos. 63-65.

After the victory in Britannia in 210, Septimius Severus minted sestertii with a triumphal group, showing the emperor accompanied by his two sons and a soldier with the insigniae, while there is a tied captive sitting on the ground (Fig. 43) (RIC IV.1: 200, no. 799).53 The emperor, who is a victor, is placed between his heir-sons and the army, who won the victory, maybe just addressing the soldiers and recommending heirs to their loyalty. Comositionally similar to the previous one is also the scene on Geta's mints from the same year, on which there are only brothers depicted, accompanied by soldiers, with a captive sitting next to their feet (Fig. 44) (RIC IV.1: 335, no. 157; 337, no. 157).<sup>54</sup> It is noticeable that conceptive personifications of provinces, being previously summarized on pictures of captives with their national characteristics, slowly fade and now appear as parts of compositions with a different basic sense. Apart from victory, dynastic propaganda is also present, clearly recognizable on the picture of Caracalla on the coins from 198, when he was proclaimed an augstus. The young heir is depicted wearing a military suit with a spear, holding Victoria on the globe, while there is a captive sitting next to his feet, along with the legend IVVENTA IMPERII (Fig. 45) (RIC IV.1: 214, no. 20).55 The same picture is to be repeated by Caracalla in his independant minting after the war against the Parthians, with the legend VICT PARTHICA (RIC IV.1: 260, no. 315).

Up to the time of Galienus, one no longer cmes accross pictures of captives and trophies. During the reign of this emperor, they were used again on a big scale as propaganda on coins. On one hand, pictures of captives were summarized to an ordinary small figure sitting at the bottom of a trophy, with his hands tied and without any national characteristics, either as clothes or weapons and equipment. The only thing that points out to

the national belonging of the captives is the legend and the whole composition should indicate victory. Two standardized combinations of pictures and legends appear on Gallienus' mintings: a trophy and two captives sitting at its bottom and the legend GERMANICVS MAXIMVS (Fig. 46) (RIC V.1: 70, no. 18)<sup>56</sup> or Victoria (sometimes on the globe), who is stepping and holding a wreath, on both sides of her feet there is a captive, almost identical to the motive with the trophy and the legend VICT GERMANICA (Fig. 47) (RIC V.1: 72, no. 49).<sup>57</sup> The succeeding rulers, all the way to the end of the principate, minted similar motives with the same message. We shall show only some examples of motives with trophies and captives: Claudius Gothicus and Quintillus, with the legend VICTORIAE GOTHIC (Fig. 48) (RIC V.1: 223, no. 252; 247, no. 87);<sup>58</sup> Probus with the legend VICTORIA GERM (Fig. 49) (RIC V.2: 41, no. 222).<sup>59</sup> The only new thing in depicting captives during this period is Aurelian's minting after his conquering of Palmyra in 272. Along with the legend ORIENS AVG there is Sol depicted in the middle of the emposition with a globe in his hand, hile there are two captives, each one sitting either left or right of his feet (Fig. 50) (RIC V.1: 293, no. 252).60

<sup>53</sup> Illustration taken from BMC V, Pl. 57.8.

<sup>54</sup> Illustration taken from BMC V, Pl. 59.3.

<sup>55</sup> Illustration taken from BMC V, Pl. 29.13.

<sup>56</sup> Illustration taken from Burns and Overbeck 1987: 61, cat. 142. In Gallien's mintings, both pictures appear in a huge number and they will not be exceptionally named here.

<sup>57</sup> Illustration taken from Burns and Overbeck 1987: 61, cat. 143.

<sup>58</sup> Illustration taken from Burns and Overbeck 1987:63, cat. 150 (Claudius Gothicus).

<sup>59</sup> Illustration taken from Burns and Overbeck 1987: 64, cat. 155.

<sup>60</sup> Illustration taken from Burns and Overbeck 1987: 44, cat. 92. Sol appearing on coins from 3rd century is not the Roman Sol, but solar divinity from Emesa, to whom Elagabalus showed utmost respect as Sol Invictus. In 274, Aurelianus errected a huge temple to Sol Invictus, the divinity which was identified with the Roman Sol (deus Soli Invictus). He built this temple from the gain he won during the war against Zenobia and it was believed that he won it with the help from Sol (OCD: 999; Stevenson 1964: 753-755).

## **PROVINCIA FIDA ET PACATA**

The images of provinces went through phases from *capta* to *fidem*, which can also be recognized on coins. During the time of their conquering and durign the years when they were still rebelling, we see personifications of provinces through the images of captives, defeated oponents, sitting and mourning, tied and surrounded with captured weapons, begging for mercy. In time, newly founded provinces gradually become romanized and incorporated into the administrative, military and political life of the empire, they are depicted on coins like friends of Rome.

On Galba's mintings, for the first time, one comes accross images of provinces' personifications which are shown as friends of Rome and with their national characteristics. The real cause was showing gratitude to Gaul and Spain, which supported Galba during the civil war.<sup>61</sup> Next to the legend GALLIA HISPANIA there are personifications of these two provinces in a dextrarum iunctio gesture. Gallia stands to the left, depicted with a female figure in a short tunic, holding a scepter with a boar on top, while Spai stands to the right, illustrated with a male figure of a warior wiht a shiled, parasonium and a spear (Fig. 51) (RIC I: 233, nos. 15-18).<sup>62</sup> Special honour for Spain was given by Galba in the form of two pictures on coins, both with the same legend HISPANIA.63 On the first one, there is a pesonificized bust of Spain, with her hair tied from the forehead towards the neck, one curl falling down her neck, and behind the bust there are two spears, a round shield and below there are two ears of grain (Fig. 52) (RIC I: 232, nos. 1-3).<sup>64</sup> On the second one, the personification of the province is shown as a whole figure, standing, dressed in a tunic, holding

grain ears and poppy in her right hand and a round shield and two spears i her left (Fig. 53) (RIC I: 233, nos. 19-21).<sup>65</sup>

During the first few years of his reign, Trajan minted several denars and aurei with a picture of a female figure, the personification of Germania. She was shown sitting on two hexagonal shileds, between which there is a helm, naked down to her waist, with her hair tied in a long braid, holding a branch in her right hand (Fig. 54) (RIC II: 245, no. 5; 246, no. 15; 247, no. 35).<sup>66</sup> Although the legend does not say it precisely, according to the hair style and the shape of the shields, one is undoubtfully dealing with Germania. It represents the first image of a province that was fida et pacata, in the real sense of the word and in such a manner appeared on Roman coins. Trajan commanded the troops in Upper Germania before he was adopted by Nerva and it is therefore logic that in such a manner, at the beginning of his reign, he confirmed the existing relationships in Germania.

In 106, Arabia became a Roman province in a peaceful manner, and therefore it was defined on coins with the legend ARAB ADQVIS. It is represented as a female figure, holding a branch in her right hand, and in her left a bundle of cinnamon or calamus (?), next to her feet there is a camel (Fig. 55) (RIC II: 250, nos. 94-95; 261, nos. 244-245; 278, nos. 465-468; 287, nos. 610-615).<sup>67</sup> The personification is shown with the attributes of her country – cinnamon or calamus (?) and a camel, while she holds a branch in order to stress her character as *pacifera*.<sup>68</sup>

<sup>61</sup> In 68 there was a rebellion in Gaul and Spain against Nero, led by Vindex and Galba.

<sup>62</sup> Illustration taken from BMC I, Pl. 53.6.

<sup>63</sup> During the rebellion against Nero, Galba was the governor of Tarraconic Spain.

<sup>64</sup> Illustration taken from BMC I, Pl. 53.1.

<sup>65</sup> Illustration taken from BMC I, Pl. 53.8.

<sup>66</sup> Illustration taken from BMC III, Pl. 9.5.

<sup>67</sup> Illustration taken from BMC III, Pl. 33.4.

<sup>68</sup> From the very beginning of systematic cataloguing of Roma imperial coins in 19th century up to the present day, the authors did not succeed in certain determining of the object held by the personification of Arabia in her left hand. Naster (Naster 1983: 159-169) was dealt with this problem and named all of the opinions so far (Cohen, RIC, Strack, BMC, Mazzini, Robertson, Beloni, Kent, Carson, Toynbee, even considering ancient sources) about that. He accepts Toynbee's opinion, who thinks that it is a calamis odorata, i.e. calamus (a herb with aromatic leaves).

Up to 112, Dacia was shown as provncia capta on Trajan's coins, but in that year it became a provincia pacata. From that year onwards, it was marked on coins as DACIA AVGVST PRO-VINCIA and shown with a personification who is sitting on a rock, wearing a conical cap, holding a legionary eagle and next to her there are two children holding grapes and grain ears (Fig. 56) (RIC II: 288, nos. 621-623).<sup>69</sup> According to Trajan, Dacia was a pacified province ever since, but it still needs Roman weapons (aquila) to defend itself, and within such an attitude there is a room for it to make progress in peace. The image of Dacia as a pacata province appears on coins exactly at the moment when the East takes over the central position in Roman affairs, most likely representig a political move of Trajan, because it was far from being pacified. After all, it will be shown by its representation in Hadrian's series, on which it does not carry any signs of welfare, but a legionary eagle.

The first and the only attempt to canonize provinces' personifications appeared on several independent series of Hadrian's minting: the "province", ADVENTVS and RESTITVTOR types.<sup>70</sup> In the "provinces" series, eleven provinces, Italy and Alexandria were depicted. The provinces include Africa, Egypt, Asia, Britannia, Capadocia, Dacia, Germania, Spain, Judaea, Mauretania and Sicily. It remains partly unclear why exactly these provinces were chosen and not some others. This especially goes for Syria, where Hadrian had supreme military command at the time of Trajan's death and was chosen for an emperor exactly by these legions. Syria, or better Syrian army, apears only on the EXERCITVS series, on which more attention was given to it than to any other army in any of the provinces. Apart from that, it can be noticed that Alexandria was

again especially honoured with an independent picture, as well as in theadventus series. Looking for an answer to the first question, Strack concluded that some of the provinces were unimportant (Sardinia, Corsica, Epirus etc.), others were within the frames of some of the named provinces (Cyrenaica under Libya, Galatia under Cappadocia, Pamphylia and Lycia under Cilicia), while Pannonian provinces were reserved for L. Aelius (Strack 1933: 145). Mattingly considers that it is wiser to admit that we cannot be certain about the reasons for any of these examples, but he agrees that Pannonian provinces were reserved for Aelius (BMC III: clxxiv, clxxv). Hadrian's "provinces" do not completely correspond to the Roman admnistrative division and some of them include a group of provinces. They no longer represent a mixture of administrative regions and certain nations or broader regions. Pictures of provinces' personifications and nations are depicted in two conceptions: like *pacata* and like *vigil*. Mattingly makes his division in forms of pictures in which he also includes the one given by Strack, with certain compression, so according to him, we get the following picture: a) provinces' personifications shown as divinities and half-divinities (Strack's types 1, 2); b) province's personifications shown as war divinities (Strack's type 3) and c) these that are shown with their national attributes and costumes (Strack's types 4, 5). Since it is difficult to make such a division between the groups b) and c) since a personification depictedas a war divinity can carry a certain local attribute, Mattingly, at the end concludes, that it is better to divide them into "peaceful" and "militant" (BMC III: clxxvii; Strack 1933: 153).

Egypt is depicted with a lying personification, leaning her elbow on a basket with fruits, while infront of her there is an ibis on a low pillar (Fig. 57) (RIC II: 374, nos. 296-297; 445, nos. 838-839).<sup>71</sup> Africa also lies, with elephant-

<sup>69</sup> Illustration taken from BMC III, Pl. 37.10.

<sup>70</sup> Apart from these, there is also an EXERCITVS series, which names armies from ten provinces and praetorians. But here, we come across a classical adlocutio picture, and not with pictures of provinces' personifications.

<sup>71</sup> With the legend AEGYPTOS. Illustration taken from BMC III, Pl. 94.4.

skin headdress, holding a scorpio and a cornucopia, while infront of her there is a basket with grain ears (Fig. 58) (RIC II: 374, nos. 298-299; 446, nos. 840-842).<sup>72</sup> Asia stands, her right foot lies on a a bow of a ship, she holds a hook and a stern (Fig. 59) (RIC II: 374, no. 301).73 Britannia sits on rocks (most likely representing Hadrian's wall), leaning her head on her right arm and in her left, leaning on a big shield, she holds a spear (Fig. 60) (RIC II: 447, nos. 845-846).74 Capadocia stands, wearing a corona muralis on her head, dressed in a short tunic, wearing a fur cloak and hunting boots, holding a model of Mons Argaeus and a vexillum (Fig. 61) (RIC II: 447, nos. 847-848).75 Dacia sits on a rock, dressed in a tunic and a cloak, holding a legionary eagle and a sica (Fig. 62) (RIC II: 447, nos. 849-850).<sup>76</sup> Germania stands, dressed in a long tunic, holding a spear and leaning her other arm on a shield (Fig. 63) (RIC II: 347-375, nos. 302-304).77 Spain sits leaning on a rock and holding a branch, next to her there is a rabbit (Fig. 64) (RIC II: 375, nos. 305-306; 448, nos. 851-852).78 The personification of Judaea stands in a long tunic, bringing sacrifice from a patera to the altar next to which there is a bull, behind her there is a child standing and infront of her there are two children holding palm-branches opposite of Hadrian, who stands dressed in a toga with his right hand lifted (Fig. 65) (RIC II: 448, no. 853).79 The treatment of Judaea in this series is unique, because it includes emperor's image

within the composition. Instead of local attributes, the personification of Judaea is depicted as a new Roman, Hadrain's creation, bringing sacrifice infront of the emperor, while children represent a new generation, growing under the new regime. The personification which is shown followed by children would be an allusion for a new Judaea, with its growing population, supported by Hadrian in his new Jerusalem, the colony Aelia capitolina (BMC III: clxxix-clxxx).80 The images of Mauretania are twofold: first, dressed in a short tunic, walking and leading a horse on a string, her head turned back towards the horse and holding a spear in her other hand (Fig. 66) (RIC II: 448, nos. 854-856).<sup>81</sup> Apart from that, she is also shown standing infront of a horse and holding the reins, dressed in a short tunic, while in her other hand there are two spears (Fig. 67) (RIC II: 449, nos. 858-860).82 Sicily is depicted with Medusa's head and a triscys behind it (Fig. 68) (RIC II: 450, no. 871).83 The personification of Pannonia minted under L. Aelius should be added to Hadrian's examples named above. It is shown standing, wearing a corona muralis on her head, holding the creases of her dress with her left hand, while in her right she is holding a vexillum, indicating cavalry (Fig. 69) (RIC II: 481, nos. 1059-1060; 482, nos. 1071-1073).<sup>84</sup>

Apart from the provinces named above, in this series there are also personifications of Italy and Alexandria. Italy holds a scepter and a cornucopia (Fig. 70) (RIC II, p. 375, no. 307)<sup>85</sup> and, opposite to other provinces, does not represent a personification with local characteristics,

<sup>72</sup> With the legend AFRICA. Illustration taken from BMC III, Pl. 94.1.

<sup>73</sup> With the legend ASIA. Illustration taken from BMC III, Pl. 63.6.

<sup>74</sup> With the legend BRITANNIA. Illustration taken from BMC III, Pl. 94.2.

<sup>75</sup> With the legend CAPPADOCIA. Illustration taken from BMC III, Pl. 94.3.

<sup>76</sup> With the legend DACIA. Illustration taken from BMC III, Pl. 94.12.

<sup>77</sup> With the legend GERMANIA. Illustration taken from BMC III, Pl. 63.8.

<sup>78</sup> With the legend HISPANIA. Illustration taken from BMC III, Pl. 95.1.

<sup>79</sup> With the legend IVDAEA. Illustration taken from BMC III, Pl. 95.3.

<sup>80</sup> Judaea is the only province in which Hadrian had major problems during his reign.

<sup>81</sup> In both cases with the legend MAVRETANIA. Illustration taken from BMC III, Pl. 95.2.

<sup>82</sup> Illustration taken from BMC III, Pl. 95.6.

<sup>83</sup> With the legend SICILIA. Illustration taken from BMC III, Pl. 95.16.

<sup>84</sup> With the legend PANNONIA. Illustration taken from BMC III, Pl. 95.2.

<sup>85</sup> With the legend ITALIA. Illustration taken from BMC III, Pl. 63.14.

but bears ideological meaning.<sup>86</sup> The personification of Alexandria lies, leaning on a basket with fruits, behind her there is a vine branch, holding grain ears in her hand, while infront of her there is wheat growing (Fig. 71) (RIC II: 446, nos. 843-844).<sup>87</sup> Alexandria obviously enjoys special privileges and that is why it is also shown in the *adventus* series. The accent on natural wealths is more expressed here than on the pictures of Egypt itself.

Although separated as a special series with provinces, we cannot neglect the images from the ADVENTVS and RESTITVTOR series, since on them, some other provinces also appear.88 Cappadocia, Dacia and Germania appear only in the "province" series. The personifications of Africa, Asia, Spain, Sicily and Italy are the oly ones represented in all of the three series. The provinces' attributes are the same as in the "provinces" series, except that in the case of Sicily grain ears also appears. Only the attributes of Asia differ, since on the second two series, it wears a corona muralis on its head and holds a scepter. Britannia, Judaea and Mauretania also appear in the adventus series. Britannia is shown without attributes; Judaea is with children again, while Mauretania shows a vexillum instead of a horse.

This would describe all of the personifications included in the "provinces" series, while others can be traced down according to their representations on other two series. Five provinces are represented both in *adventus* and *restitutor* series: Arabia, Bithynia, Gaul, Macedonia and Phrygia. Arabia is shown with the same attributes as earlies with Trajan, with a camel and a calamus (?) (Fig. 72);<sup>89</sup> Bithynia holds an acrostolium, while her

foot lies on a bow of a ship (Fig. 73); Gaul is represented without attributes; Macedonia is dressed in a short tunic and holds a whip (Fig. 74); Phrygia wears a national cap and holds a curved shepherd's stick in her hand (Fig. 75). Cilicia, Moesia, Noricum and Thrace appear only in the adventus series, while Achaia, Libya and Nicomedia appear only in the restitutor series. Cilicia is shown with a helmet on her head, holding a vexillum in her hand; Moesia is dressed in a short tunic, holding a bow (?) and a quiver with arrows; Noricum, as well as Cilicia, wears a helmet and holds a vexillum; Thrace is shown dressed in a short tunic, without attributes; Achaia has an amphora with a palm-branch as the only attribute (Fig. 76); Libya is without attributes; Nicomedia, as the capital of Bithynia, just like Alexandria, enjoys special privileges appearing among the provinces. It is shown with a corona murales on its head and holding a stern (Fig. 77). The personifications of Asia, Bithiny and Nicomedia carry the same attributes connected to sailing, which can easily be understood regarding the importance of maritime routes through Hellespont.

The new understanding of a state's conception, promoted by Hadrian, was no longer based on the priority of Italy as mastress of the provinces, but in a partnership of all of the provinces for the well-being of the whole Empire. The idea he tried to explain and transform into reality depended much on his unique personality and cosmopolitan spirit. After Hadrian's death, Antoninus Pius also minted a "provinces" series, wishing to promote his attitudes taken in inner affairs, i.e. return to the traditional understandning of the relationship between Italy and the provinces. His series bears a completely different sense that the Hadrian's one, because we see provinces here hurrying to give offerings in the form of aurum coronarium. Italy, who is to receive all og the gifts, is depicted as the queen of the earth, sitting on a stary globe, holding a cornucopia and a spepter (Fig. 78) (RIC

<sup>86</sup> The prosperity of provinces from the beginning of 2nd century lead to a gradual decline of Italy's influence in all spheres, including the political one, which will especially be noticeable dring 3rd century (Méthy 1995: 25-49).

<sup>87</sup> With the legend ALEXANDRIA. Illustration taken from BMC III, Pl. 94.6.

<sup>88</sup> Adventus series (RIC II: 376, nos. 315-320; 451-456, nos. 872-907). Restitutor series (RIC II: 377-378, nos. 321-329; 463-467; nos. 938-966).

<sup>89</sup> Illustrations (Fig. 72-77) taken from BMC III, Pl. 96.4,

<sup>96.6, 97.3, 97.4, 96.1, 97.1.</sup> 

III: 106, no. 594: 122, nos. 746-747).90 Africa is dressed in long clothes, with elephant-skin headdress, standing and holding a crown and a cornucopia or grain ears, a cornucopia and a basket (Fig. 79) (RIC III: 104, no. 574).<sup>91</sup> Asia holds an anchor, next to her feet there is a bow of a ship (Fig. 80) (RIC III: 105, no. 579).92 Capadocia is in a short tunic, holding a vexillum, next to her feet there is Mons Argaeus (Fig. 81) (RIC III: 105, no. 580).93 Dacia, dressed in a short tunic, holds a standard (Fig. 82) (RIC III: 105, no. 581).94 Spain is in long clothes, holding a branch, next to her feet there is a rabbit (Fig. 83) (RIC III: 105, no. 582).95 Mauretania is in a military suit, holding a spear or a vexillum (Fig. 84) (RIC III: 105, nos. 583-585; 122, no. 748).96 Parthia appears as a friendly kingdom, shown holding a bow and a quiver with arrows next to her feet (Fig. 85) (RIC III: 105, no. 586).97 Phoenicia holds a short scepter, next to her there is a bow of a ship and a palm-tree (Fig. 86) (RIC III: 106, no. 587).98 Scythia, in a short tunic, holds a parasonium (Fig. 87) (RIC III: 106, no. 588).99 Sicily wears a trisces on her head and long clothes, she holds poppy (Fig. 88) (RIC III: 106, no. 589).<sup>100</sup> Syria holds a cornucopia, next to her feet there is a personification of Orontes (Fig. 89) (RIC III: 106, no. 590).<sup>101</sup> Thrace holds a branch (RIC III: 106, no. 591). The only different picture is the one of Bithynia, because she is not offering the crown, but sits on a rock/wall, leaning on a shield and holding a military insignuim

- 92 Illustration taken from BMC IV, Pl. 26.9.
- 93 Illustration taken from BMC IV, Pl. 26.10.
- 94 Illustration taken from BMC IV, Pl. 26.12.
- 95 Illustration taken from BMC IV, Pl. 26.13.
- 96 Illustration taken from BMC IV, Pl. 26.6.
- 97 Illustration taken from BMC IV, Pl. 27.1.
- 98 Illustration taken from BMC IV, Pl. 27.4.
- 99 Illustration taken from BMC IV, Pl. 27.2.
- 100 Illustration taken from BMC IV, Pl. 27.5.
- 101 Illustration taken from BMC IV, Pl. 27.6.

and a spear (Fig. 90) (RIC III: 121, no. 742).<sup>102</sup> Just like during Hadrian's times, the picture of Alexandria is especially separated. The personification, with a lotus flower on her head, holds the crown with both hands, next to her feet there are grain ears and a crocodile (Fig. 91) (RIC III: 104, nos. 577-578).<sup>103</sup> Contrary to Hadrian's, the treatment of subjects under Antoninus Pius is depicted in a completely different spirit. Hadrian travelled throughout the empire and understood Italy and the provinces in the whole of their expanse and variety, as a unique political body, without stressing differences and privileges. Under Antoninus Pius, the provinces are depicted as loyal, but Italy still takes its privileged place (Strack 1937: 39).

In Commodus' mintings, a motive from the time of Antoninus Pius repeats, with a picture of Italy as the mistress of the world, sitting on the globe, holding a sceptre and a cornucopia (RIC III: 416, no. 438). The victory in Britannia in 184 finds its reflection on a medallion minted a year later, illustrating her as a provincia fida, sitting on a rock/wall, leaning her elbow on a shiled and holding a standard and a spear (Fig. 92) (Gnecchi II: 51, no. 2).<sup>104</sup> On coins of Septimius Severus, on two occassions there are personifications of Africa. The first one is in 194, on sestertii with the legend AFRICA, there is Africa depicted as a standing female figure, with elephant-skin headdress, holding folds of her dress with her left hand, in which she also holds grain ears, next to her feet there is a lion (Fig. 93) (RIC IV.1: 183, no. 668; 184, nos. 676, 680).<sup>105</sup> This picture appears during the war with Niger, on one hand wishing to show the important role of the province in supplying Rome with wheat. On the other hand, as it appears together with the image of di auspices, it certainly stresses the African origin of the emperor.<sup>106</sup> The

<sup>90</sup> Illustration taken from BMC IV, Pl. 39.11.

<sup>91</sup> Illustration taken from BMC IV, Pl. 26.4. All of the personifications hold a aurum coronarium in their right hand and it would not be repeated in the description, unless different.

<sup>102</sup> Illustration taken from BMC IV, Pl. 39.9.

<sup>103</sup> Illustration taken from BMC IV, Pl. 26.5.

<sup>104</sup> Illustration taken from Gnecchi II, Tav. 78.2.

<sup>105</sup> Illustration taken from BMC V, Pl. 22.6.

<sup>106</sup> It is probably no coincidence that in the same year, in the mintings of Clodius Albinus there is an image indicat-

second occasion is on denars dated in 207 and between 202-210, with the identical picture of Africa (RIC IV.1: 118, nos. 207, 207A; 123, no. 253) or a variant on which the personifiction reclining on a cornucopia, holding a scorpion and infront of her there is a basket with fruits (Fig. 94) (RIC IV.1: 123, no. 254).<sup>107</sup> The latest reminds a lot of the Africa from Hadrian's "provinces" series and it was most likely minted on the occassion of the visit of emperor's family to their native country Africa in 202-203.

After that, we come accross pictures of provinces only on the mintings of Trajan Decius and these were of Pannonia and Dacia. Pannonia is depicted in two manners, as one or two figures, but in both cases, the legend says PANNONIAE. The personification is depicted in long clothes, standing, with her right hand lifted and holding a military insignia (Fig. 95) (RIC IV.3: 120, no. 5).<sup>108</sup> As two figures, they appear in several varinats: personifications standing under a veil, both with their hands lifted, each holding a standard (Fig. 96) (RIC IV.3: 122, nos. 21-25).<sup>109</sup> The Panonnias are depicted in a dextrarum iunctio gesture infornt of a standard, expressing mutual military loyalty (Fig. 97) (RIC IV.3: 123, no. 26; 124, no. 41).110 Dacai is represented holding a stick with a donkey's head on top (Fig. 98) (RIC IV.3: 120, no. 2; 121, no. 12; 124, no. 35.)<sup>111</sup> or holding a standard with the legend DACIA or DACIA FELIX (Fig. 99) (RIC IV.3: 121-122, nos. 13-14; 124, nos. 36-37).<sup>112</sup>

In the first place, Trajan Decius asked for support of the Illyrian army, which he often illustrated on coins with the legend GENIVS EX-ERCITVS ILLVRICIANI (RIC IV.3: 120, nos. 3–4; 122, nos. 15–25; 124, nos. 38–40). The appearance of the perosnification of Dacia is connected to the victory won against the barbarians on the province's border, after which Decius got the title Dacicus Maximus (Kienast 2010: 205).<sup>113</sup> The special exposure of Pannonias as images on coinage in probably connected to Decius' place of birth in the vicinity of Sirmium.

For the last time during the proncipate, on Aurelian's mintings one comes across images of provinces' personifications. The accent is again given to the same group of provinces, and the following provinces are depicted on coins: Pannonias, Dacia and the Genius of Illyricum. The personification of Pannonia stands with her right arm lifted, in her left she holds a sceptre with the legend PANNONIAE (Fig. 100) (RIC V.1: 278, no. 113).<sup>114</sup> In the case of Dacia, the motive from Trajan Decius' coins repeats, with the personification who holds a stick with donkey's head on top, with the legend DACIA FELIX (RIC V.1: 277, no. 108). The appearance of Pannonia is again probably connected to certain private reasons and the birth place of Aurelianus in the vicinity of Sirmium. Still, the images of Dacia and Genius Illyricum (RIC V.1: 277, no.110; 278, no. 111; 287, nos. 204-205; 189, nos. 222-224) are rather connected to the re-organisation of the Danubian border and the abandoning of Trajan's Dacia.<sup>115</sup> Even more so because Aurelianus does not expose only

ing his African origin and his place of birth - Hadrumentum. On his aurei, Albinus depicts an African deity called saeculum frugiferum in Latin (RIC IV.1: 45, nos. 8-10). The deity is depicted on a throne with grain ears in his hands, flanked with two sphinxes. The picture undoubtfully reminds on a Punic relief from  $5^{th}$  century B.C. from a sanctuary in Hadrumetum (Birley 2002: 112).

<sup>107</sup> Illustration taken from BMC V, Pl. 34.18.

<sup>108</sup> Illustration taken from RIC IV.3, Pl. 10.7.

<sup>109</sup> Illustration taken from HCC III, Pl. 76.15. Variations: just one holding a standard or one standard between the figures.

<sup>110</sup> Illustration taken from HCC III, Pl. 76.24.

<sup>111</sup> Illustration taken from HCC III, Pl. 75.7.

<sup>112</sup> Illustration taken from HCC III, Pl. 76.21.

<sup>113</sup> About the question of different depictions of Dacia on imperial and provincial mintings of Trajan Decius cf. Jovanović 2006: 41, I-2.

<sup>114</sup> Illustration taken from RIC V.1, Pl. VIII.122.

<sup>115</sup> The abandoning of Dacia and the evacuation of people most likely followed in several phases from 271-274. Aurelianus established a new province on the right Danube bank, which included parts of Lower Moesia and Thrace (CAH XII: 301, ref. 1). About the analysis of the development of Dacia's images on imperial and provincial coinage from Trajan to Aurelianus, cf. Winkler 1965: 225–233.

the army of Illyricum like Trajan Decius before him, but just Illyricum itself.

Money as a source holds aspects of persons and time, and in most cases, it is placed within a real historical context. Images on Roman imperial coinage offer data about real events, depiciting them, of course, in the way that was the most acceptable for the administration. Emperors made a high level of political propaganda using coinage as the most powerful mean. Apart from coins, the succesfully used other means, like: public monuments, buildings and inscriptions, relief, miniature plastic, gems and cameos etc. Considering public monuments, the level of political propaganda was put down on the level of local population. This is why we come accross many public monuments and inscriptions throughout the Empire. In the case of miniature plastic, relief depictions on vessels or gems and camoes, the role of propaganda is pot down on the user's level. Money, on the contrary, was lifted above all other means, mostly because of its role as a mean of payment, which made it inevitable in everyday life and required its huge quantity. That circumstance was very well used from the very beginning of minting, firstly to outline belonging to a certain community and secondly also to spread propaganda ideas. As a skill, it develops through time, reaching its peak during the Roman empire. Minting of coins had its central role in Roman politics, as well as in the commercial life of the Empire (Harl 1996: 27).

Among others, pictures on coins offer data about numerous captured territories which were added to the Empire as provinces, about occupied nations, defeated enemies begging for mercy, about captured weapons and trophies, about emperors who are invincible but sometimes show mercy to captives. The coin series with the motive *provincia capta* show defeated nations or occupied countries which were turned into Roman provinces, usually personificized as captives carrying local features like clothes or weapons. On the other hand, the images of provinces' personifications as *fida et pacata* should point out to the pacified provinces, whose autochtonous population has been romanized and incorporated into the state system. Rome, which under Augustus rose onto the level of a world's empire, caused an artistic creation of a new conception of the archetype of enemies. Rome was no longer considered one of the sides in a bipartial world, as one side of culture, right and religion, opposed to the barbarian world. Instead of that, Rome was now placed between two extreme poles – on one hand, these are the northern and western barbarians, and on the other these are the representatives of old oriental civilisations, who respect their cultural attributes. Gauls and Germans as stereotypes were considered raw and uncivilized, but daring and reliable warriors, and as such valuable to the Romans. The orientals, on the other hand, were softened in luxury, they respect their cultural attributes and represent old civilizations (Hölscher 2003: 10). Already on Augustus' mintings we can see the differencies in depicting a Parthian and an Armenian, opposed to a German. A kneeling German is depicted with long, mussed up hair, and bearded, which would, according to Roman standards, correspond to an uncivilized and wild nation. Orientals are depicted in their national costumes, but in a dignifying manner, acceptable to the Romans.

The political propaganda of Augustus and his heirs all the way to Domitianus, did not depict the personification of Germania as a female figure and it was focused on depicting captives. On the other hand, it would be logical to expect a mourning personification of Germania to appear on Augustus' mintings, after historical events and the victory of Tiberius. But since she did not appear, it is to be concluded that during that period, such a way of depicting did not play any role (Künzl 1988: 545-546). Generally, Augustus' politics towards the defeated provinces was to cautious and conservative. Even more, the results of such a policy were present for a long time even after his death, which in a certain way set fatal borders to the possibilities of the Empire. The inevitable equalization of provinces with Rome and Italy was delayed until it was too late (Mattingly 1960: 151).

Vespasianus' propaganda on coins developed as a result of specific circumstances, grew out of the civil war and his personal promotion without adoption. The most important success was pacifying the rebellion in Judaea, marked with numerous motives on coins of Vespasianus and Titus, among others also with pictures of captives. A motive of a man and a woman is introduced, Jews, tied and mourning, surrounded with captured weapons. In the centre of the compostition there is a palm-tree, which in future mintings is to be replaced with a trophy, just like on Domitianus' Germania capta motive. This motive will develop through 2nd and 3rd century into a stereotype picture of two captives sitting on the foot of a trophy with their hands tied. In Domitianus' mintings, a new motive appears of the personification of Germania sitting on a shield, which will later also be accepted, first by Trajan in his depictions of Dacia, but later also by Lucius Verus and Marcus Aurelius. The mentioned picture of Germania as a female figure, sitting on a shield on Domitianus' mintings, represents the first attempt of allegoric depiction of a province's personification. All of the former depictions of provinces' personifications could be named "captives", representatives of a certain nation, dressed in authentical costumes and with attributes typical for a certain country or county, so that they can well be treated as geographical personifications.

During 1<sup>st</sup> century, provinces hardly appear on coins and they are almost always depicted as captives, with the exception of Galba's Spain and Gaul and Trajan's Germania. Galba's election for an emperor in Spain and their union with the rebellions in Gaul causes the emphasizing of these two provinces which appear as war-goddesses. But these images of Spain and Gaul are no results of Rome's care fot provinces, but the indication of provinces' unsatisfaction with central government, which caused the rebellion itself (Sutherland 1951: 175). For the first time on Trajan's mintings, the picture of a pacified province appears, in this case Germania, who symbolically holds a branch in her hand. The clothes corrspond to the simplified variant of a German national costume, so even when the explaining legend is missing, there is no doubt that it is Germania depicted.

After a plentitude of types depicting Dacia as broken and defeated, Trajan depicts this province as a new member of the Empire. As fida et pacata he illustrated his new province, Arabia. Only during the time of Hadrian were the provinces treated with respect and shown as such on his mintings. But Hadrian was an isolated visionary, whose ideas about functioning of the Empire were not approved by his heirs. Hadrian was the first emperor who gave special attention and a proper manner for treating the inner organization of the state in all of its segments. Still, it showed great connection to his original personality and character - Hadrian's provincial origin, natural curiosity and visionary gave him a broad view of things and strenght to persist in his ideas. His attitudes were perpetuated in his magnificent series "provinces", adventus and restitutor, which represent the climax of his life work, after that he has spent almost his entire rule visiting provinces and considering their problems on sight.

He understood the Empire as a living organism, equally consisting of all of its parts. But, as it was already pointed out, his heir showed no undertsanding for these progressive ideas. Antoninus Pius was in Italy with all of his heart and he lacked understanding, even with his noble character, for the true need of the state. His series "provinces" shows them again in an obediant relationship towards Italy, who is the mistress of the world, sitting on a stary globe and who is being offered crowns. All of the later pictures of provinces' personifications was reduced to the images of captives and was aiming to advertise victory. On none of the pictures do captives bear national characteristics like clothes or weapons, they look alike on all of the images (Méthy 1992: 274). The only exception are certain mintings of Trajan Decius and Aurelianus, on which Dacia, both of Pannonias and the Genius of the Illyrian army apper, connected with short-term raise of the Balkan provinces and the local origin of the emperors. Basically, the pictures of provinces' personifications show a conception built by actual emperors about the Roman world and they represent visual testimonies of the contemporary Roman vision of the world.

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## REZIME PROVINCIA CAPTA I PROVINCIA FIDA ET PACATA KAO REVERSNI MOTIVI NA RIMSKOM CARSKOM NOVCU U DOBA PRINCIPATA

KLJUČNE REČI: PRINCIPAT, REVERSNE PREDSTAVE, PROVINCIJE.

Reversne predstave jesu interesantan istorijski izvor koji nam dozvoljava detaljnije razmatranje aspekata spoljne i unutrašnje politike. Jedna od grupa reversnih predstava koja oslikava odnos rimljana prema pokorenim narodima, uključenim u državni provincijski sistem, su predstave personifikacija provincija. Tokom vremena ove predstave prolaze kroz različite faze, od capta do fidem, od pokorenih i još uvek neumirenih do romanizovanih i ikorporiranih u administrativni, vojni i politički život Carstva. Prema tome možemo izdvojiti i dve grupe reversnih predstava na novcu: prva (capta) ilustruje rimske pobede i osvajanja novih teritorija; druga (fida et pacata) grupa u kojoj su prikazane personifikacije umirenih i više ili manje romanizovanih provincija.

#### Provincia capta (Sl. 1-50)

Ovoj grupi reversnih predstava možemo pripisati motive trofeja i zarobljenika, kao i cara i zarobljenika. Uglavnom su reprezentovane stereotipnim ikonografskim shemama koje prikazuju osvojene trofeje i zarobljenike ili samog cara i predstavnike pokorenih naroda, koji u poniznom klečećem stavu padaju pred moćnog osvajača. Pomenuti motivi pojavljuju se na reversnim predstavama novca kao rezultat trijumfa ostvarenog uz pomoć vrlina samoga cara i snagom i sposobnostima rimske vojske.<sup>116</sup> Zarobljenici predstavljaju personifikacije porobljenih naroda ili pobunjenih provincija. Svaka od ovih personifikacija određena je atributima u vidu nacionalne odeće i oružja ili za tu oblast karakterističnim biljkama i životinjama.<sup>117</sup> Iako su postojali pokušaji kanonizacije personifikacija provincija, oni su se obično odnosili na odredjeni vremenski period i nisu sasvim ustaljeni.

Sa motivima koji predstavljaju pokorene narode susrećemo se najpre u kovanjima Cezara i potom Marka Antonija krajem Republike. Slede predstave u kovanjima: Avgusta, Flavijevaca, Trajana, Antonina, Septimija Severa i porodice, Galijena, Klaudija Gotskog, Kvintila, Aurelijana i Proba. Pojavljuju se personifikacije: Galije, Jermenije, Partije, Judeje, Germanije, Dakije, Britanije.

#### Provincia fida et pacata (Sl. 51-100)

Predstave provincija prolaze kroz faze od capta do fidem, što se odražava i u predstavama na novcu. Vremenom su se novoformirane provincije postepeno romanizovale i inkorporirale u administrativni, vojni i politički život Carstva, tako se i na novcu predstavljaju kao prijatelji Rima. Prvi put se susrećemo sa ovom vrstom predstava u kovanju Galbe (Španija i Galija), potom Trajana (Germanija i Arabija), da bi Hadrijan na poseban način predstavio svoj odnos do provincija u nekoliko velikih serija novca. Novo shvatanje koncepcije države, koje je promovisao, zasnivalo se ne više na primatu Italije kao gospodarice nad provincijama, već u partnerstvu svih radi zajedničke doborobiti Carstva. Ideja koju je pokušavao da objasni i sprovede zavisila je umnogome od njegove jednistvene ličnosti i kosmopolitskog duha. Nakon Hadrijanove smrti, Anto-

<sup>116</sup> Predstave i legende na novcu povezane su s propagandnom idejom i medjusobno su komplementarne. Legenda česće služi, ne toliko da objasni predstavu, koliko da razvije ideju koja je prikazana. Tako nailazimo na primere u kovanju Avgusta u kojima je predstava Viktorije povezana sa legendama ASIA RECEPTA (RIC I, p. 61, no. 276) i ARMENIA CAP-

TA (RIC I, p. 83, no. 514). Kao što je naglašeno u tekstu, predstave iz grupe *provincia capta* blisko su povezane sa drugim predstavama vezanim za ostvarene pobede, kojima se u ovom radu nećemo baviti. 117 Na primer: palma je vezana za Judeju, koplje i šestougaoni štit za Germaniju, krivi mač za Dakiju, luk, tobolac i tijara za Jermeniju, itd.

nin Pije je takodje kovao seriju »provincije«, u želji da promoviše svoje stavove koje će zauzeti u unutrašnjoj politici, odnosno povratak tradicionalnim shvatanjima odnosa Italije i provincija. Predstave provincija kao *fida* pojavljuju se još i u kovanju: Komoda (Britanija), Septimija Severa (Afrika), Trajana Decija i Aurelijana (Panonije i Dakija).































Fig. 1. Cezar, Sl. 2 - Marko Antonije, Fig. 3-9 - Avgust, Fig. 10-11, 13 - Vespazijan, l. 12-14 - Tit.





















Fig. 15. Tit, Fig. 16-19 Domicijan, Fig. 20-27 Trajan









31



33





Fig. 28-30 Trajan, Fig. 31-32 Antonin Pije, Fig. 33-35 Lucije Ver, Fig. 36 Marko Aurelije.



Fig. 37, 40 Komod, Fig. 38-39 Marko Aurelije, Fig. 41-43 Septimije Sever, Fig. 44 Geta, Fig. 45 Karakala, Fig. 46-47 Galijen, Fig. 48 Klaudije Gotski, Fig. 49 prob, Fig. 50 Aurelijan.























Fig. 51-53 Galba, Fig. 54-56 Trajan, Fig. 57-63 Hadrijan

























Fig. 64-75 Hadrijan























Fig. 76-77 Hadrijan, Fig. 78-87 Antonin Pije































Fig. 88-91 Antonin Pije, Fig. 92 Komod, Fig. 93-94 Septimije, Fig. 95-99 Trajan Decije, Fig. 100 Aurelijan

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# COINS FROM MINTS OF THRACE AND LOWER MOESIA ON THE VIMINACIUM CEMETERY "VIŠE GROBALJA"

## ABSTRACT

Coin finds from mints of Thrace and Lower Moesia dating from 2nd and 3rd century that were discovered on the Viminacium necropolis "Više Grobalja" are of great importance for tracing the ways of monetary circulation in the Balkan and Danubian provinces of the Empire. At this necropolis, 25 examples were discovered, dating from the time of Antoninus Pius to Philipp I.

KEY WORDS: ROMAN PROVINCIAL MINTING, THRACE, LOWER MOESIA, VIMINACIUM.

During the systematic archaeological excavation of the Viminacium necropolis "Više Grobalja", 25 examples of bronze coins were found, minted either in Thrace or Lower Moesia (Table 1).<sup>1</sup> Studying of numismatic finds from the cemeteries of Viminacium offers possibilities for new and exceptional discoveries, mostly because of the fact that one comes upon a huge sample from reliable archaeological contexts. Final publication of the whole numismatic fundus from this ancient site will represent a great contribution to the study of Roman coinage and point out once more the great importance Viminacium once had, as an important administrative, economic and military metropolis in this part of the Empire.

Thrace				
	Hadrianopolis	3		
	Augusta Traiana	1		
	MesembriaPautaliaPerinthosPlotinopolis			
	Philippopolis	2		

<sup>\*</sup> The article results from the project: *Viminacium, Roman city and military legion camp – research of material and non material of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalisation and 3D visualisation (no 47018)*, funded by Ministry of Education and Science of the Republic of Serbia.

<sup>1</sup> Systematic excavations of the southern Viminacium cemetery (sites "Više Grobalja" and "Pećine") were undertaken from 1978 to 1987. Coins found at the site "Više Grobalja" were published so far, making some 40% of all the numismatic finds from the southern Viminacium cemetery.

Lower		
Moesia		
	Marcianopolis	1
	Nicopolis ad Istrum	5
Total		25

Table 1. Coins from the mints of Trace and Lower Moesia from the necropolis "Više Grobalja".

It is especially interesting to track down the ways of circulation in the Balkan provinces of the Roman Empire and that is why our intention was drown by the Thracian and Moesian examples found at Viminacium. As already known, the difference between provincial and imperial coinage is in their areas of circulation. On the other hand, during the first half of 3rd century, one felt the lack of small bronze coins within the Balcan provinces (Borić-Brešković 1976: 8, ref. 2). It is therefore obvious that coins from the local Balcan were replacing bronze coins from the Roman mint on a large scale.<sup>2</sup> The coins from Thracian and Moesian mints found at the neropolis "Više Grobalja" can be dated from the period of Antoninus Pius to Philipp I (Table 2).

It is noticeable that coins from these mints circulated towards the West already in the second half of 2nd century, being most intense during Severian times and then starting to decline, which corresponds with opening of the Viminacium mint, which began to mint enough bronze coins at the territory of Upper Moesia. An almost identical picture of circulation and chronology is shown related to the coins of the Nicaea mint, much represented at the "Više Grobalja" necropolis (Vojvoda 2011: 243-256). Geographical position of Viminacium, at the cross-road of many roads, of which the main lead towards the south to Naissus and after that over Thrace and Bosphorus, made it one of the most important points on the road towards the East. Wars, that often broke out starting from the time of Septimius Severus and becoming even more numerous during his heirs, lead to a great circulation of people, goods and money along the road over Thrace and Upper Moesia. Obviously, there were several reasons that lead to a greater money circulation between the Balkan provinces and the provinces in Asia Minor, especially from Bithynia, over Thrace and Upper Moesia and ever further to the West, since at the same time finds of Nicaean coins were found at the territory of the southeast Alps (Kos 1986: 107-109).3

3 Emona – Iulia Maesa (1 pc.) i Severus Alexander

Emperor or a family member	no of pieces	0/0
Antoninus Pius	2	8
Marcus Aurelius	2	8
Faustina Iunior	3	12
Commodus	1	4
Septimius Severus	4	16
Caracalla	5	20
Plautilla	1	4
Geta	3	12
Elagabalus	1	4
Gordian III	2	8
Philipp Senior	1	4
Total	25	100

Table 2. Coin percentage of different emperors and their family members.

<sup>2</sup> Apart from coins from the mentioned mints of Viminacium, Thrace and Lower Moesia, at the "Više Grobalja" necropolis there are also coins from other Balkan mints: Stobi, Philippoi, Union of Macedonian cities and coins from the province of Dacia.

Further research and publishing the greatest numbe possible of all the coins from Upper Moesia, as well as from Thrace and Lower Moesia will make it possible for us to understand historical circumstances and consequences they had on life in these neighbouring provinces.

<sup>(1);</sup> Poetovio - Elagabalus (2), Severus Alexander

<sup>(3),</sup> Iulia Mammaea (1).

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• • • •	sitting; lau.
	= sitting; lau.
	= sitting; lau.
	sı. = sıttıng; lau.
	; sı. = sıttıng; lau.
· · · · ·	ig; si. = sitting; lau.
· · · · ·	ing; sı. = sitting; lau.
F	iding; si. = sitting; lau.
	anding; si. = sitting; lau.
	standing; sı. = sitting; lau.
	= standing; si. = sitting; lau.
	c = standing; si. = sitting; lau.
	st. = standing; si. = sitting; lau.
	$f_{1}$ st. = standing; si. = sitting; lau.
	SIT; St. = Standing; SI. = Sitting; lau.
	left; st. = standing; si. = sitting; lau.
	= left; st. $=$ standing; si. $=$ sitting; lau.
	$I_{c} = IeIt$ ; st. = standing; si. = sitting; lau.
	$f_{1}$ I. = left; st. = standing; si. = sitting; lau.
	ht; $L = lett; st. = standing; si. = sitting; lau.$
	ight; I. = left; St. = standing; SI. = sitting; lau.
	right; I. = left; St. = standing; SI. = sitting; lau.
	= right; I. = left; st. = standing; si. = sitting; lau.
	r. = right; l. = lett; st. = standing; si. = sitting; lau.
	f: r. = right; l. = left; st. = standing; st. = sitting; lau.
	ed: r. = right; l. = left; st. = standing; si. = sitting; lau.
	ised: r. = right; I. = left; st. = standing; si. = sitting; lau.
	used: $r = right$ ; $l = left$ ; $st = standing$ ; $sl = sitting$ ; $lau = si$
	as used: $r = right$ ; $l = left$ ; $st = standing$ ; $st = sitting$ ; $lau = right$
	ons used: $r = right$ ; $l = lett$ ; $st = standing$ ; $sl = sitting$ ; $lau $
	thons used: $r = right$ ; $l = left$ ; $st = standing$ ; $sl = sitting$ ; $lau = right$
	vations used: $r = right$ ; $l = left$ ; $st = standing$ ; $sl = sitting$ ; $lau = right$
	evations used: $r_{i} = right$ ; $l_{i} = left$ ; $st_{i} = standing$ ; $sl_{i} = sitting$ ; $lau_{i}$
	brevations used: $r = right; l = left; st = standing; si = sitting; lau :$
	bbrevations used: $r = right; l = left; st. = standing; si. = sitting; lau.$
	Abbrevations used: $r_{i}$ = right; $l_{i}$ = left; $st_{i}$ = standing; $sl_{i}$ = sitting; lau :

Moesia Inferior

	Više Grobalja C no.	8198		980				
	Dating	198-217		180-192				
	Reference	Мушмовь, 426		MyIIMMOB5, un- known, but no. 893 naked male figure holding a horn and a stick; no. 1064 (Cara- calla) Apollo in l. hand holding a branch.				
	Weight (gr.) Diameter (mm) axis	2,22 17,40 NE		13,37 29,90 N				
	Reverse	MAPKIAN[]ΩN Grape		HFE KAI[.]A[.]EP – N[] Apollo (?) st. l. in front of an altar, in r. hand holding a patera, in l. a stick (?).				
	Obverse	AVT K [] ANTΩNINOC Bust facing r., head with lau.	trum	AV K MA AVT KOM[] Bust facing r, head with lau.				
Marcianopolis Caracalla	cat. no./no. of il- lustr.		Nicopolis ad Is Commodus	0				

	4247		913		8989		9742		903
	193-211		198-217		undatable 202-205 ?		218-222		Gordianus III
	Мушмовь, 948		Мушмовь, 1097		Мушмовь, 1159		Мушмовь, 1426		Мушмовъ, 2479; Юрукова, 709
	2,53 18,10 S		2,25 17,00 SE		9,61 26,30 N		5,74 23,20 N		3,01 19,20 N
	NIKOIIOAITΩN IIPOCIC Star.		NIKOIIOAITΩN IIPOCICTPO Star above cres- cent.		[] TAAAOV NIKOIIOAIT[] Eagle on a globe, wings spread, head facing r., wreath in his beak.		NIKO [] In lau. wreath.		AΔPIANO-[] Heracles fighting a Hydra; behind him bow and quiver.
srus	[] CEVHPOC Head facing r., with lau.		[] ANTΩNIN Head facing r., bare		[] IIAAV- TIAAA CEB Bust dr. facing r.		Illegible. Head facing r., head with lau.	inting	TON KTI-CTHEN Bearded head of Heracles facing r.
Septimius Seve	3	Caracalla	4	Plautilla	S	Elagabalus	9	Thrace Hadrianopolis Autonomous m	2
	4289		4127		11569				
-----------	--	-------------	--	-----------------------	--				
	198-217		238-244		197-208				
	Мушмовь, 2605; Юрукова, 303.		Мушмовь, 2758; Юрукова, 497.		Мушмовљ, 3104				
	8,56 27,00 NE		11,68 26,70 S		3,74 17,50 N				
	AAP[I]ANO- IIOAEIT22N Asclepius st. straight, in his r. hand stick around which winds a snake.		AΔPIAN-O- ΠΟΛΕΙ ex – TΩΝ Temple with four pillars and four steps, at the en- trance st. Fortuna, holding a stern and a cornucobia.	-	AVG TRAIA ex – NHC Lion facing r.				
	[] AVR CEV -ANTONINOC Bust dr. facing r., head with lau.		AVT K M ANT FOPAIANOC AVT (VF in lig.) Bust dr., arm. fac- ing r., head with lau.	na (Traianopolis)	II CEIIT - FETAC K Bust dr. facing r., head bareheaded.				
Caracalla	∞	Gordian III	6	Augusta Traia Geta	10				

	9080/1		2620	1776
	244-249		161-180	161-180
	Мушмовъ, 4037		Мушмовљ, 4091	Мушмовъ, 4101
	12,53 27,50 SW		19,19 31,40 S	17,42 31,10 N
	MECA-MBP-IA- ΩN Female figure (Demeter ?) st. facing I, in r. hand holding a patera, behind her a tree branch with a snake around it.		HTE M TOVAAIO-V – MAΞIMOV ex – ΠΑVTAAI ex – ΠΑVTAAI ΔΩΤΩΝ Female figure with kalathos on head si. facing l., in her r. hand holding Victoria, in l. a cornucopia.	[] M TOVAA[] ex – ΠΑVTAAIΩ TΩN Temple with four pillars, Asclepius
	MAP IOVAIOC [] ex – KAICAP Bust dr., arm. fac- ing r., head bare headed, across the bust of Serapis facing l.	SI	[] AVP – ANT[] Bust dr. facing r., head with lau.	Ilegible Head facing r., with lau.
Mesembria Philip I	11	Pautalia Marcus Aureliu	12	13

Temple with four pillars, Asclepius and Hygieia stand-ing at the entrance.

981	981 217		1701	7377
undated 161-175 undated 161-175			193-211	193-211
Мушмовъ, 4114	Мушмовъ, 4114 Мушмовъ, 4114		Мушмовъ, 4183	Myшмовъ, unknown
7,65 21,50 N	7,65 21,50 N 6,28 6,28 24,00 S		17,05 31,90 S	3,53 19,40 SW
OVA[III]AC IIA[]C Fortuna st. facing 1., in her r. hand holding a stern, in her l. a cornucopia.	O[]C Similar.		Illegible (around) ex – IIAVTAAIAC Horseman fac- ing r, waving his spear towards a lion	OVAIIIĂ[C] – [IIAV]TAAIAC Naked male figure (?) st. facing 1., in r. hand holding (?), in his I. a scepter.
ΦAVC[] CE[] Bust dr. facing r.	ΦAVCTEIN[] Bust dr. facing r.	sure	[] K A CEP – CEVHPOC IT Bust dr., arm. fac- ing r., head with lau.	AV K A CEIIT – CEVEPOC Bust dr. facing r., head with lau.
14	15	Septimius Seve	16	17

Faustina II

Caracalla   Caracalla   Caracalla OV[] - ANTONINOC OV[] - IAVTAAIAC 14,75 MyumoB4, 4236 198-217 8845   18 Bust dr., arm. fac- ing r., head with lau. ing r., head with and a stick with a mod a stick with a lau. 14,75 MyumoB4, 4236 198-217 8845   19 AVTK M AVPH Bust dr., arm. fac- ing r., head with lau. OV/J - NOVIIIAC 14,75 MyumoB4, 4236 198-217 8845   19 Bust dr., arm. fac- ing r., head with patera above an lau. 15,77 MyumoB5, 4275 198-217 4465								
Caracalla   Caracalla OV[] - ANTΩNINOC OV[] - IIAVTAAIAC I4,75 MyumoBr, 4236 198-217   18 Bust dr. arm. fac- ing r., head with lau. straight, in his r. straight, in his r. NyumoBr, 30,10 4236 198-217   18 Bust dr. arm. fac- ing r., head with lau. straight, in his r. NyumoBr, 30,10 4236 198-217   19 AVT K M AVPH AVT K M AVPH ANTRONINOC OVAIIIAC NyumoBr, 4275 198-217   19 Bust dr., arm. fac- ing r., head with lau. IAVTAAIAC - NyumoBr, NyumoBr, 4275 198-217   19 Bust dr., arm. fac- ing r., head with lau. in her l. a 30,00 4275 198-217		8845	4465					
CaracallaCaracalla[]P CEV - ANTΩNINOCOV[] - IAVTAAIACOV[] - IAVTAAIACMyuuwoBb, 423618Bust dr., arm. fac- ing r., head with lau.OV[] - Asclepius st. straight, in his r. straight, in his r. straight, in his r. straight, in his r. straight, in his r. SOV[] - 44,75MyuuwoBb, 423618Bust dr., arm. fac- lau.NTCNINOC MyuumoBb, straight, in his r. straight, in his r. SId., 4236MyuuwoBb, 423619Bust dr., arm. fac- ing r, head with lau.OV/AIIIAC OV/AIIIACIs. 30,00Is. 427519Bust dr., arm. fac- ing r, head with lau.Is. in her so,00Is. 30,004275		198-217	Мушмовъ, 198-217 4275					
CaracallaCaracalla[]P CEV - I.NTA/NINOCOV[] - I.AVTA/IACI4,75 30,1018Bust dr., arm. fac- ing r., head with lau.NTC/I.NINOC Asclepius st. straight, in his r. straight, in his r. straight, in his r. S14,75 30,1018Bust dr., arm. fac- ing r., head with lau.OV[] - I.AVTA/IAC Asclepius st. straight, in his r. S14,75 30,1019AVT K M AVPH ANTONINOC ing r., head with lau.OV/MIIAC OV/MIIAC OV/MIIAC OV/MIIAC 		Мушмовъ, 4236						
CaracallaOVI]-[]P CEV -IIAVTAAAIACANT20NINOCAsclepius st.18Bust dr., arm. fac-straight, in his r.ing r., head withlau.winding snake.19ANT20NINOCOVAIIIAC19Bust dr., arm. fac-ing r., head with19Bust dr., arm. fac-ing r., head with19Bust dr., arm. fac-ing r., head with19Bust dr., arm. fac-inding snake.19Bust dr., arm. fac-inding snake.19Bust dr., arm. fac-inding snake.19Bust dr., arm. fac-r. hand holding a19Bust dr., arm. fac-r. hand holding a		14,75 30,10 S	15,77 30,00 N					
Caracalla   []P CEV -     ANTΩNINOC   Bust dr., arm. fac-     18   Bust dr., arm. fac-     ing r., head with   lau.     19   Bust dr., arm. fac-     19   Bust dr., arm. fac-     ing r., head with   lau.     19   Bust dr., arm. fac-     ing r., head with   lau.		OV[] – IIAVTAAIAC Asclepius st. straight, in his r. hand a stick with a winding snake.	ITAVTAAIAC – OVAIIIAC Concordia st. facing I., in her r. hand holding a patera above an altar, in her I. a cornucopia.					
Caracalla 18 19		[]P CEV - ANTΩNINOC Bust dr., arm. fac- ing r., head with lau.	AVT K M AVPH - ANTΩNINOC Bust dr., arm. fac- ing r., head with lau.					
	Caracalla	18	19					

8059									
197-208									
		Municipal de la construcción de	MJMMOBD,	070+					
		3,17	18,80	S					
IIAVTAAIAC –	OVAIIIAC	Dionysus, naked,	st. facing l., in his	r. hand holding	grapes, in his l. a	thvrsus			
	A CE[] –	<b>FETAC K</b>	Bust dr., arm.	facing r., head	bareheaded.				
			20			-			

147

		5054		7325	
		193-211		209-212	
		Myliimobb, 4506		MyunMoBb, unknown; but no. 4580 Tyche hold- ing a temple and a cornucopia.	
		13,39 29,70 S		19,84 33,60 S	
		AKTIA – IIVΘIA ex – IIEPINΘIΩN NEΩKOPΩN Table with two urns standing on it, in each there is a palm tree, under the table a two- handled amphora.		ΦΙΛΑΔΕΛΦΕΙΑ- [ITEPI]NΘΙΩΝ ex – NEΩKOPΩ[N] Tyche st. straight, head facing 1, in each hand holding a temple with eight pillars.	
	rus	sure	[] CEII – CEV- HPOC II Bust dr., arm. fac- ing r., head with lau.		AVT KPAT CE-IT FETAC CEB Bust dr., arm. fac- ing r., head with rad.
Perinthos	Septimius Seve	21	Geta	22	

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	206				10156
	undatable 161-175				138-161
	Мушмовь, 4729				Мушмовь, 5120
	5,82 22,30 N				17,96 30,30 N
	IIAQTEINO- IIOAE[] Apollo, naked, legs crossed st. facing r. in front of an altar, in his r. hand holding a branch, his l. lean- ing on his hin.	)			[] ANTIKOV ΦΙΛΙΠΙΟΠ[] Fluvial deity rest- ing and facing l., in his r. hand holding klasje, elbow of the l. arm leaning on a rock from which water
	ΦAVSTEINA – CE[] Bust dr. facing r.				AVT AI AΔPIAN – [] head facing r., with lau.
Plotinopolis Faustina II	23		Philippopolis	Antoninus Pius	24

2238

138-161

Myunmobd, 5120

21,21 30,30 S

springs. Illegible. Similar.

> [...] AΔPIA [...] Similar.

> > 25

149

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## REZIME NOVAC IZ KOVNICA TRAKIJE I DONJE MEZIJE NA VIMINACIJUMSKOJ NEKROPOLI "VIŠE GROBALJA"

Ključne reči: rimsko provincijsko kovanje, Trakija, Donja Mezija, Viminacium.

Na viminacijumskoj nekropoli "Više Grobalja" pronađeno je 25 primeraka bronzanog novca koji su emitovani u provincijskim kovnicama Trakije i Donje Mezije. Zastupljen je novac sedam tračkih i dve donjomezijske kovnice (Tabla 1), u rasponu od Antonina Pija do Filipa I (Tabela 2).

Analiza pojedinačnih nalaza novca, pored značaja za istraživanje cirkulacije u pojedinim delovima Carstva, pruža podatke i za bolje upoznavanje sa istorijskim okolnostima u provincijama. Za istraživače balkanskih rimskih provincija veoma je važno publikovanje, u što većoj meri, kako pojedinačnih, tako i skupnih numizmatičkih nalaza sa teritorije Mezije Superior, Mezije Inferior i Trakije. Cilj ovog rada je upravo da široj javnosti ukaže na puteve cirkulacije provincijskog kovanja između pomenutih rimskih provincija, u određenom periodu.





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# MOLEKULARGENETISCHE DETEKTION VON KRANKHEITSERREGERN AN ARCHÄOLOGISCHEM SKELETTMATERIAL AM BEISPIEL VON *YERSINIA PESTIS*

## ZUSAMMENFASSUNG

Pandemien, wie die Pest, prägten den Verlauf der Menschheitsgeschichte. Allerdings wird bis heute der Auslöser dieser Pandemien kontrovers diskutiert. So ist umstritten, ob das Bakterium Yersinia pestis, der Erreger der Pest, für die sogenannte Justinianische Pest oder den Schwarzen Tod verantwortlich war. In den hier vorgestellten Studien wurden sowohl Individuen von einer frühmittelalterlichen Grablege (Aschheim, Bavern, Deutschland) als auch aus einem mittelalterlichen Massengrab (Manching-Pichl, Bayern, Deutschland) untersucht, bei denen aufgrund der Fundumstände die Vermutung bestand, dass es sich um mögliche Pestopfer gehandelt haben könnte. Um dies zu überprüfen, wurde versucht, Yersinia-pestis-spezifische DNA-Fragmente wiederzugewinnen und zu analysieren. Genau wie die DNA des Individuums selbst, kann sich die DNA des Bakteriums, welches sich zum Zeitpunkt des Todes in der Blutbahn des Opfers befunden hat, in den skeletalen Überresten seines Opfers erhalten. Der Nachweis Y. pestis spezifischer DNA gelang bei Individuen beider Fundorte. Hierdurch ist zum einen die Todesursache der entsprechenden Individuen eindeutig bestimmt, zum anderen ist die Erkrankung für die jeweilige Bevölkerung nachgewiesen. Im Falle der Pestdetektion bei Individuen des Gräberfeldes Aschheim-Bajuwarenring handelt es sich dabei um den bis heute einzigen bekannten Hinweis, dass sich die Justinianische Pest auch nördlich der Alpen ausgebreitet hat. So bestätigt die Detektion von Y. pestis-DNA in Skelettmaterial aus den Zeiten der Justinianischen Pest und des Schwarzen Todes nicht nur, dass es sich bei diesen Pandemien höchstwahrscheinlich um die Pest gehandelt hat, sondern hilft auch, die Verbreitung der frühmittelalterlichen Pandemie zu bestimmen.

Key words: Pest, Yersinia pestis, alte DNA, molekulargenetische Paläopathologie, Paläomikrobiologie, Schwarzer Tod

#### **EINLEITUNG:**

Infektionskrankheiten führen heute noch die Liste der Todesursachen weltweit an (WHO Statistik). Diese Erkrankungen werden häufig durch bakterielle Erreger verursacht, die schon seit Jahrhunderten existieren: Ausbrüche von Pest, Typhus oder Cholera prägten in vorantibiotischen Zeiten den Verlauf der Menschheitsgeschichte (Übersichten bei Vasold 2008).

Aufgrund der nur ungenauen Beschreibung des Krankheitsbildes in historischen Quellen ist allerdings oft unklar, welches Bakterium der Auslöser für eine bestimmte historisch überlieferte Epidemie war. Weiterhin ist die Feststellung eines Seuchengeschehens in einzelnen historischen Populationen mit großen Schwierigkeiten verbunden, da die historische Quellenlage häufig nicht vollständig ist. Problematisch sind aber insbesondere Zeiträume oder Regionen für die historische Überlieferungen fehlen. Im archäologischen Befund können zwar z. B. Massengräber Hinweise auf Epidemien geben, deren Ursache kann allerdings nicht genauer eingegrenzt werden.

Einen weiteren und den einzigen direkten Zugang zur Aufklärung historischer Epidemien stellen skeletale Überreste von Lebewesen dar. Doch die wenigsten Infektionskrankheiten lassen sich morphologisch detektieren, so hinterlassen z. B. Pest oder Typhus keine sichtbaren Spuren am Skelett. Allerdings kann sich die DNA bakterieller Erreger von Infektionskrankheiten im Knochenoder Zahnmaterial ihrer Opfer erhalten haben. Die Analyse dieser "alten DNA" (aDNA) aus historischen Skelettfunden bietet somit einen neuen Zugang zur Erforschung der Epidemiologie von Infektionskrankheiten in vergangenen Zeiten und historischen Bevölkerungen. Der Nachweis von Erkrankungen mittels Detektion von Erreger-DNA aus historischem Knochenmaterial (molekulargenetische Paläopathologie, Paläomikrobiologie) ist ein relativ junges und sich aktuell stark entwikkelndes forschungsgebiet. Die aktuelle Datenlage zeigt, dass Wirt-assoziierte mikrobielle DNA für bis zu 20 000 Jahren erhalten bleiben kann (Übersicht bei Drancourt and Raoult 2005: 23-35). Bis heute konnten so zum Beispiel folgende Infektionskrankheiten an historischem humanen Skelettmaterial molekulargenetisch nachgewiesen werden: Tuberkulose (Übersicht bei Donoghue et al. 2004: 584-592, Stone et al. 2009: 66-94), Lepra (z. B. Donoghue et al. 2001: 177-182), Syphilis (z. B. Kolman et al. 1999: 2060-2063), Malaria (Sallares and Gomzi 2001: 195-213) und Typhus (Papagrigorakis et al. 2006: 206-214).

In dem vorliegenden Manuskript werden Ergebnisse aus vorherigen Studien zur Pest aus unserer Arbeitsgruppe (Garrelt and Wiechmann 2003: 247-254, Wiechmann and Grupe 2005: 48-55, Wiechmann et al. 2010: 1806) zusammengefasst, um die Möglichkeit des Nachweises darzustellen. Die Implikationen der Ergebnisse dieser Studien hinsichtlich der Erforschung der Pest werden anschließend unter Betrachtung weiterer molekulargenetischer Studien diskutiert.

## Der Pesterreger, seine Ökologie und das induzierte Krankheitsbild

Verursacht wird die Infektionskrankheit Pest durch das Bakterium *Yersinia pestis*, einem gramnegativen, fakultativ anaerobem Stäbchenbakterium, das zur Familie der *Enterobacteriaceae* gehört.

Die Pest ist eine Zoonose, die hauptsächlich bei wild lebenden Nagetieren auch heute noch in den USA, Teilen Südamerikas, Südafrikas, Südostasiens und Madagaskars vorkommt (Gage and Kosoy 2005: 507). *Yersinia pestis* existiert in diesen Reservoirs in sogenannten enzootischen Zyklen, bei denen die Übertragung zwischen den Tieren, die teilresistent gegen die Erkrankung sind, durch Flöhe vermittelt wird. Gelegentlich kommt es zu der Übertragung auf einen gegen die Krankheit empfindlicheren Wirt außerhalb dieses enzootischen Zyklus, was zu einer hohen Sterblichkeit unten diesen führt (epizootischer Zyklus) (Übersicht bei Gage und Kosoy 2005: 507–509).

Pestepidemien in menschlichen Populationen treten in der Regel dann auf, wenn der Pesterreger in Rattenpopulationen einbricht, die nahe dem Menschen leben (insbesondere im Falle der Hausratte *Rattus rattus*) Die infizierten Rattenflöhe (*Xenopsylla cheopis*) befallen nach dem Massensterben ihres Primärwirtes - der Ratte - auch den Menschen (Klassischer Pestzyklus).

Bei einer Erkrankung des Menschen werden mehrere Formen der Pest unterschieden (nach Poland and Dennis 1999: 43-54). Die klassische Erkrankung beim Menschen ist die Beulenpest, die durch den Stich eines infizierten Flohs ausgelöst wird. Nach einer Inkubationszeit von zwei bis sechs Tagen werden die namensgebenden Schwellungen der Lymphknoten (je nach Einstichstelle im Leisten-, Achsel- oder Halsbereich) sichtbar und weitere Symptome wie Fieber, Mattheit, Bewusstseinsverwirrung etc. zeigen sich. Neben dieser Hauptform tritt noch die Pestsepsis als Infektion des Blutes, sowie die Lungenpest auf. Letztere kann sich durch Streuung des Erregers in die Lungen aus der Beulenpest entwickeln (sekundäre Lungenpest). Bei dieser Form kann dann das Pestbakterium durch Tröpfcheninfektion auch von Mensch zu Mensch übertragen werden (primäre Lungenpest). Generell variiert die Sterblichkeitsrate bei einer Pesterkrankung von 30% bis 100% (letztere bei der primären Lungenpest, Stenseth et al. 2008: 0011).

### Historische Pestepidemien

Die Pest und damit *Yersinia pestis* als ihr Verursacher wird mit mehreren historisch bekannten Pandemien in der Geschichte der Menschheit in Verbindung gebracht. Als einzig gesicherte Pestpandemie kann allerdings nur der jüngste weltweite Ausbruch der Pest im neunzehnten Jahrhundert gelten, da erst hier der Erreger *Yersinia pestis* durch Alexandre Yersin (Yersin 1894: 662-557) entdeckt und somit zweifelsfrei als Verursacher nachgewiesen werden konnte. Aufgrund überlieferter Beschreibungen von Pestepidemien der Vergangenheit, also aus der Zeit vor 1894, kann man lediglich von der Wahrscheinlichkeit ausgehen, dass diese durch den Erreger *Yersinia pestis* verursacht wurden.

Aus der Seuchenbeschreibung in der Antike lassen sich kaum sichere Diagnosen ableiten. Neben der "Pest" von Athen im Jahre 430 v. Chr., bei der Perikles stirbt, sind mehrere Seuchen aus der Zeit des römischen Reiches bekannt. Die schwerste Epidemie war die der Antoninischen "Pest", die das gesamte römische Reich zwischen 169 und 194 erfasste und zum Tod von Marcus Aurelius führte. Auch zwischen 254 und 266 wurde das Empire wiederum von einer Seuche getroffen, die ähnliche Ausmaße hatte (Übersicht bei Retief and Cilliers 2000: 267-272).

Die erste Pestpandemie, die weite Teile Europas betraf und als deren wahrscheinlichster Verursacher Y. pestis gilt, ist allerdings die sogenannte Justinianische Pest, die zum ersten Mal zur Zeit des oströmischen Kaisers Justinian I (527-565) ausbrach. Die "Pest des Justinian" i. e. S. herrschte in den Jahren 541 - 544. Auch die durch sie verursachten (die Pest blieb endemisch erhalten) nachfolgenden kleineren Epidemien werden zu der Justinianischen Pest in Abgrenzung zur mittelalterlichen Pest (Schwarzer Tod) gezählt. Der geographische Ursprung der Justinianischen Pest ist nicht eindeutig, auch weil er von den historischen Quellen unterschiedlich benannt wird (Diskussion bei Sarris 2002: 169-182). Viele Schreiber dokumentierten diese Periode, die drei Hauptquellen stammen jedoch von John von Ephesus, Evagrius Scholasticus und im speziellen Procopius, der in seiner Geschichte des Krieges (publiziert 550 nach Chr.) die Symptome und Auswirkungen beschreibt. Procopius gibt einen Ursprung der Pest in Ägypten, nahe Pelusium, an während Evagrius als Ursprung Axum (Äthiopien) angibt. Populationsgenetische Analysen rezenter Pesterreger legen allerdings einen Ursprung in Asien nahe (Morelli et al. 2010: 1143). Von diesem Ursprung verbreitete sich die Pest über die römische Welt, wobei ihre Verbreitung von Handelswegen und Truppenbewegungen durch Justinian gefördert wurde. Sie trat nach den historischen Quellen in jedem Fall in Ägypten im Jahr 541 auf, um 543 erreichte sie Italien und im gleichen Jahr Syrien und Palästina, von wo sie sich nach Persien ausbreitete. Gregor von Tours beschreibt wie die Bewohner von Clermont-Ferrand in Gallien vom heiligen St. Gallen im Jahr 543 vor der Pest gerettet wurden.

Die Opfer dieser Pandemie können nur geschätzt werden. Procopius gab an, dass 10000 Menschen täglich in Konstantinopel starben (Übersicht bei Little 2007: 1-32). Sicher ist, dass der Einfluss dieser Pandemie auf die römische Welt beträchtlich gewesen sein muss. Nach Bergdolt (2006) beeinflusste nie wieder eine Seuche so umfassend und nachhaltig die politische und kulturelle Entwicklung einer Epoche wie die Pest zur Zeit der Völkerwanderung. Inwieweit sie das östliche Imperium schwächte und zu dessen Untergang beitrug, wird diskutiert (Sarris 2002: 169-182). Während der Kaiser die Pest 544 für das byzantinische Reich offiziell für erloschen erklärte, flackerte sie 577 wieder auf und blieb etwa 200 Jahre endemisch (Bergdolt 2006).

Die am besten greifbare historische Pandemie ist jedoch die des Schwarzen Todes im Mittelalter (1347-1353). Diese Pandemie nahm, den geschichtlichen Schilderungen und auch molekulargenetischen Daten zufolge, ihren Ausgang in China (Morelli et al. 2010: 1140-1143) und forderte in Europa bis zu 25 Millionen Todesopfer. Von der Zeit des Schwarzen Todes an traten immer wieder einzelne Pestepidemien bis zum Beginn des 18. Jahrhunderts auf (die hier, nicht ganz treffend, als mittelalterliche Pest zusammengefasst werden). Der letzte große Pestausbruch erfolgte 1720-1722 in Marseille (z.B. Vasold 2008). Nach Bergdolt (2006) stellt diese Pandemie und die darauffolgenden Epidemien einen der großen, europäischen Erinnerungsorte dar. Seit Jahrhunderten verbindet man mit der Pest Leiden, Verzweiflung, ein einsames und qualvolles Sterben, die Auflösung gesellschaftlicher Bindungen, den Verlust religiöser oder weltanschaulicher Sicherheit und einen menschlichen Ausnahmezustand. Der schwarze Tod hatte enorme Auswirkungen in allen Bereichen der Gesellschaft. So werden beispielsweise die mittelalterlichen Judenmorde und Geißlerzüge mit der Angst vor der Pest begründet, verschiedene Versorgungskrisen und wirtschaftliche Krisen durch den Bevölkerungsrückgang verursacht, spezielle Schutzpatrone gegen die Pest etabliert und die Pest als Thema der bildenden Kunst spätestens ab der Barockzeit etabliert (Bergdolt 2006, Achilles-Syndram 1995: 94–122, Dormeier 1995: 54–94, Wilderotter 1995: 12–53).

#### Wirklich die Pest?

Das Wissen um die Art der Erkrankung, die in einer Bevölkerung grassiert, ist zentrales Thema der Geschichte. Nur so wird ermöglicht, das Auftreten und die Verbreitung einer historisch bekannten Epidemie mit ihren sozialen und physischen Umwelten und der Alltagserfahrung der Menschen in Verbindung zu bringen. Krankheiten sind sicherlich zum Teil ein kulturelles Konstrukt und die moderne Pesterfahrung lässt sich nicht in allen Punkten mit der vorantibiotischen historischen Pesterfahrung vergleichen (siehe hierzu Cunningham 1992: 209-244). Allerdings liegt einer Erkrankung eine pathologische Realität zugrunde. Die Kenntnis der Ursache einer Erkrankung führt nicht nur dazu das individuelle Leiden der Erkrankten nachzuzeichnen, sondern auch Fragen bezüglich der Umweltbedingungen, die einen Ausbruch und die Verbreitung der Krankheit erlaubt haben, zu beantworten.

Die Diagnose Pest ist insbesondere für die antiken Epidemien bis zum dritten Jahrhundert in Frage zu stellen. So werden, aufgrund der historischen Beschreibung des Krankheitsbildes, als Verursacher für die "Pest" von Athen (430-426 v.Chr.) eher die Pocken angenommen (Retief and Cilliers 1998: 52–53), molekulargenetische Untersuchungen weisen allerdings auf Typhus hin (Papagrigorakis et al. 2006: 214). Ebenso wird für die frühen Pandemien im Römischen Reich eher eine Pocken-, Masern-, Hautleishmaniose- oder auch Malaria- Infektion als die eigentliche Pest angenommen (Übersicht bei Retief and Cilliers 2000: 267–272).

Kontrovers diskutiert wird ebenfalls, ob es sich bei den durch historische Quellen besser erfassbaren Epidemien des Justinianischen Zeitalters und des Schwarzen Todes wirklich um die durch Y. pestis verursachte Infektionskrankheit Pest handelt (Übersicht bei Benedictow 2011). Gegen die Diagnose Pest spricht, dass das epidemiologische Geschehen im Mittelalter zum Teil von der Pandemie im 19ten Jahrhundert abweicht und sich häufig nicht schlüssig durch den klassischen Pestzyklus Hausratte - Rattenfloh - Mensch erklären lässt (Übersicht bei Vasold 2003, 2008). Als Alternative zu der von Y. pestis verursachten Pest werden für diese Pandemien andere Infektionen wie Anthrax (Twigg 1984) und ein hämorrhagisches Fieber (Duncan und Scott 2005: 319) postuliert.

Die Untersuchung von archäologischem Material auf die DNA des Pesterregers kann also nicht nur dazu dienen die Krankheit in der jeweiligen untersuchten Population nachzuweisen, sondern auch dazu beitragen, diese Diskussion um den Erreger historischer "Pest"-Pandemien zu beenden.

# DAS ARCHÄOLOGISCHE MATERIAL

In den hier vorgestellten Studien wurde von zwei verschiedenen Fundorten, die in den Zeitraum der zwei großen historischen Pestpandemien fallen, archäologisches Skelettmaterial auf die Anwesenheit des Erregers *Y. pestis* untersucht.

# Frühmittelalterliches Gräberfeld Aschheim – Bajuwarenring

Auf dem Gebiet der heutigen Gemeinde Aschheim kamen an mehreren Stellen bajuwarische Gräber zu Tage. Die Nekropole der frühmittelalterlichen Siedlung (Aschheim-Bajuwa-

renring, Lkr. München, Bayern, Deutschland) wurde schließlich in den Jahren 1997 und 1998 geborgen, sie datiert in die Zeit des 6. und 7. Jahrhunderts nach Christus. Insgesamt enthält das Gräberfeld 402 Körpergräber mit insgesamt 444 Bestatteten. Aufgrund der Bestattungsanzahl und der Belegungsdauer der Nekropole kann auf eine durchschnittliche Größe der dazugehörigen Siedlung von nur geschätzten 66 Individuen geschlossen werden (Staskiewicz 2007: 41), so dass davon ausgegangen werden kann, dass hier eine kleine ländliche Gemeinschaft vorlag. Ein auffallendes Merkmal des Gräberfeldes Aschheim-Bajuwarenring sind die vielen Doppel- und Mehrfachbestattungen (insgesamt acht Prozent der Gräber). Diese sind nicht gleichmäßig über den Belegungszeitraum verteilt, sondern konzentrieren sich im Wesentlichen auf zwei Zeitabschnitte: Zum einen in das mittlere Drittel des 6. Jahrhunderts, zum anderen an das Ende des 6. Jahrhunderts. (Gutsmiedl-Schümann 2010). Dies führte zu der Vermutung eines Zusammenhangs dieser Mehrfachbestattungen mit der Justinianischen Pest, die zu dieser Zeit weiter südlich in Italien geherrscht haben dürfte.

Aus dieser Überlegung heraus wurden zwei Individuen (166 und 167) eines der Doppelgräber molekulargenetisch auf Y. pestis untersucht (Wiechmann and Grupe 2005: 48). Diese waren mit einem reichen Beigabenensemble ausgestattet. Insbesondere fiel auf, dass zwischen den Oberschenkeln der beiden Bestatteten je eine Fibel eines Bügelfibelpaares vom nordischen Typ lag (Gutsmiedl-Schümann 2005, siehe Abbildung 1) Eine der beiden hier bestatteten Frauen starb juvenil (13-16 Jahre), während die andere ein spätadultes Alter (ca. 48 Jahre) erreichte (Staskiewicz 2007: 51). Die Bestattungssituation führte dementsprechend zu der Vermutung, dass es sich bei diesen beiden Individuen um Verwandte gehandelt haben könnte, was ebenfalls molekulargenetisch überprüft werden sollte.



#### Abbildung 1:

Links: Doppelgrablege mit Individuen 166 und 167 aus dem frühmittelalterlichen Gräberfeld Aschheim-Bajuwarenring (Bayern, Deutschland). Rechts: Je eine Fibel eines Bügelfibelpaares vom nordischen Typ, welche bei jedem Individuum zwischen den Oberschenkeln lag (Nr. 7 bei Individuen 167, Nr. 9 bei Individuum 166). Abbildung aus Gutsmiedl-Schümann 2005.

# Mittelalterliches Massengrab Manching-Pichl

Während einer im Jahr 1984 stattgefundenen Renovierung der katholischen Pfarrkirche St. Leonhard im Ort Pichl, Gemeinde Manching, Landkreis Pfaffenhofen an der Ilm (Bayern, Deutschland), wurden im Erdreich unterhalb der Sakristei zahlreiche Skelettfunde freigelegt. Der archäologische Befund ergab 75 Skelette sowie einige Sammelfunde. Im Vergleich zum üblichen Aussehen eines mittelalterlichen Dorffriedhofes handelte es sich bei der vorgefundenen Grabstätte um einen ungewöhnlichen Fund: Die Skelettindividuen lagen dicht gedrängt in vier Schichten übereinander (Abbildung 2). Einzelne Grabgruben, also zeitlich getrennte Aushebungen, konnten nicht festgestellt werden. Für die Toten wurde augenscheinlich kaum eine Grube ausgehoben; die Toten wurden vielmehr beinahe ebenerdig niedergelegt und schichtweise mit Sediment bedeckt. All diese Details zeigen, dass es sich bei den aufgefundenen Skelettfunden um ein Massengrab handelt. Da keine Grabbeigaben vorlagen, konnte eine zeitliche Zuordnung der Skelette nur anhand begleitender Bauelemente erfolgen. Baubefund und Baumaterialien führten zu der Hypothese, dass es sich bei dem Fund um ein Massengrab handeln könnte, in dem die Opfer einer Pestwelle der großen Pandemie des "Schwarzen Todes" des 14. Jahrhunderts bestattet worden waren. (Garrelt and Wiechmann 2003: 247) Für die Überprüfung der Funde auf Y. pestis wurden 33 Individuen ausgewählt.



Abbildung 2:

Mittelalterliches Massengrab unterhalb der Sakristei der Pfarrkirche St. Leonhard (Manching-Pichl, Bayern, Deutschland), mit freundlicher Genehmigung des Bayerischen Landesamtes für Denkmalpflege.

## **METHODEN**

Der Nachweis bakterieller Erreger von Infektionskrankheiten in archäologischem Skelettmaterial gelingt über die Detektion spezifischer Abschnitte der DNA des Erregers. So kann sich z. B. im Falle der Pest der Erreger *Y. pestis* zum Zeitpunkt des Todes des Individuums in seiner Blutbahn befinden. Auch nach dem Tode und der Skelettierung können daher nicht nur DNA-Reste des Individuums selbst, sondern auch von *Y. pestis* in den Überresten des Pestopfers vorhanden sein.

## Generelle Betrachtung zur Analyse alter DNA

Die Analyse von alter DNA stellt besondere methodische Anforderungen, verursacht durch die Instabilität von Nukleinsäuren nach dem Tod des Individuums. In toten Geweben sammeln sich DNA-Schäden aufgrund spontaner Hydrolyse und Oxidation an, was dazu führt, dass viele archäologische Proben keine DNA mehr enthalten. Ist noch Erbinformation vorhanden, ist sie durch Strangbrüche, Basenverluste, fehlkodierende Läsionen und Quervernetzungen gekennzeichnet. So resultieren erhöhte methodische Anforderungen bei der Analyse von alter DNA und es lassen sich überwiegend nur kleine Fragmente wiedergewinnen. (Willerslev and Cooper 2005: 5–6).

Bei dem meist unumgänglichen Einsatz des Verfahrens der Polymerasekettenreaktion (PCR) werden zudem bevorzugt unbeschädigte Nukleinsäuren vervielfältigt, was die Gefahr von Kontaminationen stark erhöht (Willerslev und Cooper 2005: 6). Daher sind viele molekulargenetische Nachweise von Erreger-DNA umstritten (z. B. Barnes and Thomas 2006: 651; Gilbert et al. 2004: 342). Die Ursache hierfür liegt in der unzureichenden Sicherung der Authentizität der gewonnenen Daten (Roberts and Ingham 2008: 609). Die Problematik besteht in noch stärkerem Ausmaß bei der Analyse von menschlicher DNA, da sich hier ungleich größere Kontaminationsmöglichkeiten z. B. mit der DNA der archäologischen und anthropologischen Bearbeiter bieten. So bestehen für die Analyse von aDNA besondere Richtlinien (z.B. Gilbert et al. 2005: 541), welche die Authentizität der gewonnenen aDNA-Ergebnisse sichern sollen. Unter anderem ist ein speziell für diese Anforderungen ausgestatteter Reinstraum notwendig, in dem ausschließlich mit alter DNA gearbeitet wird, um Kontaminationen mit modernem Probenmaterial zu vermeiden. Hier wird die DNA aus dem Skelettmaterial extrahiert und es werden Analyseschritte vor der Vervielfältigung durchgeführt. Um Kontaminationen mit schon vervielfältigter DNA (Amplifikate) aus vorherigen Studien zu vermeiden, sollte dieser Reinstraum vollständig räumlich und logistisch getrennt von allen Analyseschritten sein, bei denen mit mittels PCR vervielfältigter DNA gearbeitet wird.

#### Molekulargenetische Detektion von Y. pestis

Für die DNA-Analyse wurden ausschließlich Zähne verwendet, da hier sowohl die Quantität als auch die Qualität der DNA erfahrungsgemäß höher ist. Es wurden weiterhin sogenannte Negativkontrollen sowohl bei der Extraktion als auch bei den PCRs mitgeführt; diese sollen eine ggf. eingeschleppte Kontamination während des Analyseprozesses detektieren. Verwendete Arbeitsgeräte sowie Arbeitsflächen wurden – je nach Materialbeschaffenheit – mit Natriumhypochlorit (NaOCl) bzw. Aceton gereinigt sowie UV-bestrahlt, weiterhin wurden nur als DNA-frei deklarierte Chemikalien zur Analyse verwendet.

Abbildung 3 zeigt eine Übersicht über den im Folgenden beschriebenen Arbeitsablauf:

Nach dem Reinigen der Proben (Details siehe bei Wiechmann and Grupe 2005: 49), werden diese mittels Kugelschwingmühle homogenisiert. Aus dem entstehenden Knochenmehl wird die DNA nach einem Protokoll basierend auf dem von Yang et al. (1998: 540) extrahiert. Anschließend werden für *Y. pestis* spezifische DNA-



Abbildung 3:

Arbeitsablauf der Analyse von alter DNA (Fotos Lisa Seifert). 1: Reinigen und Homogenisieren des Zahnmaterials, 2: Extraktion der DNA, 3: Vervielfältigung definierter DNA-Fragmente mittels Polymerasekettenreaktion (PCR), 4: Überprüfung des PCR-Erfolges mittels Gelelektrophorese, 5: Sequenzierung und Auswertung

Fragmente gezielt mittels des Verfahrens der PCR amplifiziert. Dabei handelt es sich um Abschnitte eines Plasmids des Bakteriums (pPCP1), das im Gegensatz zur chromosomalen DNA in erhöhter Kopienzahl vorliegt und so zur Analyse besonders geeignet ist (Parkhill et al. 2001: 523). Als Referenz diente die in GenBank veröffentlichte Nukleotidsequenz des Plasmids pPCP1 von *Y. pestis* Stamm CO92 (GenBank accession no. AL109969.1).

Bei allen Individuen wurde versucht den Sequenzabschnitt 7116 – 7263 (148 bp) des auf dem Plasmid pPCP1 lokalisierten *pla*-Gens (*pla*-Region 1) zu amplifizieren (Abbildung 4). Dafür wurde das zuvor von Raoult et al. (2000: 12801) beschriebene Pimerpaar YP12D/YP11R genutzt. Bei einigen Individuen wurde darüber hinaus das ebenfalls von Raoult et al. (2000: 12801) beschriebene Primerpaar YP11D/YP10R eingesetzt (*pla*-Region 2, Position 7242 – 7389).

Ein weiterer Sequenzabschnitt (130 bp) des *pla*-Gens ließ sich mit dem Primerpaar YP14F/ YP13R amplifizieren (*pla*-Region 3, Position 6953 – 7082). Zum Einsatz kamen ferner das Primerpaar pst-F/pst-R, mit dem ein Sequenzabschnitt (129 bp) des *pst*-Gens (Abb. 4) amplifiziert werden kann (Position 5026 – 5154), sowie das Primerpaar PCP-F/PCP-R, mit dem ein weiterer, 130 bp langer Sequenzabschnitt (Position 8428 – 8557) auf dem Plasmid vervielfältigt werden kann. Die Primersequenzen und PCR-Bedingungen entnehme man Wiechmann and Grupe (2005: 49-50) sowie Wiechmann et al. (2010: 1806).

Um festzustellen, ob die entsprechenden Fragmente erfolgreich amplifziert werden konnten, wurden die PCR-Produkte anschließend gelelektrophoretisch aufgetrennt. Mit diesem Verfahren lassen sich die gewonnenen Amplifkate nach ihrer Größe auftrennen. Gleiche Moleküle laufen in diskreten Zonen (Banden) bei Anlegen eines elektrischen Feldes durch das Gel. Die DNA wird durch Silberfärbung (Protokoll siehe Wiechmann and Grupe 2005: 50) sichtbar gemacht und die Größe der DNA-Fragmente kann durch Abgleich mit einem mitlaufenden Standard (DNA-Leiter) abgeschätzt werden.

Konnte eine Bande der erwarteten Fragmentlänge auf dem Gel nachgewiesen werden,



Abbildung 4: Plasmid pPCP1 von *Y. pestis*. Roter Pfeil: pla-Gen, blauer Pfeil: pst-Gen.

wurde das Amplifikat anschließend sequenziert (mittels Sanger-Sequenzierung, Protokolle siehe Wiechmann and Grupe 2005: 51, Wiechmann et al. 2010: 1806), d.h. die Basen-Abfolge des erhaltenen DNA-Moleküls (Sequenz) wurde dargestellt.

#### Verwandtschaftsanalyse

Der prinzipielle Ablauf einer Verwandtschaftsanalyse bei alter DNA entspricht dem der molekulargenetischen Detektion von *Y. pestis* (Abbildung 3).

Dabei werden bestimmte Abschnitte der DNA des Individuums mittels PCR vervielfältigt, die dazu geeignet sind Auskunft über verwandtschaftliche Beziehungen zu geben. Hierbei handelt es sich z. B. um die Hypervariable Region I (HVRI) der mitochondrialen DNA. Mitochondrien befinden sich beim Menschen zusätzlich zur chromosomalen DNA in der Zelle und liegen im Gegensatz zu dieser in erhöhter Kopienzahl vor. Dementsprechend ist ihre Erhaltungswahrscheinlichkeit gegenüber der chromosomalen DNA (ebenso wie bei den Plasmiden von Y. pestis) erhöht. Mitochondriale DNA wird ausschließlich mütterlich vererbt, abgesehen von Mutationen stimmt also die mtDNA jeder Person mit jener ihrer Mutter, ihrer Geschwister und ihrer Verwandten der mütterlichen Linie überein. Diese beiden Eigenschaften (gute Erhaltungswahrscheinlichkeit, nur mütterliche Vererbung) machen die mitochondriale DNA so gut geeignet für genealogische Untersuchungen von skeletalen Überresten.

Eine Verwandtschaftsanalyse wurde für die zwei frühmittelalterlichen Individuen aus Aschheim durchgeführt. Der amplifizierte mtDNA-Sequenzbereich umfasste unter Einbeziehung von zwei überlappenden Amplifikationsprodukten insgesamt 354 bp (Position 16056 bis 16409, Nummerierung nach rCRS, Andrews et al. 1999). Primerpaare und PCR-Bedingungen entnehme man Wiechmann and Grupe (2005: 49-50). Die erhaltenen Amplifikate wurden wiederum mittels Gelelektrophorese aufgetrennt und bei erfolgreicher Signaldarstellung sequenziert. Die erhaltenen Sequenzen wurden anschließend miteinander verglichen, um eine mütterliche Verwandtschaft der Individuen zu überprüfen. Chromosomale DNA war leider nicht ausreichend erhalten, um eine Aussage zur Verwandtschaft der beiden Individuen zuzulassen, so dass die Darstellung dieser Analysen hier ausgespart bleibt (vgl. Wiechmann and Grupe 2005: 52).

## ERGEBNISSE

Es gelang bei Individuen beider Grabgruppen *Y. pestis*-spezifische DNA-Abschnitte nachzuweisen. In beiden Studien blieben alle mitgeführten Negativkontrollen (Extraktions- und PCR-Kontrollen) ohne Befund. Die Standards für die Analyse alter DNA wurden eingehalten. Daher ist davon auszugehen, dass die im Folgenden vorgestellten Ergebnisse authentisch sind.

# Frümittelalterliches Doppelbegräbnis Aschheim-Bajuwarenring

Für beide Individuen konnten *Y. pestis*spezifische Fragmente der *pla*-Region 1 (siehe Methoden) gewonnen werden. Die Sequenzresultate der Amplifikate ergaben eine 99% - 100%ige Übereinstimmung mit der in GenBank (Accession no. AL109969.1) veröffentlichten Nukleotidsequenz (Nukleotide 7136-7241) des auf dem *Y. pestis*-spezifischen Plasmids pPCP1 lokalisierten *pla*-Gens (Parkhill et al. 2001).

Es gelang von beiden Individuen der Doppelgrablege mitochondriale DNA-Fragmente der HVRI – Region zu gewinnen. Beide Individuen weisen die gleichen Abweichungen von der Referenzsequenz rCRS auf: 16069 T, 16126 C, 16145 A, 16231 C, 16261 T.

Daraus lässt sich eine mögliche Zuordnung zur mitochondrialen Haplogruppe J vermuten, welche häufig in Europa und dem Nahen Osten vorkommt (nach van Oven und Kayser 2009), eine sichere Zuordnung wäre allerdings nur durch die Einbeziehung weiterer Regionen möglich.

Der vorgefundene Haplotyp weist in der Empop-Datenbank (http://empop.org/, Version

2.1, Release 5) eine Häufigkeit von 2.007e<sup>-3</sup> auf, d.h. nur 21 von 10261 untersuchten Individuen in dieser Datenbank weisen diese spezifische HVR I – Sequenz auf. Eine Verwandtschaft der beiden Individuen über die mütterliche Linie ist damit relativ sicher anzunehmen.

## Mittelalterliches Massengrab Manching-Pichl

Bei den Individuen des Massengrabes von Manchig-Pichl konnten bei 10 von 33 untersuchten Individuen positive Signale bei Amplifizierung der *pla*-Region 1 erzielt werden (Garrelt and Wiechmann 2003: 252). Um zu überprüfen, ob die erhaltenen Amplifikate tatsächlich den gesuchten *Y. pestis*-spezifischen DNA-Sequenzabschnitt aufweisen, wurden Amplifikationsprodukte von fünf Individuen sequenziert. Die Sequenzresultate ergaben eine 94% – 100%ige Übereinstimmung mit der in GenBank veröffentlichten Referenzsequenz (GenBank accession no. AL109969.1). Die



Abbildung 5:

Silbergefärbtes Polyacrylamidgel, das aus alter DNA amplifizierte *Y. pestis pla*-Fragmente (130 bp) aufzeigt (Spuren 3 und 6). Spuren 1 – 6: DNA-Extrakte menschlicher Zahnproben (Manching-Pichl, Bayern), Spur 7: Extraktionskontrolle, Spur 8: PCR-Negativkontrolle, Spur 9: 20 bp DNA-Leiter, Spur 10: 50 bp DNA-Leiter, Spuren 11 und 12: Amelogenin-Marker zur Geschlechtsbestimmung. beobachteten Sequenzabweichungen beruhen höchstwahrscheinlich auf Degradationsprozessen in der DNA während der Liegezeit. Degradationsbedingte Sequenzartefakte kommen in alter DNA häufig vor und erklären sich durch Desaminierung bedingte Modifikationen in der *template* DNA (Hofreiter et al. 2001: 4797).

Das Ausbleiben eines Amplifikationserfolges bei 23 der 33 untersuchten Individuen ist indes nicht als Negativbefund zu bewerten. Das Ausbleiben eines positiven Signals kann, neben methodischen Gründen, vielerlei Ursachen haben, z. B., dass der Erreger sich nicht in die Blutbahn des Individuums ausgebreitet hatte, die Erreger-DNA nicht erhalten geblieben ist oder das entsprechende Individuum tatsächlich nicht mit *Y. pestis* infiziert war. Daher sind Negativbefunde bei dem Versuch molekulargenetisch Erreger-DNA nachzuweisen prinzipiell nicht aussagekräftig.

Die weiterführenden Analysen konzentrierten sich auf sechs Individuen des Massengrabes von Manchig-Pichl, deren DNA-Extrakte für die *pla*-Region 1 bereits positiv getestet werden konnten. In Abbildung 5 ist beispielhaft ein silbergefärbtes Polyacrylamidgel mit entsprechend angefärbten DNA-Amplifikaten der *pla*-Region 3 zu sehen.

Eine Zusammenstellung aller bei Individuen aus Manching-Pichl hinsichtlich *Y. pestis*-DNA bislang erfolgten Analysen ist in Tabelle 1 dargestellt. In dieser Tabelle ist auch zu ersehen, dass es nur bei drei der zehn für die *pla*-Region 1 positiv getesteten Individuen gelang den Befund häufig zu reproduzieren.

Die Ursache hierfür mag darin liegen, dass die Quantität der DNA in den nur vereinzelt amplifizierbaren Proben am Detektionslimit der verwendeten PCR lag, so dass es vom Zufall abhing, ob genügend Matrizen für eine Vervielfältigung in die PCR-Reaktion eingesetzt werden konnten. Wie man in Tabelle 1 erkennt, ist es aber auch nur bei den drei häufig reproduzierbar amplifzierbaren Proben gelungen, weitere Abschnitte des

Individuum/	Sterbealter/	Geschlecht/	YP12D/	YP11D/	YP14F/	pst-F/	PCP-F/
individual	age at death	sex	YP11R	YP10R	YP13R	pst-R	PCP-R
1-I	adult	W	01 / 42				
2	adult	m	0 / 4				
5-I	25-30	m	0 / 4				
15-I	~ 8	m	0 / 4				
17-I	~ 11	m	2 / 10	0 / 1	0 / 2	0 / 1	0 / 1
22	20-22	W	1 / 6	0 / 1			
26-I	adult	m	1 / 4				
28-I	~ 8	m	0 / 4				
34-I	adult	W	6 / 6			1 / 1	1 / 1
40	20-25	m	0 / 4				
44-III	~ 5	W	1 / 4				
49-I	matur	m	0 / 4				
50	adult	W	0 / 4				
64-I	matur	W	0 / 4				
67-II	matur	m	0 / 4				
73-I	20-25	m	3 / 10	0 / 2	0 / 2		
74	adult	W	0 / 4				
S1-I	~ 8	m	6 / 6	4 / 4		1 / 1	1 / 1
S2-II	adult	m	0 / 4				
S3-IIX	12-14	m	1 / 4				
S3-IX	11-13	?	0 / 4				
S4-III	adult	W	0 / 4				
S4-IV	adult	W	0 / 4				
S4-VI	~ 10	m	1 / 4				
S4-XX	~ 15	W	9 / 10	2 / 2	2 / 2	3 / 3	2/3
S8-III	matur	W	0 / 4				
S8-VII	20-25	W	0 / 4				
S11-II	adult	W	0 / 4				
S11-IV	matur	m	0 / 4				
S13-I	20-25	W	0 / 4				
S13-IX	matur	m	0 / 4				
S14-I	15-16	m	0 / 4				
S15-I	matur	m	0 / 4				

Tabelle 1:

Zusammenfassung der erhaltenen Amplifikationsresultate für die getesteten Individuen aus der St. Leonhard-Kirche in Manching-Pichl. Diverse, auf *Y. pestis*-DNA ausgerichtete, Primerpaare wurden eingesetzt.

1 = Anzahl erfolgreicher Amplifikationen; 2 = Anzahl der Amplifikationsreaktionen (PCRs), m = männlich; w = weiblich

Plasmids pPCP1 zu vervielfältigen. Sequenzierte Amplifikate der *pla*-Region 2 resultierten in einer 96% - 100%igen Übereinstimmung mit der Referenzsequenz, wobei auch hier die beobachteten Sequenzabweichungen voraussichtlich auf durch Desaminierung bedingte Modifikationen in der *template* DNA zurückzuführen sind. Die Sequenzabschnitte der *pla*-Region 3 und des *pst* entsprachen der Referenzsequenz (GenBank accession no. AL109969.1) zu 100%.

Abweichungen zu dieser Referenzsequenz wurden jedoch nach Sequenzierung der mit dem Primerpaar PCP-F/PCP-R erhaltenen Amplifikate beobachtet. So weisen die Sequenzen der untersuchten Individuen an den Nukleotidpositionen 8528-8532 nur 3 T auf, während die Referenzsequenz (*Y. pestis* strain CO92, plasmid pPCP1, GenBank accession no. AL109969.1) an diesen Nukleotidpositionen 5 T zeigt (Wiechmann et al. 2010: 1807).

### DISKUSSION

Im Falle der frühmittelalterlichen Doppelgrablege konnte der Erreger in beiden Individuen nachgewiesen werden. Damit ist als Todesursache dieser Frauen die Pest anzunehmen. Zusätzlich konnte eine Verwandtschaft der Individuen über die mütterliche Seite gezeigt werden. Die Art der Verwandtschaft kann allerdings nicht näher eingegrenzt werden, Abbildung 6 zeigt ein Schema der Vererbung der mitochondrialen DNA - wie man sieht, kommen sowohl ein Mutter/Tochter-Verhältnis, als auch z.B. Großmutter/Enkelin, Cousinen oder Tante/Nichte - Interpretationen in Frage. Ein enges Verwandtschaftsverhältnis erscheint allerdings nicht nur aufgrund der Bestattungssituation wahrscheinlich, sondern wird auch von den archäologischen Funden unterstützt - die beiden Individuen teilen sich ein identisches Bügelfibelpaar (siehe Abbildung 1), welches als re-



Abbildung 6:

Mütterliche Vererbung der mitochondrialen DNA für 21 Individuen in einem hypothetischen Stammbaum. Quadrate repräsentieren Männer, Kreise Frauen. Jeder mtDNA-Typ (Haplotyp) wird durch ein unterschiedliches Muster repräsentiert. lativ wertvoll eingeschätzt werden darf und wahrscheinlich in der Familie vererbt wurde (Reimann et al. 2000: 84-85). Betrachtet man das Sterbealter der gemeinsam bestatteten Frauen – eine verstarb juvenil, die andere spätadult - erscheint daher eine Mutter/Tochter-Interpretation, am plausibelsten.

Im Falle des mittelalterlichen Massengrabes gelang es gut reproduzierbar nur bei 9% der untersuchten Individuen den Erreger *Y. pestis* nachzuweisen. Dieses Ergebnis entspricht den Studien anderer Arbeitsgruppen (z. B. Haensch et al. 2010: 2) und verdeutlicht die Schwierigkeiten bei der Gewinnung alter DNA aus skeletalen Überresten. In einigen Fällen konnten nur einige Regionen des untersuchten Plasmides amplifiziert werden, was wiederum den Ergebnissen anderer Arbeitsgruppen (z.B. Haensch et al. 2010: 2) entspricht und auf degradationsbedingte Schäden der DNA zurückzuführen ist.

Auch wenn bislang nur für drei Individuen aus dem Massengrab sicher nachgewiesen werden konnte, dass sie Opfer der Pest waren, sprechen die Fundumstände dafür (siehe oben), dass dies wahrscheinlich auch für die anderen Individuen der Grablege zutrifft.

Die wahrscheinlichste Erklärung für den Fund des Massengrabes unter der Sakristei ist dementsprechend eine Pestwelle im mittelalterlichen Manching-Pichl, die zu so einer hohen Anzahl von Opfern führte, dass ein Massengrab angelegt werden musste.

# Yersinia pestis und der Schwarze Tod des Mittelalters

Unsere Ergebnisse zum mittelalterlichen Massengrab von Manching-Pichl reihen sich in eine Reihe von weiteren Studien ein, die *Y. pestis* in mittelalterlichen Gräbern nachweisen konnten (Abbildung 7). Der molekulargenetische Nachweis von *Y. pestis* wurde zunächst für drei Skelettfunde einer Mehrfachbestattung aus dem 14. Jh. in Montpellier (Raoult et al. 2000: 12800-12803), für zwei Skelettfunde aus einem Massengrab des Jahres 1722 in Marseille sowie für zwei Skelettfunde aus einem Massengrab des Jahres 1590 im südfranzösischen Dorf Lambesc (Drancourt et al. 1998) beschrieben. Des Weiteren wurden Nachweise beschrieben von Drancourt et al. (2004: 1585-1592, 2007: 332-333), Fundorte Martigues sowie Dreux in Frankreich, Pusch et al. (2004: 485), Beinhaus in Stuttgart, Tran et al. (2011), Fundort Venedig, im Rahmen einer von Haensch et al. (2010) durchgeführten Studie (Fundorte Saint-Laurent-de-la-Cabrerisse, Frankreich, Bergen op Zoom, Niederlande und Hereford, England), sowie von Schuenemann et al. (2011) für das Londoner "East Smithfield" Massengrab.

Neben dem reinen Nachweis von Y. pestis-DNA in archäologischen Überresten ist es bei entsprechendem DNA-Erhalt auch möglich chromosomale Marker des Bakteriums zu untersuchen, die Aufschluss über die spezifische Variante von Y. pestis geben, welche die jeweilige Pestepidemie ausgelöst hat. Damit können Ausbreitungswege der Pestepidemien nachgezeichnet und die evolutive Entwicklung des Erregers aufgeklärt werden (siehe Haensch et al. 2010: 3).

Allerdings findet sich hier eine Diskrepanz bei den bisherigen Studien, in denen es gelungen ist diese Marker zu typisieren. Während Haensch et al. (2010: 5) und Schuenemann et al. (2011: 6) Erregerstämme in Skelettmaterial der zweiten Pandemie typisieren konnten, die in bestimmten Markern keinem der modernen Y. pestis-Varianten entsprechen, sondern "Vorläufertypen" darstellen, finden Drancourt et al. (2007: 333) in Skelettmaterial der ersten und zweiten Pandemie molekulargenetische Hinweise, dass es sich bei dem gefundenen Erreger um Stämme des Typus 1. ORI (vgl. Haensch et al. 2010: 6) handelt. Da unterschiedliches Material untersucht wurde, ist die Möglichkeit nicht auszuschließen, dass beide Erregertypen im Mittelalter in unterschiedlichen Regionen aktiv waren. Unter Berücksichtigung phylogenetischer Aspekte der Evolution von Y.



Abbildung 7:

Bisherige Pestnachweise an archäologischem Skelettmaterial, Dreiecke = "mittelalterliches" Material, Rauten = frühmittelalterliches Material. Daten aus Drancourt et al. (1998, 2004, 2007), Garrelt and Wiechmann (2003), Haensch et al. (2010), Pusch et al. (2004), Raoult et al. (2000), Schuenemann et al. (2011), Tran et al. (2011), Wiechmann and Grupe (2005)

*pestis* ist dies allerdings nicht sehr wahrscheinlich. Dieser Widerspruch in den bisherigen molekulargenetischen Daten zu *Y. pestis* kann nur durch Analysen an weiteren *Y. pestis*-Bakterien aus mittelalterlichem Skelettmaterial auf ihre Variantenzugehörigkeit gelöst werden. Momentan werden dementsprechende Analysen an dem Material von Manching-Pichl durchgeführt, die damit einen Beitrag zur Beantwortung dieser Frage leisten sollen.

Insgesamt betrachtet kann man allerdings aus der vorhandenen und weiter wachsenden molekulargenetischen Datenlage schlussfolgern, dass *Y. pestis* der Verursacher der zweiten Pestpandemie war.

Dies wird unterstützt durch Ergebnisse aus immunchromatographischen Untersuchungen, die das pesteigene F1-Kapselprotein durch Reaktion mit dem Anti-F1-Serum darstellen (z.B. Kacki et al. 2011: 583-587). Aufgrund möglicher Kreuzreaktionen mit anderen bakteriellen Proteinen sind diese Tests allerdings unspezifischer bzw. unsicherer als ein DNA-Nachweis (Brandt et al. 2002: 313-314).

Der Nachweis von Y. pestis steht im scheinbaren Widerspruch dazu, dass die durch historische Quellen erschließbare Epidemiologie der mittelalterlichen Pest in einigen Fällen zum Teil nicht jener der gut dokumentierten Pandemie des 19ten Jahrhunderts entspricht, aus der sich der "klassische" Ratten-Floh-Mensch-Zyklus ableitet.

Laut Stenseth et al. (2008: 0010), die die Ergebnisse mehrerer internationaler Konferenzen zum Thema zusammenfassen, zeigt allerdings die heutige Erfahrung mit modernen Pestausbrüchen, dass die klassische Pest-Epidemiologie, wie sie durch den klassischen Zyklus ausgelöst wird, nur eine von vielen Möglichkeiten ist. Dies liegt weitgehend an der komplexen Ökologie des Erregers (Gage and Kosoy 2005: 505-528) und einer Vielzahl von Übertragungswegen, die ebenfalls vom klassischen Bild abweichen können. Untersuchungen in Gegenden mit modernen Pestreservoirs zeigen, dass neben dem Ratte-Floh-Mensch-Weg weitere Möglichkeiten der Tier zu Mensch-Übertragung bestehen, z.B. Bisse von infizierten Tieren, durch den Verzehr von infiziertem Fleisch

oder über Tröpfcheninfektion durch den Umgang mit infizierten Haustieren (Übersicht bei Stenseth et al. 2008: 0012). Neben der direkten Übertragung von Mensch zu Mensch durch Tröpfcheninfektion bei der Lungenpest können Mensch zu Mensch-Übertragungen wahrscheinlich auch durch den Menschenfloh oder Läuse (Ayyadurai et al. 2010: 892) vorkommen. Abbildung 8 fasst diese Möglichkeiten zusammen.

All diese Faktoren dürften das epidemiologische Erscheinungsbild der Erkrankung weiter komplizieren. Von Drancourt et al. (2006: 239) werden verschiedene Szenarien aufgeführt, die abhängig von den ökologischen Bedingungen zu unterschiedlichen Pestbildern führen können, einige seien hier exemplarisch genannt:

Sollte der Pesterreger in wilden Nagetierpopulationen vorkommen, aber keine humanen Ektoparasiten involvieren, kommt es zu sporadischen Ausbrüchen beim Menschen (durch den Verzehr von infiziertem Fleisch, Bissen von Nagern etc.).

Kommt der Pesterreger in wilden Nagetieren und Ratten vor und sind menschliche Ektoparasiten (Menschenfloh, Laus) involviert, resultiert dies in einer sich schnell von Ort zu Ort ausbreitenden Epidemie.

Eine reine Rattenpest hingegen ohne die Einbeziehung menschlicher Ektoparasiten resultiert in vielen menschlichen Opfern (Übertragung durch den Rattenfloh), allerdings mit einer begrenzten zeitlichen und räumlichen Ausbreitung.

Zu großen Pandemien beim Menschen kommt es, wenn die Rattenpest in Kombination mit menschlichen Populationen auftritt, die schwerwiegend mit menschlichen Ektoparasiten verseucht sind.

In Anbetracht der Komplexität der Pesterscheinung, die im Einzelnen nicht vollständig geklärt ist, erscheint es doch plausibel, dass die Epidemiologie von historischen Pestausbrüchen, insbesondere in klimatisch bzw. ökologisch verschiedenen Gebieten, von Ausbruch zu Ausbruch unterschiedlich sein dürfte. Ein epidemiologisches Geschehen, das nicht allein durch den Ratte-Floh-Mensch-Zyklus erklärt werden kann, ist dementsprechend kein zwingendes Argument gegen eine durch *Y. pestis* verursachte Epidemie.

#### Yersinia pestis und die Justinianische Pest

Im Vergleich zum schwarzen Tod des Mittelalters liegen für das Justinianische Pestgeschehen bislang nur wenige molekulargenetische Studien an Skelettmaterial vor: Neben der hier vorgestellten Untersuchung gelang es bisher nur Drancourt et al. (2004: 1590-1591, 2007: 333) *Y. pestis*-DNA bei Skelettfunden aus frühmittelalterlichen Massengräbern bei den französischen Städten Sens (5tes bis 6tes Jh. n. Chr.) und Vienne (7tes bis 9tes Jh. n. Chr.) zu detektieren (Abbildung 7).

Diese bisherigen, vereinzelten molekulargenetischen Detektionen in frühmittelalterlichem Material sind allerdings als starker Hinweis dafür zu werten, dass auch die Justinianische Pest durch *Y. pestis* verursacht wurde. Um eine sichere Identifizierung von *Y. pestis* als Verursacher der Justinianischen Pandemie zu gewährleisten, müssten aufgrund der beschriebenen methodischen Schwierigkeiten bei der Analyse von alter DNA und damit verbundenen Möglichkeit der falsch positiven Signale (siehe oben) allerdings mehr molekulargenetische Daten erhoben werden.

Der hier vorgestellte Nachweis von *Y. pestis* in einem frühmittelalterlichen Gräberfeld Bayerns hat zudem eine große Bedeutung hinsichtlich der Ausbreitung der Justinianischen Pest: Da es keine bekannten historischen Texte gibt, die implizieren, dass die Justinianische Pest Bayern erreichte, liegt mit diesem Fund der einzige Nachweis dieser Art vor, der die Ausbreitung der Justinianischen Pest über das römische Reich hinaus in nördlichere Regionen bestätigt.

Die historische Quellenlage ließ dies vorher nur vermuten. So existieren Erwähnungen in keltischen und angelsächsischen Quellen über annähernd zeitgleich zur Justinianischen Pest auftretende Seuchenepidemien in Großbritannien (Maddicott 2007: 214), die allerdings das Krankheitsbild nicht ausführlich genug für eine Diagnose beschreiben. Weiterhin besteht Grund zur Vermutung, dass eine Epidemie, die 544 n.



#### Abbildung 8:

Mögliche Übertragungswege von *Y. pestis*. Schwarze Pfeile deuten den sogenannten klassischen Übertragungsweg Ratte – Rattenfloh – Mensch an.

Chr. in Irland auftrat (die ebenfalls aufgrund mangelnder Beschreibungen nicht eindeutig diagnostiziert werden kann), der letzte Ausläufer der ersten Welle der Justinianischen Pest durch Europa gewesen sein könnte (Dooley 2007: 228).

# AUSBLICK

Die vorgestellte Untersuchung zeigt das große Potential, das die Anwendung molekulargenetischer Methoden zur Aufklärung historischer Epidemien hat. Dieses ist allerdings noch lange nicht ausgeschöpft. Viele Fragen, insbesondere für die Justinianische Pest, sind noch offen: Wie weit hatte sich die Pest ausgebreitet? Wo ist ihr Ursprung? Welche Variante von Y. pestis war ihr Verursacher? Hat sich die Virulenz des Pesterregers im Verlaufe der Zeit verändert, wie einige Autoren vermuten? Wie man in Abbildung 7 erkennen kann, sind die bisherigen Nachweise des Pesterregers an archäologischem Skelettmaterial auf einige westliche Regionen Europas beschränkt. Systematische molekulargenetische Analysen an weiterem archäologischem Material aus den entsprechenden Zeitepochen, die Funde aus den übrigen Teilen Europas und Asien miteinbeziehen, sind notwendig, will man den Verlauf der Pestepidemien charakterisieren und Informationen über die Evolution des Erregers gewinnen.

Offen ist ebenfalls die Frage nach den Verursachern der Epidemien der Antike vor der Justinianischen Pest. Auch hier könnte eine systematische molekulargenetische Analyse an geeignetem Material (z.B. aus Massengräbern dieser Zeitstellung) Aufschluss über den Erreger bringen.

### DANKSAGUNG

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# REZIME MOLEKULARNO-GENETSKO OTKRIVANJE UZROČNIKA BOLESTI NA ARHEOLOŠKOM SKELETNOM MATERIJALU NA PRIMERU YERSINIA PESTIS

Ključne reči: kuga, *Yersinia pestis*, stara DNK, molekularna paleopatologija, paleomikrobiologija, crna smrt.

Epidemije prouzrokovane infektivnim bolestima često su oblikovale istoriju čovečanstva. Na osnovu ne baš preciznih opisa bolesti iz istorijskih izvora teško je odrediti koja je tačno bolest prouzrokovala dalekosežne posledice. Razvila se čak i kontroverzna rasprava da li se u slučajevima srednjevekovne kuge, tzv. crne smrti, i justinijanske kuge tokom kasne antike i ranog srednjeg veka, zaista radilo o kugi. Kugu prouzrokuje bakterija Yersinia pestis, koju prenose buve, a čiji su pravi domaćini zapravo glodari. Epidemija kuge nastaje kada nosilac kuge dospe u populaciju pacova. Zaražene pacovske buve nakon smrti svog prvobitnog domaćina - pacova - u velikom broju prelaze na ljude. Sumnja da je Y. pestis uzročnik crne smrti i justinijanske kuge obrazlaže se razlikama u epidemiološkim manifestacijama ovih istorijskih pandemija u poređenju sa poslednjom pandemijom kuge u 19. veku. Jedan od pristupa ovom problemu je analiza DNK uzoraka uzetih sa pretpostavljenih žrtava kuge iz pomenutih istorijskih perioda. Naime, DNK bakterije koja je u trenutku smrti mogla biti sačuvana u krvotoku pokojnika, baš kao i DNK samog pokojnika, može ostati sačuvana u skeletnim ostacima žrtve.

U ovoj studiji su ispitivani ostaci potencijalnih žrtava kuge iz ranosrednjevekovnog groba (Ašhajm-Bajuvarenring, Bavarska, Nemačka) i iz srednjevekovnog masovnog groba (Manhing-Pihl, Bavarska, Nemačka). U te svrhe je iz pojedinih zuba individua uzet DNK uzorak. Delovi *Y. pestis* specifičnog plazmida pPCP 1 su polimerskom lančanom reakcijom amplificirani, a zatim je niz upoređen sa DNK nizovima savremene Y. *pestis*.

Kod individua sa oba lokaliteta su se *Y. pestis*- specifični DNK fragmenti u velikoj meri podudarali sa savremenim nizovima patogena. Nekoliko uočenih neslaganja se mogu tumačiti kao proizvodi degradacije. Procenat uspešnosti od 10% podudara se sa onim iz drugih studija starih DNK. Osim toga, treba imati u vidu da negativan rezultat ne isključuje infekciju putem *Y. pestis*, već se može objasniti nedovoljnim obimom DNK uzorka.

Kod obe sahranjene individue potvrđena je pretpostavka da se radi o žrtvama justinijanske kuge, odnosno crne smrti. Zajedno sa malobrojnim preostalim dokazima prisutnim na skeletnom materijalu, a vezanim za Y. pestis, ovo predstavlja jasan o dokaz da je kuga zaista bila ta koja je i tokom ranog i punog srednjeg veka odnela toliko žrtava. Protivrečnosti u epidemiološkim pojavama istorijskih pandemija i pandemija 19. veka mogu se objasniti kompleksnom ekologijom začetnika oboljenja. Ispitivanja pojava kuge u savremenom dobu takođe pokazuju da postoji više mehanizama prenošenja nego što je to pretpostavljeno u okviru klasičnog modela prenošenja. Zato odstupanja u epidemiološkom toku ne moraju po svaku cenu da znače da se ne radi o kugi kao uzročniku istorijskih pandemija. Dokaz o kugi u ranosrednjevekovnoj sahrani iz Ašhajma (Aschheim) je za sada jedini postojeći dokaz da je justinijanska kuga prodrla u oblasti severno od Alpa. Molekularno-genetska istraživanja skeletnog materijala na nosiocima infekcije na taj način mogu da doprinesu određivanju uzročnika smrti pojedinaca. Ona ne samo da mogu da dokumentuju pojavu epidemija u određenoj populaciji, već i da odrede njihov uzrok i rasprostranjenost. Ipak, veliki broj pitanja koja se odnose na istorijske pandemije ostaje i dalje otvoren. Tako, na primer, do danas nisu razjašnjeni uzroci pojave kuge u antici, rasprostranjenost justinijanske kuge nije poznata do detalja, a geografsko poreklo kuge se još

uvek samo pretpostavlja. Upravo tu mogu biti od izuzetnog značaja molekularno-genetske analize na pogodnom skeletnom materijalu iz određenih vremenskih perioda. Nina M. Korać Archaeological Institute, Belgrade korac.nina@gmail.com UDK 902.2:616.71-002-091.5(497.11) Original research article

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# TWO CASES OF UNSPECIFIC INFECTIONS FROM VIMINACIUM

# ABSTRACT

In this paper, two tibiae from two skeletons discovered at the "Više grobalja" necopolis of the ancient Roman city of Viminacium, were compared and analyzed. Sex, age and individual height were studied. According to paleopathological analyses, it was observed that both skeletons showed traces of unspecific infections.

With macroscopic observation of the cross-section of paleopathological finds, an infection of the periostitis type was confirmed and by comparing both skeletons, direct cause of death (causa mortis) was studied.

KEY WORDS: VIMINACIUM, ROMAN NECROPOLIS, ARCHAEOLOGY, BIO-PHYSICAL ANTHROPOLOGY, PALEOPATHOLOGY, PALEOPATHOLOGICAL DIAGNOSIS, PERIOSTITIS, OSTEOMYELITIS.

## **INTRODUCTION**

One of the biggest Viminacium cemeteries is named "Više grobalja" (the name was given according to modern cadastre units). The cemetery is situated 700 m to the southwest from the military camp, with common skeletal burials positioned northwest - southeast. The terrain falls in this direction, with denivellation of 2 m. The area of the cemetery is some 450 m long and 80 to 100 m wide. It is interesting to mention that in the second half of 6th century, in the northwestern part of this cemetery, a Gepide cemetery was unearthed (Zotović and Jordović 1990). This cemetery was systematically excavated during the seventies, the eighties and at the beginning of the nineties of 20th century (Korać and Golubović, 2009). During these investigations, more than 3000 inhumations were discovered. The number of cremations was much smaller. Paleopathological observations of cremated remains are difficult and become more difficult if the remains are not well-preserved, so that they are actually very rare. But, when skeletal remains are concerned, paleopathology shows its real sense and meaning, in anthropological as well as in archaeological interpretation of the cemetery i. e. of the population which used this cemetery during a specific period of time.

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

Since skeletal remains from the Viminacium cemetery "Više grobalja" from the previous excavations have been preserved, two cases of unspecific infections have been studies for this occassion. These are the skeletons from graves G-90 and G-2112.

## MATERIAL

At the "Više grobalja" cemetery, in soundage no. 6, at the relative depth of 2.50 m a skeleton was discovered in a pit with no construction. It was orientated north – south, with a deviation of  $20^{\circ}$  of the northern end towards the west. The deceised was placed on his right side. Legs are crouched and positioned to the height of his stomach. Arms are bent and the hands are placed under the chin. It should be mentioned that this inhumation is placed under an area with animal bones at the southern end of the slope. The youngest coins are the ones of Alexander Severus (Zotović and Jordović 1990).

In grave G-90 a skeleton of a young man was discovered, whose growth and development were not completed. His fragility is especially noticeable in the post-cranial part. The skull is poorly and incompletely preserved, but it was noticed that the sutura metopica was not ossified during the first few years of life, but was only partially present from bregmae to nasion. Of course, this was just a notified anatomic variation (Hauser and De Stefano 1989).

A for other bio-anthropological data about this skeleton, one should point out that no epiphysis of long bones were ossified, neither on distal nor on proximal part. Further on, no third mollars errupted on neither of the sides. It errupted in the maxilla, but its height did not reach the height of the neighbouring second molar. Because of these facts, his age was estimated from 15 to 20 years (Ferembach, Schwidetzky and Stloukal 1979).

According to regression tables concerning relationships between long bones and body height, average individual height could have been estimated. It is average because the greatest femur length was reconstructed and it was about 400 mm.

It occurs that individual height was not more than 160cm (Breitinger 1934).

Grave G-2112 was found in soundage 149 and within it, four male skeletons were discovered, whose individaul biological age, according to the same methodology applied in the previous case, were aged between 30 and 40. It is a mass inhumation of four individuals. The individuals were marked A, B, C and D. The deceased marked as D was orientated west-east, with the deviation of 15° of the western part towards the south. It lies on its back in a stretched position, with arms stretched next to the body. The length of the skeleton measures 1,45 m. The bones are poorly preserved. The skeleton is marked 2112/D and it was incompletely preserved even during the excavation. Therefore, no anthropological measures could have been gained, except for the tibia, on which a paleopathological change was noticed. Its length was calculated according to methodological principles of Martin and Saller an it measures 340 mm (Martin and Saller 1957). Accordign to the already mentioned regression tables, the individual height measured about 168 cm.

Repeatedly, on skeletons from G-90 and G-2112/D of the "Više grobalja" cemetery, paleopathological changes were noticed on one tibia and they will be the subejcts of this paleopathological analysis.

## METHOD

On skeletons put at disposal, sex was determined according to 21 morphological elements on skull and post-cranial skeleton. These include the following gender-morphological elements: tuber frontale et parietale, glabela-arcus supercilialis, processus mastoideus, protuberantia occipitalis externa, squama occipitalis, arcus supercilialis, arcus zygomaticus, facies malaris, corpus mandibulae, trigonum mentale, angulus mandibulae, capitulum mandibulae, angulus, pubis, pelvis major, pelvis minor, foramen obturatorium, incisura ischiadica major, sacrum, caput femoris, linea asperaena femurima, clavicula (Ferembach, Schwidetzky and Stloukal 1979). For determining age between 14/15 and 21/23 years of age diagrams according to Wolf-Heidegger were applied (Wolf-Heidegger 1954). With adult individuals, whose ossifzing of long bones was completed, as well as

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the process of erruption of permanent teeth, age was determined according to a complex method and based on the following elements: obliteration degree of skull sutturae, density degree of spongiose mass in the humerus head, density degree of spongiose mass in the femur head, surface relief of pelvis simphysis and the abrasion degree of molar teeth in both jaws (Ferembach, Schwidetzky and Stloukal 1980).

For calculating individual height, regression tables for males of E. Breitinger were used, which should correspond most to the European population of ancient times.

Paleopathological method is macroscopic and includes five cross-sections of the infected bone, which is illustrated. Actually, Fig. 1represents the tibia from garve no. 90, while Figs.2,3 and 4 illustrate the tibia from the grave no. 2112.

Since one is dealing with unspecific infectious bone diseases i.e about two cases of periostitis, their descriptions are anmed at Steinbock's (Steinbock 1976), Aufderheide's and Rodriguez-Martin's (Aufderheide and Rodriguez-Martin 1998), Ortner's (Ortner 2003), Hošovski and Mikić (Hošovski and Mikić 1995), Lovričević and Mikić (Lovričević and Mikić 1989)

## RESULTS

Within the individual grave no. G-90, a skeleton of a young man was discovered, with light corporal structure and height of about 160 cm. On this skeleton, the following palopathological find was observed: on one tibia, there is a change caused by an unspecific infection of bone tissues. The other tibia is healthy. Other palopathological changes were not noticed.

The change is placed on the periost, consumes the whole bone, it is of grey-brown color, porose, with slightly increased and clearly defined edges. Its appeanace resembles tree bark (see Fig. 1). Such a change indicates periostitis. It can be caused by different factors, ike unspecific bacterial infections, specific contageous diseases liki syphilis, trauma, metabolic diseases, venous insufficientions etc. It can be observed in two forms, in a local and in a general one, but it can also be observed from the aspect of acute or chonic periotitis. Contrary to osteotytis and osteomielitis, which are dangerous infections and could cause serious damages and even death, periostitis usually does not cause serious complications nor death, excep when it appears in a general, acute form. This individual did not survive the infection and died because of it before the age of twenty.

In the mass grave G-2112, four male individuals were discovered, aged between 30 and 40 years. On one of the individuals, marked as D, a tibia remained well preserved, although in general, the skeleton was poorly preserved and could offer no anthropological measures. The individaul height was estimated to about 168 cm. At the preserved tibia, the following paleopathological find was observed: on the medial third of the diaphysis there is a limited and clearly defined change, with increased edges, of round shape and grey-brown colour. In order to gain a more detailed paleopathological find of this change, five cross-sections were made. During macroscopic observation of these cross-sections, it was noticed that there is a zadebljanje on the bone, similar to ivory and which spreads from the edge of the bone to the medullary canal. Medullary canal was not damaged. Changes of nidus type were noticed neither, indicating that one is not dealing with the infection of osteomyelitis type (see Figs. 2, 3, 4).

Such a find indicated periostitis of local type, since the individual survived this infection. It is usually a consequence of a trauma or chronic boils.

## **DISCUSSION AND CONCLUSION**

For this paper, two cases of unspecific infections from ancient Viminacium were chosen. It turned out that they were cases of periostitis of different types (see Figs. 1-4).

The first case, connected to a younger individual, according to author's opinión was determined as general periostitis, also shown within the here presented documentation. The individual (skeleton no. 90), a male aged between 15 and 20, did not develop defensive mechanisms and did not conquer this infection, directly shown by his early death. So one could presume that with this individual, the disease was acute. We therefore
conclude that for this individual, general periostitis was the direct causa mortis.

Among numerous ostheological reamins from ancient Viminacium, on which paleopathological changes of bone tissues are noticeable, as a case diamteral to the previously mentioned one, a deffect on tibia was observed on an individual from the mass grave G-2112. This individual marked as D, was also male, forty years of age, which is above the average life length of Viminacium of that time (Hošovski and Mikić 1995).

As the paleopathological analysis showed, this individual suffered from local periostitis, shown on fotographs.

The goal of this paper is to show on actual finds from a single site, in this case Viminacium, that the same type of unspecific infections can be manifested differently. This manifestation can be of different result, also shown on this material. Still, the question remained opened whether resistance to this infection, as well as its result, could have been infuenced by individual age, or whether course of the disease could have been infuenced by some other factors, like health care, factors leading to the infection, social status etc. We presume that this question can hardly be answered precisely.

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### REZIME DVA SLUČAJA NESPECIFIČNIH INFEKCIJA SA VIMINACIJUMA

KEY WORDS: VIMINACIUM, RIMSKE NEKROPOLE, BIOFIZIČKA ANTROPOLOGIJA, PALEOPATOLOGIJA, PALEOPATOLOŠKE DIJAGNOZE, PERIOSTITIS, OSTEO-MYELITIS.

Na osnovu paleopatološke analize dva skeleta koja su pronađena na rimskoj nekropoli "Više grobalja" antičkog grada Viminacijuma, potvrđena je nespecifična infekcija koštanog tkiva tipa periostitis. Skelet G-90 pripada muškarcu starom između 15 i 20 godina, visine tela oko 160cm. Drugi skelet G-2112/D potiče iz grupnog groba koji je sadržao ostatke četiri muške individue, a pripada muškarcu starom oko 40 godina, visine tela oko 168cm. Poređenjem, može se izvesti zaključak da prvi skelet potiče od individue koja nije prebolela nespecifičnu infekciju koštanog tkiva, dok drugi skelet pripada individui koja je prebolela infekciju i dostigla zrelo životno doba. Ostaje dilema, u kojoj meri otpornost organizma na ovaj tip infekcije zavisi od starosti individue i koji sve činioci, od pobrojanih, mogu biti presudni za nastanak infekcije.



Fig. 1. Više grobalja G-90









Fig. 3. Više grobalja G-2112





Fig. 4. Više grobalja G-2112

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### TREPANNING ON MEDIAEVAL GAMZIGRAD – FELIX ROMULIANA

### ABSTRACT

Between 1974 and 1992 in Gamzigrad, three locations with mediaeval skeletal burials were archaeologically investigated. More precisely, between 1974 and 1980, within the defence system, most likely near the church, 28 graves were excavated. Eleven skeletons were appropriate for an anthropological analysis. Later on, in 1984, near the southern wall, another three skeletal graves were unearthed and anthropologically investigated. Finally, between 1981 and 1992, the necropolis outside the eastern gate, consisting of 95 skeletons, was fully investigated, both archaeologically and anthropologically. The skeleton no. 28 belonged to a male, up to 45 years of age. On the central part of his left parietal bone, there is a clear mark of a soundly healed trepanning openning, measuring 2 X 3 cm. The trepanning itself was done in an old technique of filing.

The anthropological analysis of all the skeletons, dating from the 10th and 11th century, was done during 1992.

Key words: gender analysis, individual age, chronological determination, anthropological measures, trepanning technique, trepanning instruments.

As already stated in the abstract, the anthropological analysis of human skeletal remains was done in 1992, after the archaeological excavation of the cemetary outside the eastern Gamzigrad gate was finished . That means that the most recent methods of bio-physical anthropology were applied on all the analysis levels. Determination of gender and individual age were done according to the reccomendations of European anthropologists, systematized by D. Ferembach, I. Schwidetzky and M. Stloukal (1980), also signed by the author of this paper.

All the anthropological measures on adults, on skulls as well as on post-cranial skeletons, were taken according to the methodological rules defined by R. Martin (Martin R. and Seller K., 1957). All the skull indexes were measured and categorized according to the same anthropological criteria. Measuring of height was done according to regression table of long bones of post-cranial

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skeletons, made by E. Breitinger (1937) for males and H. Bach (1965) for females and which, after author's experience, correspond best with European skeletal series.

For paleo-pathological diagnoses, case categorizations were used, shown by A. Lovrinčević and Ž. Mikić (1989) and E. Hošovski and Ž. Mikić (1995).

The same methodological criteria were applied on eleven skeletons discovered within the defense wall, most likely near the church, were concerned, as well as on three skeletons discovered near the eastern wall, although they will not be included in this study.

The highlight of this anthropological study is a male skull no. 28 from the cemetery outside the eastern Gamzigrad gate, which was fully archaeologically excavated and anthropologically investigated. It was previously not published, because the intention was to include the latest human osteological material from the sites within the city walls. The intention was also to compare and observe events on the mediaeval Gamzigrad.

\* \* \*

Today, as the only anthropological complex from Gamzigrad – *Felix Romuliana*, there is the mediaeval cemetery outside the eastern gate, whose paleo-demographical content was recently published (Mikić 2009). Among other data, one could find out that 91 graves were archaeologically excavated with 95 individual skeletons. Still, only 92 skeletons could have undergone an anthropological analysis. There were 31 male skeletons, 31 female skeletons and 30 infants.

As picture 1 shows, the anthropological distribution of skeletons regarding their orientation is a common one, while their disposition i.e. concentration is uneven. On one hand, it follows the architecture of the eastern gate and on the other the slope and consistence of the terrain. As for division according to sex and age, the same conclusion can be repeated – it is mostly an uneven disposition.

Diagramme 1 graphically shows average life lengths.

More precisely, an average life length of men was over 42 years, while women lived a little shorter, between 39 and 40 years of age. It shows that an average adult lived for 41 years. Still, life length of children was rather short. It barely went over five years of age. An average life in this mediaeval population group from Gamzigrad did not exceed 30 years (29,72).

The skull with trepanning (specifically marked on the plan 1 and on diagramme 1) is certain to have belonged to a male individual. Its individual age was less than 45 years. That indicates that this trepanated person easily underwent this very complicated chirurgic operation, even after criteria of modern neuro-chirurgy. It lived longer than an average man did, an average adult or even an average person from the population group examined.

In the anthropological appendix about trepanning in the 20th century in Serbia (Mikić, 2007), the author wrote only a few sentences (without illustrations) about skull no. 28 from Gamzigrad. More precisely, he stated that it belonged to a male individual, who has less that 45 years of age when he died, that the trepanning was located on the left side and that it was succesfully made (according to the osteoplastic reaction of the bone). On the other hand, it was stated that this skull will be published in more details within the publication about the whole necropolis. It can be seen from the title of this paper, since one is dealing with the only trepanated skull from the mediaeval necropolis of Gamzigrad.

Within the whole of the necropolis discovered outside the eastern Gamzigrad gate, i.e. the population which was using it, according to its anthropo-morphological profilation, the trepanated male skull no. 28 fits in the morpho-structure of male individuals. According to tables 1 and 2, in which osteometric data for all of the 15 preserved (11 male and 4 female) skulls were given, it does not exceed any of the average values. For example, the average value of the length-width index is 73,10. On the trepanated skull no. 28, this index measures 71,20, showing that it belongs to the dolichocrane category.

Speaking about corporal height, with eleven male skeletons measured, it was about 168 cm (168,23), with a variation span from 164 to 177 cm. According to to the anthropological criteria applied in this analysis, the male individual no. 28 was 165 cm tall. It turnes out that he was among the less tall members of the mediaeval population of Gamzigrad.

The features of female members of the population will not be discussed here, especially because, due to their poor state of preservation, only four skeletons were adequate for anthropological measurings. Still, their osteomethrical values for skulls, as well as for post-cranial skeletons, can be seen in tables 1 and 2.

\* \* \*

In the previous chapter, all of the better preserved skulls, including their long bones of the post-cranial skeletons, were in detail osteometrically presented on tables 1 and 2, paleo-demographically on diagramme 1, as well as on plan 1. The reason for this is that, within the whole of the population group burried outside the eastern Gamzigrad gate, whose necropolis was fully archaeologically investigated, only one trepanated skull was discovered. This situation indicates that it should be observed within the group it belongs to and which dwelt in Gamzigrad during a certain period of time.

One should stress that trepanning is the oldest chirurgic intervention on man's head/skull, which left its traces through time – instruments for trepanning and trepanated skulls themselves. So far known, trepanning first appears in Hypocrat's notes. In his chapter about the head, it was described to the detail and the most important part of the medical intrumentaria was a knife – file and a jagged tubular drill. Since in Europe trepanated skulls appeared much earlier than technology of metal processing, one shuld most certainly think of similar tools made of stone.

In Europe, more precisely in 1973, on a congress "Association française pour l'avancement de la science", P. Prunières showed a skull found in 1868 in a dolmen by Aiguieres (Lozère), along with a bone plate taken from the skull. It is considered the first time when it was pointed out to the existence of prehistoric trepanning.

Further information about trepanning were gained in 1876, at the "International congress for anthropology and prehistoric archaeology" held in Budapest. On that occasion, within his lecture titled "Sur la trépanation du crane et les amulettes cranienne à l'epoque néolithique" P. Broca published results of his voluminous study. He showed a great number of trepanated skulls and bone rondells, being the first to introduce terms like "trépanation posthume" and "trépanation chirurgicale". He also imposed the problem of osteoplastic reaction of the bone along the edges of the trepanning opening as the main criterium for patient's surviving of this complicated intervention, even according to modern criteria.

After Prunières and Broca, many experts dealt with the problem of trepanated skulls, trying to discover also the motives of its performance. Less than a century later, in 1940, St. Piggott published a list of about two hundred finds and in 1960, P. Hein added 334 skulls to this list. In Europe, several thousands of trepanated skulls were gathered and studied. Their number varies from period to period and also from region to region. Only in Hungary, trepanated skulls come from fifty different sites (Nemeskéri 1960).

From the area of the Middle Balkans, actualy from Serbia, according to results gained so far, the oldest trepanated skulls appear during the Bronze Age and up to the period between 19th and 20th century. They were found on the cemeteries of the Metal Ages in Mokrin and Kriva reka in the Drina valley, on Roman Viminacium and on mediaeval sites like Davidovica and Gamzigrad. Oral data from our archaeologists, that they often encountered trepanated skulls on mediaeval sites, especially in Vojvodina, could have not been proved. Still, the publication of S. Trojanović from 1900, titled "Die Trepanationen bei denSerben ein ethnologischer Beitrag" and pulished in Munich, brought encyclopedic data: direct oral data, names of trepanated people, places of their burials and a commet that their skulls should be studies when science improves, detailed descriptions of trepanning itself (named "šaronjanje"), description of all the instruments used, postoperative recovering etc. He concluded that then, in 1900, almost nothing is known about trepanning by Serbs and Albanians in Europe, while the same operations by non-European nations are quite well known.

In 1922, S. Trojanović published another paper about trepanning in Skopje, entitled "Šaronjanje kod Srba – novi podaci (Trepanning by Serbs – new data)". This paper mostly repeats what was already published in Munich, concluding that folk/village doctors of that time in Hercegovina, Montenegro, Albania and South Serbia practice trepanning, i.e. "šaronjanje" as a usual routine procedure. He also listed personal names of people operated.

In this very brief description of research of the phenomenon of trepanated skulls, beside S. Trojanović, one should mention two further authors:

V. Đorđević was a doctor, educated in Germany, and in 1883 in Berlin he published a study about the development of medical care from 12th to the end of 19th century in Serbia, in which he only mentioned trepanning. The beginning of research of this phenomenon should b brought in connection with S. Trojanović, the first Serbian educated anthropologyst and with the year 1900.

Much later, in 1948, M. Barjaktarović published a work in Cetinje about "Šaronjanje in Montenegro". One can immediately notice that Trojanović's works from 1900 and 1922 make most of his work. The author also notices that the name "Serbs" and "by Serbs" does not appear in the whole paper. On the other hand, three other data appear: in 1930, a man named Niko Spahov Dučić, a trepanated man from Kuč, died at the age of 80. Further on, in 1928, a famous trepanator from Kuč, Radosav Petrov died, for whose father stories are told that he trepanated about three hundred people. The third data concearns the most famous "doctors". They were the Iličković family from Crmnica, whose complete chirurgic intrumentarium, made by village smiths, is being kept at the Museum of chirurgical clinic of the Medical University in Moscow ever since 1907 (after Iličković 1940).

In this short historical overview one should stress that at the territory of Serbia, either from preistoric or from historic times, no trepanning instruments were found by archaeologists, so we only have their descriptions from the late 19th and early 20th century.

After a huge break, Hungarian anthropologists (Farkas and Lipkak 1971) return to the phenomenon of trepanning by publishing a Bronze Age cemetery discovered in Mokrin and on which, according to their data, even nine skulls were discovered, trepanated with a filing technique.

After Mokrin, a find was known from

Kriva reka, dating from the Iron Age, regarding a male skull being trepanated three times with drilling technique (Mikić 1980; Schulz 1993). After that, three trepanated skulls were discovered at *Viminacium* (Mikić 2006), as well as a find from the Davidovica monastery (Mikić 2000).

This is why to the trepanning phenomenon, practicated in this area for more than four millenia and belonging only to bio-physical anthropology, not much attention was paid and it is very hard to give streight answers. One should even doubt the wrongly understood work of folk doctors, which could be regarded as "out-of-fashioned and primitive" and which was to be avoided at the beginning of the 20th century.

\* \* \*

This very brief overview of the history of trepanning in Europe, as well as in our region, was necessary considering the fact that the skull no. 28 from the mediaeval cemetery of Gamzigrad is the best preserved one. In comparison with other trepanated skulls from our sites, it can be said that it is fully preserved and does not require any reconstruction, which can be seen on Fig. 2/A of this paper. Fig. 2/B shows the position of the trepanning opening itself. As already stated in the abstract, its outer dimensions are 2 X 3 cm, immediately indicating that it is not of circular, but of irregular shape. It is situated in the middle of the left parietal bone, directly under the slightly grown parietal torus.

The inner dimensions of the trepanning opening are smaller, but very difficult to determine because of a very strong osteoplastic reaction of the bone. It led the opening itself on the utmost depth (above the dura matris) and the healing was very intensive. Therefore the author presumes that the full effect of healing of the trepanning was reached.

The difference between the dimensions of the outer and the inner trepanning openings surely indicate that it was done in filing technique, which is chronologically older. Considering the very strong osteoplastic reaction of the bone all around the trepanning opening, it cannot be determined in how many directions it was performed. One gets the impression that there were two directions. One direction was surely bowed, covering more than a half of the opening, and it was directed towards the lower head/skull part. The other direction of filing of the parietal bone was most likely straight, but not horizontal. It stretched diagonally from the middle of the sutura coronalis to the middle of the sutura occipitalis. Any further reconstruction of the way of opening the left parietal bone would lead to speculations, mostly because of the high level of healing. Needless to say, this man from the mediaeval Gamzigrad (Felix Romuliana) survived this very sensitive chirurgic operation, known to science as trepanning. Conclusively, it was not the causa mortis, at least not in the primary sense of diagnosis. Further on, one cannot tell whether this middle-aged man, who most likely lived in Gamzigrad during 11th century, came here with trepanning done somewhere else or did a surgeon/doctor of the time visit Gamzigrad. The only certain fact is that this is the only trepanated skull found within the mediaeval necropolis near the eastern Gamzigrad gate.

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KLJUČNE REČI: POLNA PRIPADNOST, INDIVIDUALNA STAROST, HRONOLOŠKO OPREDELJENJE, ANTROPOLOŠKE MERE, TREPANACIONA TEHNIKA, INSTRUMENTI ZA TREPANACIJU.

Na tablama 1 i 2 date su raspoložive kranijalne i postkranijalne antropološke mere, uključujući i lobanju br. 28, koja je u celini očuvana. Paleodemografske elemente, odn. distribuciju pola i starosti donosi dijagram 1, na kome je lobanja br. 28 posebno označena. Slika 1 predstavlja plan nekropole pored istočne kapije Gamzigrada, odn. antropološku distribuciju skeleta, sa označenom lokacijom skeleta br. 28 u okviru same nekropole. Poslednji prilog - slika 2 (A + B), donosi fotografiju lobanje br. 28 sa trapanacionim otvorom. Kako je u apstraktu već navedeno, njegove spoljne dimenzije su 2 x 3cm, što odmah ukazuje da nuje kružnog oblika. Unutrašnje dimenzije trepanacionog otvora su manje, ali ih je vrlo teško odrediti zbog vrlo jake osteoplastične reakcije kosti, tako da se procenjuje da je ova trapanacija u celini uspela. Treba naglasiti da je ova individua sa srednjovekovnog Gamzigrada preživela i nadživela ovaj osetljiv hiruški zahvat i po kriterijumima savremene neurohirurgije. Zaključno, nije Causa mortis, bar u primarnom smislu dijagnoze.



## **Diagram1: Sex & Age distribution**

32	female	30			185	138		ı			ı	ı	ı	ı	ı		
31	female	30			182	131	93	93		110	122*	68	39	33	21	49	60
30	male	40			181	136	95	I	ı	110	123	72	36	34	23	52	92*
28	male	45			191	136	100	103		120	131	71	41	32	27	50	100
26	male	45			191	142	ı	103	135	117	128*	72	38	35	24	55	$101^{*}$
21	male	40			200	144	100	104	140	120	I	+02	37	30	25	52	102
15	male	up to 45			190	130	94	101	124	102	ı		I		ı		91
10	female	up to 45			170	137	ı	ı		ı	ı	ı	I	ı	ı		92
Grave Number	SEX	AGE	Martin No	SKULL	1	8	6	13	17	20	45	48	51	52	54	55	99

		_	_	~							
	33.	80	40	12		'	'		'		56,5
	'	'	'	'		'	ı		'		_
	ı	ı	ı	ı		ı	ı		357		53
	414	88	40	131		295	68		ı		10
	423	88	42	138		ı	ı		ı		64
	•		1	ı		ı	•		ı		-
	ı	ı	ı	ı		ı	ı		347		55
	432	97	50	162		311	76		'		1
	447	92	49	157		330	70	ı	357		69
	ı	ı	ı	ı		ı	ı		•		1
	434	95	50	159		312	70		1		99
	1	ı	ı	ı		1	ı		1		-
	448								376		8
	447	96	48	156		313	73				16
	437	84	43	140		311	62		ı		5,5
	ı	ı	ı	ı		ı	ı		ı		16
FEMUR	1	8	19	20	HUMERUS	1	7	TIBIA	1	TELESNA VISINA	Breitinger, Bach (cm)

\* Reconstructed Anthropological Measurements

64	male	up to 40		182	143	102	111	1	114	1	1	1	1	1		98
51	male	30			1	1	1	1	1	1	1	ı	1	I	1	
50	male	50		197	136	104	105	140	114	130	73	41	32	29	50	1
45	female	40		187	137	96	86	138	116	1	61	38	28	I	46	1
41	male	30			1	1	1	1	1	1	1	1	1	ı	1	
38	male	40		198	142	94	1	1	1	1	1	1	I	1	1	1
34	male	40		178	138	102	107	135	112	1	1	1	1	1	1	98
Grave Number	SEX	AGE	Martin No SKULL		8	6	13	17	20	45	48	51	52	54	55	66

	4	6	4	4								
	4	×	4			Ľ	'		Ľ	-	64,5	
	ı	ı	ı	ı		303	65		356			
	485	102	50	160		351	78		412		9/	
		1							1			
		,	1			333	73		,		6	
	440	97	47	152		334	70		370		16	
	422	81	43	142		1			366		9	
	1	1	ı			306	64		ı		16	
		1	ı			ı	1				14	
	414	97	48	157		311	80		345		16	
		1				ı						
	499	100	52	168		356	71				17	
		1	ı			296	60		137		~	
	433	06	42	139		ı					16	
FEMUR		8	19	20	HUMERUS		6	TIBIA		TELESNA VISINA	Breitinger, Bach (cm)	

\* Reconstructed Anthropological Measurements



Fig I: Anthropological distribution of skeletons.



## Fig. 2: Trephinic Skull No 28;

A - Lateral view;



B - Part of Skull No 28

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## EPIGENETIC TEST ON MEDIEVAL SKULLS FROM VINČA

### ABSTRACT

During the past fifty years, more attention was paid to epigenetics as an addition to morphometry, especially in bio-physical anthropology. In Serbia, first papers of this kind, as an addition to classical anthropological analyses of skeletons from anthropological sites appeared during the seventies of 20th century. Still, our experiences are insignificant in this field of research. In our anthropological literature, there are only a few papers. In this paper, only the results of epigenetic tests conducted on fifty preserved skulls from the mediaeval cemetery in Vinča are presented. During several campaigns in Vinča, some 1000 skeltons were excavated, but they were not preserved and well kept. The group of only fifty wholy preserved skulls remained, which was kept at the Dental faculty, but now kept at the Philosophical Faculty in Belgrade. The results of their epigenetic test are presented in table 1 and discussed within the integral part of this paper.

KEY WORDS: BIOPHYSICAL ANTHROPOLOGY, MIDDLE AGES, AGE, SEX, EPIGENETIC VARIATIONS.

### **INTRODUCTION**

At the end of the sixties of 20th century, in biology, and especially in biophysical anthropology, more attention was paid to skeletal characteristics which were not continuously present, but were varying from one individual to another or from one population to another. The following terms were used: variant, variety, variable, data, marks, dispositions. The most frequent adverbs appearing were: anatomic, abnormal, varying non-metric, morphological, quazi-continuing, incontinuous, discontinuous, discontinuous variables, non-adjusted, discrete, little/lesser. But there is also a smaller number of marks which can be described with the following terms: malformation, anomaly, heterotipy and discreta. Still, in time, some of the terms prevailed: anatomic variations, epigenetic and non-metric features. In time, it also turned out that pathological changes

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on bones cannot be ascribed to the complex of these characteristics. The best example is Cribra orbitalia, which was proved to be caused by a specific disease (Hengen 1971; Grupe 1995). Even after this, Cribra orbitalia still appears on epigenetic lists, without taking into consideration that it actually has its rightful place in quantitative paleopathology (Reinhard and Rösing 1985).

The importance of epigenetic elements/ anatomic variations is shows in a possibility to broaden analyses of similarities between different population groups, but also their individuals, as an addition to osteometric values. Contrary to metric characteristics on fragmented osteological material, the "non-metric elements" have their advantage, because they enable a more reliable determination of sex and skeletal age, due to differencies in development. There is a well-known example of a skeletal series Mikulčice, on which A. Czarnetzki already in 1972 recognized a very extreme difference in frequency of numerous epigenetic elements between men and women, even recommending their separate observation and interpretation (Czarnetzki 1972).

One should add that genesis of epigenetic elements is heterogenous and there is only few hundreds of them. The greatest part is genetically conditioned and follows polygenetic inheritance (for example blood and nerve supply). The second group was undoubtfully gained during one's lifetime and expresses specific activities of individuals and groups (mostly on post-cranial skeleton). The third group is a result of common activities of genetic dispositions and outer influences. There are inlayed bones in skull sutures (special nuclei of ossification), for which it is well-known that their number varies from one population to another. On the other side, for example at artificially deformed skulls, epigenetic elements can be caused (Sjovold 1984).

It should be mentioned that a frequent term for this kind of skeletal characteristics among the English-speakers is "Discreta traits" and a simple "Discreta" among the German-speakers, although the most commonly used term in literature actually is - Epigenetic variation.

### MATERIAL

The analyzed skulls come from graves excavated during the archaeological research of Vinča, conducted between 1978 and 1982 by G. Vujović-Marjanović and her team (National Museum, Belgrade). This cemetery was used in the period from 8th to 17th century and the anthropologial material is very poorly preserved. The main reason is an intense usage of this cemetery and digging new graves into the already existing older ones, as well as agricultural usage of the upper soil layers on this site (Vujović-Marjanović 1982, 91-97).

Since after the archaeological excavation such a large amount of medieval osteological material could not be preserved and kept, only fifty skulls were sorted out, chosen because of their state of preservation. They were handed over to the staff of the Faculty of Stomatology for certain research, but recenly, they are kept at the Faculty of Philosophy in Belgrade, where the epigenetic test was undertaken.

The fifty skulls belong to a broad chronological span. During the research, it was determined that 28 skulls belonged to men and 22 to women. It meant that 56% were male and 44% female skulls.<sup>1</sup> Considering individual biological age, only one skeleton belonged to the juvenile age, 19 to the adult group, not more than 25 to the mature group and the remaining five to the oldest group (*senilis*).

In order to show at least basic features of the morphological structure, basic skull index was calculated and represented (the index of cranial

<sup>1</sup> According to an oral information from  $\check{Z}$ . Mikić, this would approximately correspond to 10% of all the adult individuals from the excavated part of the cemetery of totaly about 750 graves and about 1000 skeletons.

width and length), which showed great variety. More precisely, 15 skulls belonged to the dolichocranial type, 11 to the mesaticranial and 22 to the brachycranial type. Since two skulls were partly

damaged, they could have not be specified.

All data are given in the following overview:

Grave number	Sex	Age	Longitudinal width index
8	female	maturus	75,14
69	male	adultus	73,62
131	male	maturus	72,16
133	female	maturus	76,27
153	male	maturus	73,68
158	male + infant	maturus	77,32
159	male	maturus	71,72
162	male	maturus	75,26
192	male	maturus	69,61
195	male	adultus	82,35
197	male	maturus	89,87
214	male	maturus	76,34
230	male + infant	maturus	87,02
235	male	senilis	80,25
261	female	adultus	81,92
267	female	adultus	78,37
270	female	adultus	74,57
280	female	adultus	81,92
296	female	maturus	?
309	male	adultus	82,35
322	male	maturus	90,64
337	male	maturus	88,57
338	female	adultus	73,68
360	male	senilis	75,67
366	male + infant	adultus	88,62
368	female + infant	adultus	81,35
371	male	maturus	83,42
374	male	maturus	78,21
383	male	adultus	89,09
399	female	adultus	83,62
400	female	adultus	?

405	male	adultus	83,61
419	male	maturus	72,63
439	female	maturus	82,48
447	male	senilis	73,57
450	male	maturus	85,71
465	female	maturus	74,44
455	male + infant	adultus + juvenilis	93,41
478	male	senilis	90,62
485	female	maturus	76,08
491	male	adultus	84,61
510	female	maturus	86,22
518	female	maturus	67,57
519	female	maturus	79,77
524	male	adultus	74,45
530	male	adultus	73,93
531	female	adultus	80,11
534	male	juvenilis	71,35
541	male	maturus	73,62
542	male	senilis	74,46
552	male + infant	juvenilis	70,22

Since all of the examined skeletons belong to individuals whose growth and development were complete and since they possess an extremely heterogenous morphostructure, they were determined as an anthropological collection.

### METHOD

The methodology applied on the anthropological collection from medieval Vinča is twofold. The first part is the so called standardized methodology of an anthropological study of skeletons, concearning sex, age and morphometry (connected to the calculation and categorizing of cranial length and width). The second part is the epigenetic analysis. The results gained need to be presented separately. The results gained after the standardized anthropological method were already presented in the previous chapter (about material), by applying the following standards: for determining sex after elements present on skulls, criteria were applied defined by D. Ferembach, I. Schwidetzky and M. Stloukal.<sup>2</sup> For determining individual age only by examining skulls, combined methods were applied, since of all the crietria, only two were at our disposal – separation of superficial teeth levels and the joining of skull sutures (Lovejoy 1985; Olivier 1973.).<sup>3</sup>

<sup>2</sup> In front of the group of about forty biophysical anthropologists from Europe, the United States and Canada (Ferembach, Schwidetzky i Stloukal 1980).

<sup>3</sup> Individual age was added to the following categories: juvenilis/subadultus (19/22 years), adultus (from about 20 to about 40 years of age), maturus (from 40 to 60 years) and senilis (over 60 years of age).

Two basic skull measurments needed for the mentioned index – the greatest skull length (the distance between the measuring points G-OP) and the greatest width (the distance between even points EU-EU) were measured after R. Martin's definitions (Martin 1928), i. e. after reformed instructions of W. Bass (Bass 1971).

For the needs of the epigenetic test, the adequate methodological literature was consulted, in order to make the best possible choice of served through a special process and not dug out of the soil. Because of that, the number of epigenetic elements mentioned in the literature was reduced to 25 and specified within the epigenetic notification-paper applied in this test. It includes the most frequently preserved epigenetic elements on archaeologically excavated skulls. These are the following epigenetic elements, next to the column for special remarks (in order to mark the specifics of each skull):

1. Os Incae/Os Lambdae	14.Os epiptericum
2. Ossa suturae lambdoidae	15. Torus auditorius
3. Linea nuchae suprema	16. Foramen spinosum
4. Os intersuturale parietalis	17. Foramen palatinum
5. Os Asterion	18. Foramen ovale
6. Foramen mastoideum exsutural	19. Tuberculum praecondilaris
7. Condilus occipitalis dubl	20. Foramen Huschke
8. Os Bregmaticum	21. Canalis postcondilaris
9. Foramen parietale	22. Metopism
10. Ossa suturae coronalis	23. Foramen supraorbitale
11.Foramen zygomaticofacialis	24. Incisura/sulcus supraorbitalis
12. Foramen infraorbitale	25. Os zygomaticum partitum
13. Foramen frontale	26. Special acknowledgments

elements which can be preserved on anthropological material from archaeological sites. In this sense, the most helpful were the already wellknown publications (ex. Berry and Berry 1967; Czarnetzky 1971; Hauser and De Stefano 1989), as well as working material of B. Kaufmann (Anthropological Institute, Basel), which was put at our disposal and which is more voluminous than the previously published book (Kaufmann 1986).

It was imidiately noticed that, due to poor state of preservation of skeletal material from archaeological sites, out of several hundreds of epigenetic elements, most of them cannot actually be studied. It is quite contrary to material from anatomic collections and institutes, which is preWithin the notification-papers, all the details were named connected to each element, like oscillations, dimensions etc. According to the sequence in which the elements were given, it was most practical to begin the observation with the posterior projection of each skull, then the vertical, both of the lateral, basilar and at the end the facial projection.

Apart from these epigenetic elements, in notification-papers there were also the grave numbers, i.e. skull, gender, individual age, the value of longitudinal-latitudinal index of each skull, as well as the date of evaluation. Due to their volume, epigenetic notification-papers cannot be incorporated into an anthropological paper of this kind.

### RESULTS

Since the data concerning gender, age and basic index of each out of fifty skulls from the medieval anthropological collection from Vinča were already given within the chapter about the material itself, one can now only present precise epigenetic results gained. They are shown within the following table:

T 11 1	<b>T</b> 7' <b>Y</b>	1		C 1	1 C	· · · · · · · ·	c :		· · · · · · · · · · · · · · · · · · ·	1.0
Table 1.	$v_{1nca} -$	the number	r and perc	ent of al	i treane	encies o	t enigen	enc varia	fions specifi	ed atter sex
14010 1 .	11100	the mannoer	i ana pere	one or an	1 110944		r epigen	ette tarra	cions speenii	ou arter ben.

Epigenetic element	Total	Men	Women
	+/n = %	+/n=%	+/n=%
Os Incae	4/50 = 8%	1/28=2%	3/22=6%
Os Lambdae	9/50=18%	5/28=10%	4/22=8%
Lambda sutura	23/50=46%	11/28=22%	12/22=24%
Linea nuche suprema	14/50=28%	7/28=14%	7/22=14%
Os intersuturale parietalis	2/50=4%	0/0	2/22=4%
Os Asterion	12/50=24%	6/28=12%	6/22=12%
Foramen Mastoideum Exsutural	23/50=46%	16/28=32%	7/22=14%
Condilus Occpitalis Dubl	3/50=6%	2/28=4%	1/22=2%
Os Bregmaticum	0/0=0%	0/0=0%	0/0=0%
Foramen parietale	19/50=38%	9/28=18%	10/22=20%
Ossa Suturae coronalis	2/50=4%	1/28=2%	1/22=2%
For. zygomaticofaciale	33/50=66%	20/28=40%	13/22=26%
Foramen infraorbitale	44/50=88%	28/28=56%	16/22=32%
Foramen frontale	9/48=18,75%	4/26=8,33%	5/22=10,4%
Os Epiptericum	9/50=18%	4/28=8%	5/22=10%
Torus auditorius	2/47=4,25%	2/25=4,25%	0/0=0%
Foramen spinosum	0/0=0%	0/0=0%	0/0=0%
Foramen palatinum	4/4 poorly pre- served		
Fotamen ovale	23/26=88,5%	15/19=57,7%	8/9=30,8%
Tuberculum praecondylare	1/4 poorly pre- served		
Foramen Huschke	6/9 poorly pre- served		
Canalis postcondilaris	12/33=36%	8/14=24%	4/9=12%
Metopism	5/5=10%	2/28=4%	3/22=6%
Foramen supraorbitale	14/49=28,57%	5/28=10,2%	9/21=18,36%
Incisura supraorbitale	26/50=52%	15/28=30%	11/22=22%
Sulcus supraorbitalis	31/50=62%	19/28=38%	12/22=24%

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The table 1 shows that there were no specifications on the collection of medieval skulls which could be notified under nr. 26. Still, due to great frequency of elements like Os Incae and Os Lambdae they can be separated into 1/a and 1/b. The same is with Incisura supraorbitalis (24/a) and supraorbital foramen (24/b). The reason is their position on the skull itself.

It should also be explained that the percentage was calculated according to the number of skulls examined for each epigenetic element separately. It was not calculated when the state of preservation of specific skull parts was extremely poor and only in cases of less than ten observations. It was shown with three epigenetic variations on specific skull parts: *foramen palatinum* (nr. 17 could have been observed on four skulls), *Tuberculum praecondilaris* on four skulls), as well as *Foramen Huschke* (nr. 20 – observed on maximum nine skulls).

Table 1 did not include epigenetic variations on madibulas. The reason is that in some cases the mandibulas were missing or in a very poor state of preservation.

### **DISCUSSION AND CONCLUSION**

The collection of fifty skulls represents a choice of best preserved skulls from the medieval necropolis of Vinča. They were excavated during the archaeological research between 1978 and 1982 and they represent about 10% of all the adult individuals discovered on the studied part of this necropolis. For a short period of time, they were given to the Faculty of Stomatology in Belgrade and they were recently handed over to the Faculty of Philosophy. In 2010, they were examined there by undergoing an epigenetic test as a part of a complex anthropological analysis. All the other skulls are unfortunately lost.

If one returns to table 1, it can be seen that *Os Incae* was observed on one male and three fe-

male skulls. That is a rather high frequency concerning the number of skulls studied, but their forms do not completely fit into schemes given by ex. Kanadoff and Mustafov (Kanadoff and Mustafov 1970) or Hauser and De Sefano (Hauser and De Stefano 1989).

*Os lambdae* is situated in the same, occipital skull zone, as well as the *Os Incae, pars Incodiae squamose occipitalis* and *sutura Mendoza*. In the studied skull group, it was observed on five male and four female skulls. Its total frequency is 18%, while their forms are rather difficult to systematize according to the already existing and observed forms named in literature. This should be understood as a very broad individual variation.

The bones inlayed into the *lambda sutura* (*Ossa suturae lambdoidae*) were practically present on half of the skulls – 46% (11 male and 12 female skulls). Their total number is 122 and they are very hard to systematize or categorize, since they are never bigger than 20mm.

*Linea nuchae suprema* is not especially outraging, but it was observed on seven male and seven female skulls, 28% in total.

*Os intersuturale parietalis* was observed on only two female skulls. It is of small dimensions and on both of the skulls, it was located on the right side.

*Os asterion* was observed on six male and six female skulls, although it was examined on the whole collection. Its appearance is rather frequent and it appears on one as well as on both sides.

*Exsutural foramen mastoideum* was discovered on 16 male and seven female skulls. It can be determined as frequent, since it appears on 46% of all the skulls.

*Condilus occipitalis* dubl was noticed only on two male and one female skull. Its frequency is low, especially because it was not discovered in an extremely doubled form.

*Os bregmaticum*, as a specific ossification nucleus, was not found on any of the examined skulls.

*Foramen parietale* was also examined and detected on nine male and ten female skulls, which makes the total of 38%.

*Ossa suturae coronalis* include small bones inlayed into the skull sutura named above. They were discovered only on one male and one female skull, always on the right side. On the male skull, there are several of them, but they are all of very small dimensions.

*Foramen zygomaticofacialis* was found on 20 male and 13 female skulls, meaning that its frequency in total measures 66%. The total number of such openings was 82%, showing that some were doubled (everything was noted in the named notification-papers).

*Foramen infraorbitale* is an opening through which runs an important facial vein. It was found on 28 male and 16 female skulls, which shows the greatest frequency of totaly 88%.

*Foramen frontale* is a passage for a branch of the same facial vein, which was observed on nine skulls – four male and five female skulls. It is present on 18,7% of the skulls.

*Os epiptericum* was examined on all of the 50 skulls, but it was found on four male and five female skulls, 18% in total. Their locations, shapes and dimensions are very different, which was precisely noted in epigenetic notification-papers.

Due to partial preservation, *torus auditivus* was examined on only 47 skulls. It was found only on two male skulls, which makes 4,2%.

*Foramen spinosum* was examined on the whole collection, but it was not found.

*Foramen paltinum* is another epigenetic variation which was difficult to trace, due to the poor state of preservation. In this case, it was found only on four skulls – one male and three female ones.

*Foramen ovale* was examined on 26, but found only on 23 skulls. As an important opening on the skull's base, it is present on 88,5% of the examined skulls (26) - 57,7% belongs to male and 30,8% to female skulls. *Tuberculum praecondylare* was examined on four skulls, but found only on one female skull. It can be concluded that it highly depends on the state of presevation of the osteological material.

*Foramen Huschke* is again highly dependent on the state of preservation of anthropological finds. It was named after its finder, A. Huschke. It was examined on nine skulls and discovered only on six of them.

*Canalis postcondylaris* represents a passage for a big blood vessel on skull's base and it was examined on 33 skulls. It was found on 12 of them (36%) – eight male (24%) and four female ones (12%).

Metopism was examined on all of the 50 skulls. It was discovered on two male and three female skulls, which makes 10% in total. On all of the skulls it was present in its whole length.

Fisura metopica was not noticed at all.

*Foramnen supraorbitale* was examined on 49 skulls. It was found in 14 cases, i.e. on five male and nine female skulls. In total, it makes 28, 6%, actually 10,2% and 18,4%.

*Incisura supraorbitalis* was examined on all of the 50 skulls, but it was found on 26 of them (52%). They include 15 male (30%) and 11 female skulls (22%).

*Sulcus supraorbiralis* was examined on the whole collection on medieval skulls from Vinča. It was discovered on 31 of them (62%), out of which there are 19 male (38%) and 12 female skulls (24%).

*Os zygoomaticum partitum,* as the last in the selection of the most commonly preserved epigenetic elements, was examined on the whole collection, but it was found on none of the skulls.

\*\*\*

Due to poor state of preservation, the author faced several problems during his research. First of all, he had a group of fifty skulls chosen because of their state of preservation. Since the anthropological series of medieval Vinča was not completely published, certain value shoud be given to this skull collection and all of the necessary anthropological analyses should be undertaken.

The question of terms also had to be solved. The best example is *foramen Huschke*, which is also named *foramen acusticum Huschke* and *foramen tympanica*. The first term was chosen, just like the original one, after A. Huscke.

It turned out that the number of pathological changes observed as epigenetic elements is growing. The case with cribra orbitalia was already explained. Still, the appearance of exostases in the outer auditory canal (*Porus acusticus externus*) is a result of pathological changes, so it cannot be observed as an epigenetic element, which was already shown on the anthropological material from *Sirmium* (Miladinović-Radmilović 2010, 137-145). That means that *torus auditivus* shoud not be considered as epigenetics, but as quantitative paleopathology.

No matter that our experience in the field of epigenetic analyses is insignificant, it includes only skeletal series. Since in this case one is dealing with a collection of medieval skulls chosen after their state of preservation, which in no case can represent an anhropology series, any kind of comparing would not give adequate results. After all that was said, it is certain that a specific systematization and standardization in this field of research would be highly welcome.

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### REZIME EPIGENETSKI TEST ANTROPOLOŠKE KOLEKCIJE LO-BANJA SREDNJOVEKOVNE VINČE

KLJUČNE REČI: BIOFIZIČKA ANTROPOLOGIJA, SRED-NJI VEK, INDIVIDUALNA STAROST, POL, EPIGENETSKE VARIJACIJE.

Krajem šezdesetih godina XX veka u biologiji, a posebno u biofizičkoj antropologiji, počinje da se obraća značajna pažnja na karakteristike skeleta koje nisu kontinuirano prisutne, nego variraju kako od individue do individue, isto tako od populacije do populacije. Ovaj kompleks karakteristika je u međuvremenu imenovan brojnim nazivima. To su sledeći imenski termini: varijante, varijacije, varijable, podaci, oznake, dispozicije. Kao najčešći pridevski termin u literaturi se pojavljuju sledeći izrazi: anatomski, anormalni, odstupajući, nemetrički, morfološki, kvazi kontinuirani, nekontinuirani, diskontinuirano varijabilni, neadaptivni. Međutim, postoji još jedan mali broj oznaka, koji se može podvesti pod sledeće termine: malformacija, anomalija, heterotipija i diskreta. Ali, vremenom se težište usmerilo na izraze kao što su anatomske varijacije, epigenetika i nemetričke osobine čoveka. Takođe, vremenom se uvidelo da su kompleksu ovih karakteristika pripisivane patološke promene na kostima, kao što su npr. Cribra orbitalia i pojava egzostoza u spoljnom slušnom kanalu. Pomenimo da se slične pojave vremenom ispravljaju, a epigenetskih elemenata na lobanji i postkranijalnom delu skeleta čoveka ima nekoliko stotina. Njihov značaj se ogleda u mogućnosti proširenja analize sličnosti između različitih grupa stanovništva, ali i njenih pojedinaca, kao dopuna osteometrijskim vrednostima. Nasuprot metričkim karakteristikama, ove nemetričke pokazuju specifičnosti u razvoju, kako na ontogenetskom, tako i na poligenetskom planu. Najveći broj epigenetskih elemenata je genski uslovljen i sledi poligenetsko nasleđivajnje, kao što su npr. specifičnosti u prokrvljenosti i inervaciji tela.

Naša iskustva na epigenetskom planu su nevelika.

U našoj antropološkoj literturi prisutan je mali broj radova o epigenetici, gde ona ulazi u sastav standardne antropološke analize skeleta. – Odvojeni naslovi su kod nas izuzetno retki.

Oko 1980. godine u nekoliko arheoloških kampanja na Vinči je iskopavana srednjevekovna nekropola. Tom prilikom je arheološki istraženo oko hiljadu skeleta, koji nisu svi pronađeni u individualnim grobovima. Oni ne pripadaju najstarijoj i najmlađoj fazi sahranjivanja, tako da se mogu datovati u vremensko razdoblje između XI i XV veka. Nažalost, svi ovi skeleti nisu u celini antropološki publikovani, niti su svi mogli biti deponovani. Grupa od 50 najbolje očuvanih lobanja se doskora nalazila na Stomatološkom fakultetu u Beogradu, a odnedavno je na Filozofskom fakultetu u Beogradu, gde je 2010. godine i objavljena njihova epigenetska analiza.

S obzirom da se radi o grupi lobanja koja je izabrana po kriterijumu očuvanosti, posmatrana je kao kolekcija, pošto ona nikako ne predstavlja antropološki seriju. Sam epigenetski test za ovu kolekciju srednjovekovnih lobanja iz Vinče je prvo podrazumevao pripremu epigenetskih zapisnika, koji je obuhvatio 25 elemenata koji su najčešće očuvani na skeletnom materijalu poteklom sa arheoloških nalazišta. Njihov izbor se decidno može videti na tabeli 1.

Rezultati testa su prikazani na tabeli 1, s tim što obuhvataju prisustvo određenog epigenetskog testa, broj lobanja na kojima je posmatran, kao i procentualnu vrednost (u odnosu na broj opservacija). U integralnom delu priloga (na engleskom jeziku) dobijeni rezultai su objašnjeni i prodiskutovani, a u smislu zaključka autor je izneo da poređenje naših inače skromnih epigenetskih rezultata sa ovom kolekcijom lobanja nije svrsishodno, s tim što bi određena sistematizacija i standardizacija na ovom planu u našoj praksi svakako dobrodošla.

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### MEDIAEVAL CEMETERIES BY THE ZAVOJSKO LAKE NEAR PIROT – PALEODEMOGRAPHIC AND PALEOPATOLOGIC ANALYSIS

### ABSTRACT

During archaeological excavation in 1988, conducted next to the St. Nikola's monastery, 28 skeletons were discovered. In the same year, next to the church of Holy Resurrection (Svetog Vaznesenja), 157 individual skelteons were excavated. Within their anthropological study, paleodemographic, as well as paleo-pathologic analyses were undertaken. The results gained were very indicative for the Middle Age, actually for cemeteries connected to sacral objects and contrary to those placed within urban centres. Their presentation is the main topic of this interdisciplinary paper.

Key words: Biophysical anthropology, archaeology, sex, age, life length, paleodemography, paleopathology, paleodemographic reconstruction, paleopathologic interpretation.

### INTRODUCTION

The Zavojsko lake is situated some 17 km to the north from Pirot. It was named after the Zavoj village, which was flooded after the natural errosion of the Visočica River formed a natural dam. After that, a man-made dam was built upon the natural one. The water from the lake is lead through tunnels and used for the "Pirot" water power-plant. The lake itself is 17 km long and its greatest depth measures 70 m. Today, it also represents a touristic attraction. During the late eighties of 20th century, archaeological survey of the nearby area was undertaken, because, due to the relief changes caused by accumulatied water, some parts were flooded both modern settlements and ancient archaeological sites. Parallel to archaeological excavations, anthropological studies were made of skeletons discovered in the villages of Zavoj, Velika and Mala Lukanja.<sup>1</sup>

<sup>1</sup> Anthropological documentation used for this publication was handed to the authors by the retired professor of anthropology of the Philosophical Faculty in Belgrade,  $\check{Z}$ . Mikić, for which we express our gratitude.

<sup>\*</sup> The article results from the project: Viminacium, Roman city and military legion camp – research of material and non material of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalisation and 3D visualisation (no 47018), funded by Ministry of Education and Science of the Republic of Serbia.

### ARCHAEOLOGICAL CONTEXT

Archaeological research in 1988 at the medieval sites in the villages of Zavoj, Velika Lukanja and Mala Lukanja were conducted by Predrag Pejić M.A., custodian-archaeologyst of the Ponišavlje Museum in Pirot.<sup>2</sup> In the catalogue of the permanent exibition about these excavations, printed in 1991, he writes that there were three medieval cemeteries with inhumations burried in rows. The oldest is the one next to the St. Nikola's monastery, in the village of Mala Lukanja. According to the grave goods from these graves, the cemetery was dated into the period from 12th to 14th century. The excavated area measured 660m<sup>2</sup>, which is just a smaller part of the cemetery. Archaeological excavations revealed 28 graves, i.e. 28 individual skeletons which were anthropologicaly studied.

Within the area of the former Velika Lukanja village, only a smaller part of a medieval cemetery (55m<sup>2</sup>) was unearthed. Seven individual graves were excavated, which were dated from 15th to 17th century according to grave goods found within them. Still, apart from being less numerous, this osteological material was also poorly preserved and therefore not included into this study.

In the Zavoj village, which was abandoned during the sixties of 20th century, there was a church of Holy Resurrection (Svetog Vaznesenja) with a necropolis which was in use during a long period of time from 15th all the way to 19th or even to the middle of 20th century. It is actually a graveyard next to the sacral object which, in time, spread further away from the church and closer to the village. Some 200 m<sup>2</sup> of the oldest part of the cemetery next to the church were archaeologically examined. Here, 137 graves were unearthed, but also three graves within the church, which should be the oldest ones. Since the younger part of this cemetery was not excavated, one should consider that the human osteological material studied could belong to the period between 15th and 17th century. Still, it should be noticed that this cemetery could not be completely examined.

### MATERIAL

The first conclusion about the anthropological material from the St. Nikola's monastery from the village of Mala Lukanja and from the church of Svetog Vaznesenja in Zavoj, is their poor state of preservation. Due to the poor state of conservation and small number of samples, the osteological material from Velika Lukanja was not included into this interdisciplinary analysis. Generally, we had 28 individual skeletons from the first medieval necropolis (St. Nikola's monastery) and 140 individual skeletons from the second cemetery (the church of Svetog Vaznesenja) were at our disposal. After the anthropological analysis conducted in 1988, according to Serbian orthodox customs, all of the bones were burried in a common grave on a new location, followed with an adequate church ritual, and therefore it was not possible to deposit them or observe or photograph them afterwards. Apart from that, in the meantime, these mediaeval cemeteries were mentioned in the catalogue named above, but in the anthropological sense, these osteological finds are published here for the first time.

### METHOD

For the needs of both paleodemographic and paleopathological analyses it is first necessary to determine the gender and individual age of every skeleton. On the here presented skeletons, gender was determined according to 21 morphological elements on skull and post-cranial skele-

<sup>2</sup> We also express our gratitude to P. Pejić, M.A. for the handed archaeological data which were quoted in this paper.

ton. These include the following gender-morphological elements: 1. Tuber frontale et parietale, 2. Glabela-arcus supercilialis, 3. Processus mastovdeus, 4. Protuberantia occipitalis externa, 5. Squama occipitalis, 6. Sharpness of orbital bows, 7. Arcus zygomaticus, 8. Pacies malaris, 9. Corpus mandibulae, 10. Trigonum mentale, 11. Angulus mandibulae, 12. Capitulum mandibulae, 13. Angulus pubis, 14. Pelvis maior, 15. Pelvis minor, 16. Foramen obturatum, 17. Incisura ischiadica maior, 18. Sacrum, 19. Caput femoris, 20. Linea asperae on femurs and 21. Clavicula (Ferembach, Schwidetzky, Stloukal 1979). With incompletely and poorly preserved skeletal remains, which made most of the here studied material, sex was determined only after the elements preserved. With completely destroyed adult skeletons, sex was determined only with certain possibility (also named within referrent tables).

For age of adolescents between 14-15 years, lists according to Kronfeld (Kronfeld 1954) were used. For the individual age between 14-15 and 21-23 years, diagrams were used according to Wolf-Heidegger (Wolf-Heidegger 1954). With adults, whose ossification processes of long bones and teeth growth were completed, age was determined according to a complex method based on the following elements: 1. Obliteration degrees of skull *sutturae*, 2. Density degree of the spongiose mass within humerus' head, 3. Density degree of the spongiose mass within femur's head, 4. Relief surface of carliene simphyses and 5. Abrasion degree of molar teeth in both jaws (Ferembach, Schwidetzky, Stloukal 1980).

Within the complete anthropological study and according to R. Martin's methodological rules (Martin and Saller 1957, 429–518) twelve primary skull measurments were taken on the bones put at our disposal: 1. The utmost skull length, 8. The utmost skull width, 9. The smallest forehead width, 17. The basion-*bregma* height, 20. The socalled ear-height of skulls, 45. Cheekbone width, 48. The height of the upper face part, 51. The width of eye holes, 52. The height of eye holes, 54. The width of nasal openning, 55. The height of nasal openning and 66. The so-called angular width of mandibula. Out of these measurments and depending of the state of preservation, certain skull indexes can be calculated and categorized.

As certain tables in this paper point out, due to the poor state of preservation, detailed and numerous measurments of the long, post-cranial bones were not taken. According to the methodological rules of R. Martin (Martin and Saller 1957), only in a small number of cases the greatest femur length (F. 1) and the greatest *humerus* length (H. 1) was measured. Although less numerous, these measurments for both sexes made it posible to calculate individual height with the help of regression tables. These include the regression tables of E.Breitinger (Breitinger 1938) for male individuals and of H. Bach (Bach 1965) for female individuals, which correspond best to the European population of past times

For detecting paleopathological changes on bone tissues, jaws and teeth, and according to our experience, atlas of A. Lovrinčević and Ž. Mikić (Lovrinčević and Mikić 1989) are very useful, as well as an instruction book of E. Hošovski and Ž. Mikić (Hošovski and Mikić 1995). Publications by D. R. Brothwell (Brothwell 1965) and R. T. Steinbock (Steinbock 1976) also had to be consulted. Still, paleopathological observation could only be performed with a macroscopic method, because the whole study of the anthropological material was done in a filed laboratory and during 1988, i.e. during the existence of the "Direction for building the Zavojsko lake dam".

An attempt to follow epigenetic elements according to the method published by A. C. Berry and R. J. Berry in 1967 (Berry and Berry 1967) did not result as it was expected, mostly due to the very poor state of preservation. Still, for the analyses planned for this mediaeval ostheological material this is not of utmost importance.

### RESULTS

From the cemetery of the St. Nikola's monastery, as the older of the two sites, 28 graves were excavated, which present only a smaller number of the total, since the monastery's cemetery could have not completely been investigated. As table 1 shows, the most of the grave contents were only determined according to their sex and age (for a good overview, archaological and anthropological numerations were introduced). As for sex, only the skeletons from the graves numerated as 15 and 27 were marked as probably male, i.e. probably female, due to the lack of preserved markers needed. Still, skeletons no. 14, 23, 24 and 25 were in such a poor condition that their sex could have not been determined at all. It was only posible to determine that they belonged to adult individuals, from 20 years of age and upwards. In general, the excavated part of the necropolis included 11 male, 2 female and 11 skeletons of infants in the first life decade, as well as the mentioned four skeletons.

The age structure of the skeletons is only partly known. For infants it can also be said that most of them died in the first few years of their lives. For both of the female skeletons, as shown in table 1, age was very difficult to determine. It was also difficult to determine on seven of the male skeletons. With the remaining four skeletons, the individual age was between 45 and 60 years of age.

Paleopathological changes on bones, as well as on jaws and teeth, were observed on seven skeletons. Table 2 shows that these are the skeletons no. 3, 10, 12, 15, 17, 21 and 28, one of which is an infant grave (no. 21).

Table 1: Zavojsko	Lake (St. Nikola'	s Monastery)	Mala I	Lukanja -	- elements
	of paleodemo	graphic profi	les		

Archaeological numeration	Anthropological numeration	Sex	Age	
1/2	1	male	up to 50 years	
2/2	2	infant	up to 1 year	
3/2	3	male	over 45 years	
4/2	4	infant	between 5 and 6 yeras	
5/2	5	female	adult	
6/3	6	infant	about 4 years	
7/3	7	infant	about 2 years	
8/3	8	infant	up to 1 year	
9/3	9	male	adult	
10/3	10	male	up to 60 years	
11/3	11	male	adult	
12/3	12	male	up to 45 years	
13/	13	male	adult	
14/4	14	undetermined	adult	
15/4	15	male (?)	adult	
16/4	16	infant	between 8 and 10 years	

17/4	17	male	adult
18/5	18	infant between 2 and 3 years	
19/5	19	infant up to 5 years	
20/5	20	infant	between 6 and 8 years
21/5	21	infant	between 6 and 8 years
22/5	22	infant	about 2 years
23/5	23	undetermined	adult
24/5	24	undetermined	probably up to 20 years
25/5	25	undetermined	adult
26/5	26	male	adult
27/5	27	female (?)	adult
28/5	28	male	adult

# Table 2: The Zavojsko Lake (St. Nikola's Monastery) Mala Lukanja – an overview of paleopathological observations

Skeleton number	Sex	Age	Paleopathological find				
3	male	over 45	Caries teeth, teeth cists and intra vitam loss of teeth in both jaws.				
10	male	up to 60 years	On both sides of the <i>mandibula in-</i> <i>tra vitam loss</i> of all of the premolars and molars.				
12	male	up to 45 years	<i>Exophytes</i> on toracal and lumbal <i>vertebrae</i> . Caries and <i>intra vitam</i> loss of teeth in the mandibula.				
15	male (?)	adult	Osteophytes on lumbal vertebrae.				
17	male	adult	Extreme depositing of <i>osteophytes</i> on toracal and lumbal <i>vertebrae</i> .				
21	infant	between 6 and 8 years. Caries deciduous teeth in the maxilla. Gribra orbitalia in both of the eye holes.					
28	male	adult ( <i>senilis</i> )	<i>Exophytes</i> on toracal and lumbal <i>vertebrae. Intra vitam</i> loss of all of the teeth in <i>maxilla</i> . Healed fracture of one of the upper ribbs (which, due to incomplete preservation, can- not be determined).				
Skeleton number:	Sex:	1*.	8.	9.	13.	17.	66.
---------------------	------	--------	-----	-----	-----	-----	-----
1	male	186	145	101	100	110	107
3	male	186+**	148	98	-	117	100
2	male	188+	148	105	-	114	117

# Table 3: THE ZAVOJSKO LAKE (ST. NIKOLA'S MONASTERY) Mala Lukanja – cranial measures at disposal

\* Osteometric marks according to R. Martin.

**\*\*** + mark for the anthropological measure gained through reconstruction.

If jaws and teeth are observed separately, different types and locations of caries can be noticed, one tooth cist (*peridontitis periapicalis chronica grahulomatosa*), along with numerous teeth losses during one's lifetime (*intra vitam*). Caries teeth in both of the jaws were noticed only on skeleton no. 3, and in *mandibula* of the skeleton no. 12. Numerous cists were oticed on skeleton no. 3 (due to evolved caries). Loss of teeth in both of the jaws was again noticed at the skeleton no. 3 and only on madibulas of skeletons no. 10 and 12. The loss of *maxilla* teeth were noticed on skeleton no. 28. The infant skeleton no. 21 had caries teeth in the *maxilla*.

Destructive changes on spine were the most frequent paleopathlogical diagnoses on the examined skeletons from this necropolis. The changes include forming of *osteophytes* and *exophytes* on certain *vertebrae*. *Ostheophytes*, as a less destructive change, were noticed on lumbal *vertebrae* of the skeleton no. 15\*, while on the skeleton no. 17 it is extreme depositing on toracal and lumbal parts of spine. *Exophytes*, as a developed form of bone destruction, were noticed on the skeletons no. 12 and 28, always on toracal and lumbal *vertebrae*.

*Cribra orbitalia* in a developed form was noticed in both of the eye holes of the infant skeleton 21.

Traumatic destruction is only noticeable on the skeleton of an old man no. 28. Its reliable position is difficult to determine, but it is obvious that one is dealing with a badly healed fracture (*status post fracturam*) of one of the upper ribbs, which was most probably caused by a fall from greater height.

Even though it is out of the titled frame of this paper, anthropometric features should also be mentioned. Due to the poor state of preservation, they could only be gained for three skulls, no. 1, 3 and 12 (see table 3).

Their length-width indexes vary between 73 and 80 point out that there are morphostructures at the bordering line between high mesocrane and brachicrane, and accompanied with *planoccipitalia*, they could be connected to the mid-Balkans mediaeval population (Mikić 1988).

Due to the poor state of preservation, examining anatomic variations, i.e. an attempt to establish family connections did not offer any indicative results. Os apicis sin was only noticed on the male skull no. 12. Here, the poor state of preservation was also the main cause.

As already mentioned, the cemetery around the church of Holy Resurrection (Svetog Vaznesenja) had its spacial dynamics which is chronologically conditioned. Still, it was archaeologically not completely investigated. This reduces its anthropological and paleodemographic reconstruction and interpretation.

As table 4 and its appendix show, for our analyses, all of the 140 archaeologically excavated skeletons were at our disposal, although very poorly and incompletely preserved. The 137 skeletons belong to the oldest part of the cemetery, from 15th century, while the three male skeletons, which should be the oldest ones, come from the inside of the church (separately show non the appendix of table 4).

Due to poor state of preservation, out of 137 skeletons from the oldest part of the cemetery

of the church of Svetog Vaznesenja, 22 skeletons could have not been determined according to thier sex. All of the male skeletons, 54 of them, were successfully determined. With female skeletons, 12 were successfully determined and three skeletons were determined with great probability. The number of infant skeletons is 46.

Archaeological numeration	Anthropological numeration	Sex	Age
sondage 1			
skeleton no. 1	1	robust male adult	
skeleton no. 2	2	infant aged between 8 to 10 years	
sondage 2			
skeleton no. 3	3	infant aged between 3 to 5 years	
skeleton no. 4	4	robust male over 40 years	
skeleton no. 4/a	5	infant in the first life year	
skeleton no. 5/a	6	female(?) up to 60 years	
skeleton no. 5/b	7	undetermined adult	
skeleton no. 5/c	8	infant in the first life year	
skeleton no. 6	9	undetermined adult	
skeleton no. 7	10	undetermined adult	
skeleton no. 8	11	robust male adult	
skeleton no. 9	12	infant aged between 2 to 3 years	
skeleton no. 10	13	male adult	
skeleton no. 11	14	male up to 50 years	
skeleton no. 12	15	infant aged between 10 to 12 years	
skeleton no. 13	16	undetermined adult	
skeleton no. 14	17	male 30 to 35 years	

Table 4: Zavojsko Lake (Church Svetog Vaznesenja) – elements of paleodemographic profiles

skeleton no. 15	18	male adult	
skeleton no. 16	19	infant aged up to 6 years	
skeleton no. 17	20	robust male to 45 years	
skeleton no. 18	21	male to 40 years	
skeleton no. 19	22	undetermined adult	
skeleton no. 20	23	male to 50 years	
skeleton no. 21	24	male adult	
skeleton no. 22	25	robust male to 40 years	
skeleton no. 23	26	undetermined adult	
skeleton no. 24	27	infant aged between 10 to 12 years	
skeleton no. 25	28	male adult	
skeleton no. 26	29	infant in the first life year	
skeleton no. 27	30	infant in the first life months	
skeleton no. 28	31	male to 50 years	
skeleton no. 29	32	female adult	
skeleton no. 29/a	33	infant aged up to 3 years	
skeleton no. 30	34	infant aged between 6 to 8 years	
skeleton no. 31	35	undetermined	adult
skeleton no. 32	36	robust male	over 40 years
skeleton no. 33	37	robust male	to 60 years
skeleton no. 34	38	robust male	to 50 years
skeleton no. 35	39	robust male	over 40 years
skeleton no. 36	40		infant in the first life year
skeleton no. 37	41	infant aged up to 2 years	
skeleton no. 38	42	male	to 50 years
skeleton no. 39	43	infant aged up to 2 years	
skeleton no. 40	44	male	to 50 years
skeleton no. 41	45	male	to 21/23 years
skeleton no. 42	46	male	to 30 years
skeleton no. 43	47	infant aged between 12 to 15 years	

skeleton no. 44	48	male	to 21/23 years
skeleton no. 45	49	undetermined	adult
skeleton no. 46	50	undetermined	adult
skeleton no. 47	51	male	to 45 years
skeleton no. 48	52	undetermined	undetermined
skeleton no. 49	53	robust male	to 40 years
skeleton no. 50	54	male	to 50 years
skeleton no. 51	55	robust male	undetermined
skeleton no. 52	56	undetermined	undetermined
skeleton no. 53	57	male	to 60 years
skeleton no. 54/a	58	robust male	to 50 years
skeleton no. 54/b	59		infant aged between 6 to 8 years
sondage 3			
1	60	undetermined	undetermined
2	61	infant in the first life months	
3	62	infant in the first life year	
4	63	infant aged between 8 to 10 years	
5	64	infant aged up to 3 years	
6	65	infant aged up to 3 years	
7	66	infant in the first life year	
8	67	infant in the first life months	
9	68	infant aged up to 2 years	
10	69	female(?)	to 21/23 years
11	70	infant aged up to 6 years	
12	71	infant aged between 8 to 10 years	
13	72	undetermined	undetermined
14	73	robustna female	to 30 years
15	74	robust male	to 30 years
16	75	undetermined	adult

17	76	infant aged between 8 to 10 years	
18	77	infant aged between 6 to 8 years	
19	78	undetermined	undetermined
20	79	female	to 40 years
21	80	infant aged between 12 to 15 years	
22	81	infant aged between 8 to 10 years	
23	82	robust male	to 60 years
24	83	male	to 35 years
25	84	male	adult
26	85	male	to 60 years
27	86	female	to 60 years
28	87	male	to 40 years
29	88	robust male	adult
30	89	robust male	to 40 years
31	90	infant aged between 6 months to 3 years	
32	91	infant aged up to 3 years	
33	92	undetermined	undetermined
34	93	undetermined	undetermined
35	94	undetermined	undetermined
36	95	male	to 40 years
37	96	undetermined	undetermined
38	97	undetermined	undetermined
39	98	male	to 50 years
40	99	male	to 40 years
sondage 4			
1	100	infant aged up to 2 years	
2	101	gracile female	to 40 years
3	102	female	to 50 years
4/a	103	male	over 40 years
4/b	104	male	to 60 years
5	105	infant aged up to 6 years	
6	106	male	over 50 years

7	107	gracile female	to 40 years
8	108	infant aged between 6 months to 3 years	
9	109	robust male	to 40 years
10	110	infant aged up to 15 years	
11	111	female	to 60 years
12	112	undetermined	undetermined
13	113	robust male	adult
14	114	male	to 50 years
15	115	male	to 60 years
16	116	infant aged up to 2 years	
sondage 5			
1	117	infant aged between 3 to 4 years	
2	118	infant aged up to 15 years	
3	119	robust female	to 40 years
4	120	infant aged up to 3 years	
5	121	infant in the first life year	
6	122	undetermined	undetermined
7	123	male	to 45 years
8	124	male	to 50 years
9/a	125	female (probably)	adult
9/b	126	infant aged up to 2 years	
10	127	female	to 50 years
11	128	female	to 40 years
12	129	infant aged between 6 to 8 years	
1?	130	infant aged between 5 to 6 years	
14	131	male	to 45 years
15	132	infant aged up to 5 years	
sondage 6			
1	133	male	adult
2	134	male	over 20 years

3	135	male	to 60 years
4	136	male	to 40 years
5	137	female	to 60 years

Appendix to table 4: Anthropological content of the inside of the Svetog Vaznesenja church

Grave no. 1: Poorly preserved skeleton of a robust male aged up to 40 years.

2: Incompletely preserved skeleton of a robust male aged up to 60 years. Skull calotte was preserved:

M. 1 (maximum skull length) 175 mm

M. 8 (maximum skull width) 146

M. 9 (smallest forehead width) 101

Paleopathological find: Extreme exophytes on lumbal *vertebrae*, the two lowest are blocked together.

3: Poorly preserved male skeleton aged up to 35 years.

Age structure of this specific skeleton group could have been calculated according to the data for 102 individual skeletons. As table 4 shows, individual biological age could have been determined for 4-3 male, 13 female and 46 infant skeletons. Due to the very poor state of preservation, this kind of data was not obtained for the remaining 35 skeletons.

It turned out that the relatively small group of females (13) had an average life length of almost 43 years (42,8). An average man burried at this part of the cemetery did not live longer than 40 (39,6). The large group of infants (46) mostly died in the first life years, while their average life length did not exceed 5 years (5,2). All of these results, especially the great discordance between sex, shall be discussed in the next part of this paper.

Paleopathological profile (see table 5) of the inhabitants burried at the older part of the cemetery, next to the church of Svetog Vaznesenja, shows that out of 137 individuals, 39 show traces of paleopathological destructions which lasted long enough to leave traces on bones or teeth. Out of that number, 23 are male skeletons (54 in all), 8 are female (15 in all), while 7 belong to infants (46 in all). The sex of only one skeleton remained undetermined (22 in all). The number of diagnoses (64) is greater that the number of skeletons on which they were observed (39), while 43 pathological diagnoses concearn jaws and teeth.

The same as with the skeleton group excavated at the older location, near the St. Nikola's monastery, our examining beginns with observing jaws and teeth.

Caries is noticeable already at children's age. On deciduous molars it was observed in four cases (no. 15, 63, 65 and 76). Apart from caries, *cribra orbitalia* was also observed on children's skulls. These include three cases, on skulls no. 65, 108 and 116. On the seventh child's skull with paleopathological changes (no. 47), the diagnosis concearns the hole in the right pelvis part, which is considered the direct *Causa mortis*, even though the individual was less than 15 years of age.

With adults, whose growth and development are considered to be finished according to different criteria, jaws and teeth were endangered as well. Caries is very various in type and almost all of the variations were present. It can be divided into jaws after its positioning. In five cases, it was discovered in both of the jaws (no. 37, 42, 44, 74 and 101), again in five cases only in the mandibula (no. 73, 82, 86, 107 and H9) and in two cases only in the *maxilla* (no. 36 and 39).

Teeth cists were also divided according to their position within jaws, all after table 5. Cists in both of the jaws were found on three skulls (no. 42, 44 and 101), in two cases only in the *maxilla* (no. 37 and 39) and again in two cases only in the mandibula (no. 82 and 107).

Partial tooth loss during one's lifetime oc-

Antropologi- cal number	Sex	Age	Paleopathological opservation
6	F (?)	to 60 years	Loss of a larger number of premolar and molar teeth in <i>mandibula intra vitam</i> .
13	М	adult	Erosion of the <i>osteomielitis leutica</i> type on skull bones. Loss of more than a half of man- dibula teeth <i>intra vitam</i> .
14	М	to 50 years	Extreme exophytes on lumbal vertebrae. Badly healed doublé fracture of the left <i>femur</i> (in the middle of <i>diaphysis</i> and knee ankle). Well healed fracture of the plate part of the right <i>scapula. Intra vitam</i> loss of all of the back teeth (molars) in both of the jaws.
15	Ν	10/12 years	Caries on all of the deciduous teeth.
20	М	to 45 years	Status <i>post fracturam</i> of one rib (which is dif- ficult to determine beacuse of poor preserva- tion state). <i>Intra vitam</i> loss of teeth in both of the jaws.
23	М	to 50 years	On neck <i>vertebrae</i> huge destruction which led to corporal assimetry. Visible exostoses on tibias.
25	М	to 40 years	<i>Exophytes</i> on lumbal <i>vertebrae</i> . <i>Intra vitam</i> loss of teeth in the mandibula.
26	?	adult	Sacrum and Os coxae dexter completely obliterated.
28	М	adult	Periostitis of the left tibia and left fibula.
31	М	to 50 years	Visible assimetrical destruction of lumbal <i>ver-</i> <i>tebrae</i> . <i>Intra vitam</i> loss of all fo the mandibula premolars and molars.
36	М	over 40 years	<ul><li>Well healed fracture of a rib (which could not be located due to poor state of preservation).</li><li><i>Intra vitam</i> loss of both of the mandibular premolar son the left. Caries on maxillar teeth.</li></ul>
37	М	to 60	Teeth cists on the left <i>maxilla</i> side, as well as caries teeth.
38	М	to 50	Intra vitam loss of mandibula molars.
39	М	over	Caries and teeth cists in <i>maxilla</i> . <i>Intra vitam</i> loss of teeth in the <i>mandibula</i> .
42	М	to 50	<i>Intra vitam</i> loss of a large number of teeth in both of the jaws and teeth cists.
44	M to 50 years		Caries teeth in both of the jaws, teeth cists and <i>intra vitam</i> loss of six teeth.

# Table 5: Zavojsko Lake (The Church Of Svetog Vaznesenja) – an overview of paleopathological observations

r			
47	N	12/15 years	Right pelvis half perforated circularly in the middle. Opening on the outer side 1 cm, and on the inner side about 1,5 cm. This injury indicates the <i>causa mortis</i> .
51	М	to 45 years	Extreme <i>exophytes</i> on lumbal <i>vertebrae</i> .
54	М	to 50 years	Badly healed fracture of <i>colum femoris dexter</i> . Visible loss of <i>ad longitudinem</i> .
63	N	8/10 years	Caries on mandibular deciduous teeth.
65	N	about 3 years	<i>Cribra orbitalia</i> . Caries on deciduous molars in both of the jaws.
69	F (?)	to 21/23 years	Intra vitam loss of mandibula's first left molar.
73	F	to 30 years	Molar caries in <i>mandibula</i> .
74	М	to 30 years	Caries present in both of the jaws. <i>Intra vitam</i> loss of premolares on the left side.
76	N	8/10 years	Caries on deciduous molars.
82	М	to 60 years	<i>Intra vitam</i> loss of all of the teeth in the <i>max-illa</i> , due to which the palatal bow is completely flat. <i>Intra vitam</i> loss of all of the premolars and molars in the <i>mandibula</i> . Dental illness and teeth cists in the frontal zone.
86	F	to 60 years	Loss of all of the <i>mandibula</i> teeth <i>intra vitam</i> , except one caries molar.
87	М	to 40 years	Arthritis on the whole spine. Visible discus destruction.
89	М	to 40 years	Destruction of the <i>osteomielitis leutica</i> type on skull fragments.
99	М	to 40 years	Loss of only one tooth in both of the jaws.
101	F	to 40 years	Caries teeth in both of the jaws, teeth cists and <i>intra vitam</i> loss of teeth.
104	М	to 60 years	No teeth in the <i>maxilla</i> .
106	М	over 50 years	<i>Osteophytes</i> on lumbal <i>vertebrae</i> . Only two molars left in the right <i>maxilla</i> part.
107	F	to 40 years	Caries teeth in the <i>mandibula</i> , teeth cists and <i>intra vitam</i> loss of numerous teeth.
108	Ν		6/8 years Cribra orbitalia.
116	N	about 2 years	Cribra orbitalia.
119	F (?)	to 40 years	Caries and <i>intra vitam</i> teeth loss in the <i>man- dibula</i> . Lumbal <i>vertebrae</i> grown together in a block - Morbus Becterew.
123	М	to 45 years	Extreme <i>exophytes</i> on lumbal <i>vertebrae</i> with <i>corpus</i> destruction.
137	F	to 60 years	Almost all of the teeth alveoles in both of the jaws atrophied.

Tabela 6: ZAVOJSKO LAKE (THE CHURCH OF SVETOG VAZNESENJA) - anthropological measures at disposal

							-		-							_			
sex	Μ	Σ	М	Σ	Σ	Σ	(¿) M	Σ	(;) M	Σ			Σ		Μ	(¿) M	М	F (?)	
Ή	·				334			330			Μ	Σ	323	ц	325			ı	
F1.	ı				501			ı	446					288		ı	498		
66.	120				ı			ı				458		408				ı	
55.	ı		28	29	ı			ı										ı	
54.	ı		45	51															
52.	ı		30	32												ı			
51.	I		37	38	ı														
48.	ı	ı	68	71				ı		ı	ı		ı			-		ı	
45.	ı		133	139				ı								-		ı	
20.	137		141	139				ı								-			
17.	120		123	117				ı								-			artin
.6	98	101	102	97	ı	91		98		92	96		106			92	98	98	oto R M
×.	147	146	145	144	ı	151	137	152		141	142		155	96	147	135	144	142	accordin
11.	185	175	185	182	1	177	171	181	ı	174	176		182	178	184	170	175	176	ric marks
An- thro- polog- ical num- ber	5	14	36	38	51	53	55	58	74	98	66	113	115	119	123	131	136	137	Osteomet
Ar- chae- ologi- cal num- ber	4/25	11/2	32/2	34/2	47/2	49/2	51/2	54/2	15/3	39/3	40/3	13/4	15/4	3/5	7/5	14/5	4/6	5/6	

cured very often, especially in the mandibula. Eleven cases were discovered (6, 13, 25, 31, 36, 38, 39, 69, 86, 107 and 119). In one case, loss of maxilla teeth was noticed (no. 106), while the loss of teeth in both of the jaws was examined on seven individuals (no. 14, 20, 44, 74, 82, 99 and 101). Loss of all of the teeth was encountered on one individual (no. 104), as well as in both of the jaws on skull no. 137, which is a unique case.

On spines of adult individuals burried at this part of the cemetery next to the Svetog Vaznesenja church, *osteophytes* were noticed on the skeleton no. 106. Exophytes were noticed on four skeletons no. 14, 25, 51 and 123. Destruction of lumbal *vertebrae* lead to spine deformation on skeleton no. 31, while the same change was noticed on cervical *vertebrae* of the skeleton no. 23. At skeleton no. 119 a block of ossified lumbal *vertebrae* was formed, while on the skeleton no. 87 the whole spine was ossified.

Exostases were noticed on skeleton no. 23 on its tibias.

On skeleton no. 26, on its right side, the *Sacrum* and *Os coxae* were completely grown together, which was a unique case.

Fractures were discovered on four skeletons, but in five cases. Only two out of the five cases were well healed (no. 14 - *Scapula*; no. 36 - *Os costae*). Badly healed fractures were discovered on skeletons no. 14 (left femur), no. 20 (*Os costae*) and no. 50 (*Colum femoris dex.*).

*Periostitis* was noticed only on the left tibia and on the left fibula of the skeleton no. 28. Still, the diagnosis for the skulls of skeletons no. 13 and 89 is *osteomielitis leutica*.

Out of three skeletons discovered in the inside of the church, only on one (no. 2) extreme *exophytes* on lumbal *vertebrae* were noticed and L4 and L5 were grown together.

Table 6 shows primary skull measurments, as well as the main measures of long bones, so some of the skull indexes were possible to calculate and the most probable corporal height of the individuals burried on this part of the cemetery. Primary measures were gained for 15 skulls and post-cranial measurments of long bones for only 8 skeletons.

For 15 skulls (see table 6), divided into sex, the calculated longitudinal and width indexes were mostly gained for males. These include 13 index values with the width variation from 78,38 to 85,31. Five skulls belong to high mesocrane group, while the rest of eight skulls belong to brachicrane group. The two measured female skulls have brachicrane indexes - 80,68 and 80,89.

According to the quoted methodology, for calculating corporal height according to the regression relationships of long bones, the data was gained that height of the male individuals was between 168 cm and 176 cm, which makes the average height of slightly more than 171 cm. For females, only one skeleton was at disposal (no. 119), whose height is about 159 cm.

Next to each archaeological number of grave/skeleton, there is also the number of sondage. Due to incomplete state of preservation, apart from *femur* and *humerus*, the rest of the long bones were not anthropologically measured.

In order to gain the best image of anthropological features of the here mentioned mediaeval inhabitants, we shall here try to summarize and interpret paloedemographical and paleopathological elements. These elements are presented according to the location and dating of the cemeteries. Following of anatomic variations offered very little data. That is one case of suttura metopica (no. 83), one case of fisura metopica (no.114) and one occurance of Os Incae uniratitum with dimensions 11 x 5 cm (on skull no. 115). Still, apart from the very poor state of preservation, anthropological results fit into the anthropological profile of the mediaeval population of the Mid Balkans which is related to the authochtonous population (Mikić 1988).

# **DISCUSSION AND SUMMARY**

It was already stated that the study of this human osteological material was conducted in 1988, in the same year when it was excavated. Since there was no archaeological publication, the anthropological survey was conducted in 2011. It was also stated that these cemeteries close to two sacral objects were only partly excavated. The state of preservation was so poor that only a very low number of anthropological measures was obtained. On infant skeletons, morphological observation was often reduced to minimum. Their age was determined, but not their sex. In most of the cases of adult skeletons, it was posible to determine both sex and age. Due to the lack of anthropological measures, certain discriminant functions were not performed, but the preserved elements (se tables 3 and 6) in both cases indicated that one was dealing with the authochtonous population in the late mediaeval of the Mid Balkans.

The monastery cemetery, which is older, dates back between 12<sup>th</sup> and 14<sup>th</sup> century. Since only 28 skeletons were excavated, we can say that only its smaller part is known (according to some estimations it is only one quarter of the whole necropolis). Because of that, any paleodemographic summarizing would be very variable. It can only be repeated that most of the infants died in their early life stages. The average life length of women was not obtained, while the oldest male individual reached his age of 60 years (table 1).

Paleopathological observation concern seven skeletons (table 2). Only one of them is an infant skeleton with caries teeth in the *maxilla*. *Cribra orbitalia* shows reaction on anemia which is developed in the early infanta ge (Stuart - Macadam 1985) and which was encountered on skeleton no. 21.

Teeth and alveola illnesses encountered on this group of skeletons (table 2) show that they occured often. Loss of teeth during one's lifetime is the ultimate result, supported with paradonthosis. It is interesing to mention that up to the present day, the bacteria which directly cause this was not isolated. Some scientists, such as C.W. Drake and his colleagues (Drake et al. 1993), think that these include more than 40 bacteriae.

Paleopathological changes were observed on bones of six male adults. If we would wish to systematize them, they would include three different paleopathological categories (according to table 2). The first one includes jaws and teeth (4 finds on 6 skeletons), rheumatic changes (4 cases), and one fracture on the thoracal skeleton part of an old man no. 28 (*Status post fracturam os costae*).

About women burried on the cemetery next to the monastery of St. Nikola, neither in the archaeologically nor in the anthropologically examined part, there are no paleopathological data, independent of the number of excavated skeletons.

Just like in the case of skeletons discovered next to the monastery of St. Nikola, the methodology of determining sex and age of adults and infants was already interpreted. In comparison to the first group of skeletons, this one is much bigger, but also much younger. It is dated into the period from 15<sup>th</sup> to 17<sup>th</sup> century. Apart from this difference in dating, there is also a difference in geography. Even through they belong to the same micro-region, there is a distance of about 10 km between these two sacral objects.

The first paleodemographic result, gained from table 4, is a big discordance between males, females and children. This sample includes 54 men, 15 women and 46 children from the earliest life stage, but also 22 adult skeletons whose sex was not determined. Since neither during archaeological excavation nor during the analyses there were no skeletons in fetal stage, there is a possibility that children were brought to these medieval churches for certain reasons. It is well known that, apart from their religious role, medieval monasteries also played health and social roles, which should be pointed out and considered. It is quite possible that due to their role of such a kind, there is discordance between male and female individuals discovered. Because of this, it was not used for paleodemographic studies, for which there were twenty instructions given by J. Nemsekeri already in 1970 (Acsadi and Nemeskeri, 1970).

The age reached was gained for 43 male, 13 female and 46 infant skeletons. The total of 35 skeletons remained without these demographic elements. The data named for the average life length should be considered as relative, because this cemetery was only partly excavated. Men lived approximately 43 years long, women about 40 years and infants about 5 years. We are of the opinion that the discordance between sex does not allow structurating of a so-called "time table", so these results are only regarded as relative and certainly not definite.

Since the cemeteries are not connected to any settlement with an inner and an outer dynamics, we were here dealing with one cemetery part which was connected to the church and certainly was a choice of certain number of individuals, who were present here in a certain moment because of certain needs, most likely out of their usual settlements.

Just like in the case of human osteological material discovered next to the monastery of St. Nikola, on the osteological material found near the church of Svetog Vaznesenja, paleopathological changes were observed separately on jaws and teeth and on cranial and post-cranial skeleton (Table 5).

Caries was encountered on infants (4 cases), as well as on adults. Caries in both of the jaws was observed on five individuals, only in mandibula also on five individuals and only in maxilla only on two. In three cases, the accompaning cists were discovered in both of the jaws, and two times each in *mandibula* and *maxilla*. *Intra vitam* loss of teeth in mandibula was observed eleven times. Loss of teeth on *maxilla* were noticed only once and in both of the jaws in seven cases. There were also cases of complete loss of teeth, once in the *maxilla* and in both also on only one individual.

When spine and arthritic changes are concerned, it should be pointed out that they are the most frequent ones. They were noticed on nine skeletons, as well as on one skeleton excavated in the inside of the church of Svetog Vaznesenja.

Unspecific diseases, like periostitis, were noticed on one skeleton. Since the whole human osteological material was burried in a common grave after the archaeological and anthropological research, it was not posible to gathe samples for any future labratory analyses of two cases diagnosticized as *osteomielitis leutica*.

Metabolic diseases, like anemia, were noticed only on infant skeletons, i.e. in three cases.

As for traumas of adult individuals, they were all random (5 finds according to table 5). At the infant skeleton no. 4-7 the pelvis was pierced with a sharp object and this was understood as the direct *causa mortis*, whose circumstances were difficult to interpret.

Summarized, our conclusions would be:

According to the elements which stood at our disposal, we were not able to recognize any continuity between the anthropological contents of these two cemeteries, even though they belong to the same micro-region and chronologically continue one after the other.

Since both of the cemeteries are next to hurches, the great percentual discordance between sex, with numerous infants can only be explained with the fact that the people burried here were chosen according to certain criteria.

The same conclusion is reached because of the great number of infant skeletons in the early life stages, but also because of the lack of subadult individual sor those in fetal stadium.

There were no elements for a paleodemographic study of size of a hypothetic settlement, since we were dealing with cemeteries closet o churches with no usual biologic structure. The paleopathologic analysis showed that oral hygiene (of jaws and teeth) of these medieval people was very poor, that they often suffered of rheumatism and that there were no deliberately caused traumas (except on one infant skelton). All of this shows that there is a certain choice of individuals burried on these two cemeteries.

Finally, our goal was to examine and publish this huge anthropological material, even though the state of preservation of the osteological material was poor. We are obliged to do so because of our profesional duty on one hand and on the other, a very bad treatment of human osteological remains after archaeological excavations, which is very often encountered in this region.

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# REZIME

# SREDNJOVEKOVNE NEKROPOLE PORED ZAVOJSKOG JEZERA KOD PIROTA - PALEODEMOGRAFSKA I PALEOPATOLOŠKA ANALIZA

KLJUČNE REČI: BIOFIZIČKA ANTROPOLOGIJA, AR-HEOLOGIJA, POLNA PRIPADNOST, INDIVIDUALNA STAROST, DUŽINA ŽIVOTA, PALEODEMOGRAFIJA, PALEOPATOLOGIJA, PALEO-DEMOGRAFSKA REKON-STRUKCIJA, PALEOPATOLOŠKA INTERPRETACIJA.

Pored manastira Svetog Nikole tokom arheoloških iskopavanja 1988. godine otkriveno je 28 skeleta. Pored crkve Svetog Vaznesenja iste godine otkriveno je 157 individualnih skeleta. U sklopu njihove antropološke obrade obavljena je paleodemografska, kao i paleo-patološka analiza. Dobijeni rezultati su vrlo indikativni za srednjovekovni period, konkretno za nekropole vezane za sakralne objekte nasuprot onim pored urbanih celina, a njihova prezentacija čini integralni deo ovog interdisciplinarnog priloga. Jelena Anđelković Archaeological Institute, Belgrade jelenandjelkovic@gmail.com

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# PEACOCK AS A SIGN IN THE LATE ANTIQUE AND EARLY CHRISTIAN ART

# ABSTRACT

In the art of late antiquity and early Christianity, during the Christian Middle Ages to the present, peacock holds a prominent place, not only as a decorative motif, but also as a distinctive emblematic and symbolic sign. Veneration and breeding of this bird is dating back to distant past. Owing to the beauty of his plumage and splendid tail, peacock has early got a lot of symbolic functions, causing he to become a very frequent artistic motif. Because of his protective functions, he is a characteristic sign in funerary art. On this example, the transposition of the same motif from pagan to Christian iconography is most noticeable. He is usually combined with a kantharos or a tree of life. These scenes are common in the late antique and early Christian fresco painted tombs from the territory of modern Serbia. Individually or in pair, he is usually represented on places which are the ones closest to the holiest part of churches (altar's parapet wall panels). His ornamentation is visible on floor mosaics, which are often a sole testimony of the decoration of public buildings from the early Christian period, and whose remains can be found on the territory of the Roman provinces on the Central Balkans.

KEY WORDS: PEACOCK, SIGN, ART, PAINTING, LATE ANTIQUITY, EARLY CHRISTIANITY, TOMBS, FRESCOES, MOSAIC.

# THE ORIGIN AND MEANING OF PEACOCK

Peacock (Greek παγώνι, ταώς, Latin *pa-vus* or *pavo*) belongs to the gender of hens. Due to his exceptional natural characteristics, he very early received an honorable place among birds.<sup>1</sup>

1 Peacocks differ from other hens with upper tail's plum-

The so-called ordinary peacock (*pavo cristatus*) is the most depicted one. (Fig. 1.) Iconographically

age, which is especially big and oversized. Therefore, this plumage can be considered as the most important feature of peacocks. They have solid structure and long necks, small heads, short wings, high legs and long tails. Peacock's body is covered with luxury plumage, and his head is decorated with an upright and a long, narrow feather with a brush-hook at the top. Peacocks reach the peak of his beauty at the age of three. (Brem 1982: 309-310)

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Fig. 1. Peacock (Pavo cristatus).

and stylistically, his natural look was mimed in art. If we compare his description with the most of preserved representations, it is noticeable that the specific forms and colors of plumage are reproduced with precise sensibility. Head, neck and front chest of the peacock, are of scarlet blue color, with gold and green reflexes, while the back is green. Every single feather is decorated with copper colored edges. Green tail plumage is decorated with eye-shaped flecks. (Brem 1982: 309-310). (Fig. 2.) It is this distinctive feature of the tail gives basis for symbolical meaning which was referred to the peacock in ancient time and during Middle Ages.

Peacock originates from Ceylon and India, where he was regarded as a symbol of the sun, because of the luxuriant plumy "train" on the tail. Via Babylon, Persia and Asia Minor, he reached the island of Samos, and there he became a sacred bird in Hera's temple. (Biederman 2004: 291-292). It is supposed that he was brought to Italy by Carthaginians. In Rome he was bred from the sec-



Fig. 3. Faustina the Elder on the obverse and peacock on the reverse side of coin.



Fig. 2. "Eyes" on peacock's tail.

ond century BC and there he incorporated Juno's sacred animal. His depictions in Roman art are usually associated with this goddess. Juno was an enthroned ruler of the sky, her reflection on earth was incorporated in the image of an empress, so it is logical that her attribute - peacock is frequent on the reverse sides of coins of some Roman empresses between 1<sup>st</sup> and 3<sup>rd</sup> century AD. (Fig. 3.)

Herein, he is usually rendered in frontal position with an open tail or in profile with downcast tail.<sup>2</sup> Because of his characteristic points, "eyes" on the tail, with time peacock has obtained multiple symbolic functions, so he becomes an almost inevitable motif in the visual and symbolic complex scenic repertoire of fresco painted tombs. In ancient times, he reached our region from the Mediterranean area. Artists who painted tombs, besides existent templates which they used as pattern, it is certain that they could have observed living birds of this gender. Visual arrangements of peacocks, in fresco painted tombs at the territory of present-day Serbia and in the neighboring countries are clearly rendered to imitate a real bird, with more or less success.

<sup>2</sup> On the obverses are Domitia, wife of Domitian (the end of the 1<sup>st</sup> century), Faustina the Elder, wife of Antoninus Pius (middle of the 2<sup>nd</sup> century), Faustina the Younger, wife of Marcus Aurelius (second half of the 2<sup>nd</sup> century) and Diva Mariniana, wife of Valerian I (middle of the 3<sup>rd</sup> century). (*RIC* II, 179-180, Pl. XII, 212; *RIC* III, 66-77, 157-170, 190-194, Pl. III, 64; *RIC* V/1, 64-65, Pl. I, 11, 12, 13).

# PEACOCK AS A PICTORIAL SIGN

As a motive in funerary painting, he is usually placed within scenes which evoke Elysium or Garden of Eden, paradise. These representations of gardens really can be located behind some paradisiacal enclosure, but sometimes arrangement of motifs and adequate scenes, by itself allude to the Garden of Eden, although it is not always formally depicted as such. Besides plenitude of vegetable motifs, different species of birds inhabit these places of bliss; among them, the most common are the representations of pigeons and peacocks.<sup>3</sup> Because of the similarity in decoration and the same symbolic function often combined within a single composition, pigeons in vineyards and peacocks with grapes can be found.

Both representations were conventional in the Greco-Roman funerary iconography because of their allusions to paradise. In the Balkan's tombs from the third to the sixth century a whole range of different forms of these motives could be seen. Unlike birds which may and need not to be recognized by natural features,<sup>4</sup> peacocks are so typical, that in the Garden of Eden, they are not in the function of decorative completion of the idyllic scene, they already independently act symbolically, in accordance with the surrounding scenery. They are one of the most beautiful and most popular themes in sepulchral art in Antiquity, because of the fact that through vines and grapes they are associated with the god Dionysus, and also they

are attributes of a supreme female deity of the Romans - Juno. (Cermanović and Srejović 1996: 107-110, 212-213, 263-265) A special meaning is assigned to the peacock tail, with its "eyes" which symbolize stars in the sky, and often signify the idea of eternity. Wine, together with peacocks can be understood as the potion of immortality, the symbol of Dionysus' liturgy. Confronted peacocks, alone or with a kantharos, were directly transferred from the Dionysian into the Christian symbolism, bearing here their implications entirely. (Đurić 1985a: 5-18) Frequency of this scene in the Balkan's late antique and early Christian fresco painted tombs, on the early Byzantine mosaics, and its appearance throughout the whole Christian Middle Ages, made this theme popular today.

In funerary painting on the territory of Serbia we find peacocks in six tombs of Viminacium<sup>5</sup> (Korać 2007: 18-25, 43-48, 69-72) and in one in Beška. (Đorđević 2007: 70-71; Маријански – Манојловић 1987: 17 – 32; Đurić 1985: 5-18)

# PAGAN CONTEXT

Viminacium – in the tomb marked as G-5464, (Korać 2007: 18-22) in the western part, two confronted peacocks are painted, among them there is a spherical amphora. The amphora is painted in linear manner, with dark brown color. Peacocks are rendered with contours of dark brown, which are filled with cobalt and light blue color. The other walls of the tomb are decorated with a combination of geometric and floral motifs. (Fig. 4.)

On each of the lateral walls of the tomb marked as G-4734, (Korać 2007: 22-23) in the surrounding of floral motifs, peacocks were painted. The peacock depicted on the western side still has most of the tail, wings and body with feet pre-

<sup>3</sup> From all vegetable motifs low shrubs (which are not often defined botanically) and vines with birds (generally recognized as pigeons) are usually shown. In such combination, they are an allusion to the paradise gardens and are usual iconographic repertoire of the late antique and early Christian funerary painting on the territory of Serbia. (Rakocija 2009: 87-105; Мирковић 1954-1955: 53-71)

<sup>4</sup> About the fact that for painters of a certain epoch, it was important to show the bird as such (probably schematically long enough exploited to recognizable) in the characteristic expressive manner, testified two pairs of birds from the ``Tomb with Cupids'' marked as G160. (Korać 2007: 125-140, fig. on the page 135). About expressionist artistic expression in late antiquity, *cf.* (Čremošnik 1984: 198-199).

<sup>5</sup> Because of the impossibility of precise dating (and thus defining the religious framework), tombs which have been fragmentary preserved are classified as pagan.

served.

On the west side of the tomb G-3130 (Korać 2007: 23) beside geometrical motifs which imitate marble surface, on the south side, only a detail of feet of the former figure of a peacock has been preserved. (Fig. 5.)

Tomb G-5313 (Korać 2007: 23-25) is largely destroyed with looting. Two birds and vegetative motifs are preserved on the west and south, while on the eastern frontal side, inside a trapezoidal frame, a painted bird is probably the peacock. (Fig. 6, 6a.)

In the "Pagan tomb" marked as G-2624<sup>6</sup> on the northern and southern lateral walls, peacocks are depicted in the profile facing west, where there is the portrait of a deceased woman, to whom the whole tomb and paintings inside are consecrated. (Fig. 7, 7a.) With his multi-layered symbolism indicating the cults of Dionysus and Juno, (Срејовић and Цермановић-Кузмановић 1979: 182-183) they are also the emblem of an empress or a princess, and with the meaning of the starry sky, they are related to the apotheosis and immortality. (Lother 1929: 283). They can be represented independently as here (in G2624) but more often in pair, when there is a kantharos between them. Although viewed individually, they independently occupy the whole panel in which they are represented, however, in a three-dimensional context, i.e. in the "scenery" of the whole architectural complex they are in pair, painted on the walls which are opposed. In this tomb, kantharos is located in front of both of the two peacocks, and it is filled with wine, which is represented with a dark, brown color. The symbolism of the kantharos filled with wine refers to the idea of immortality. Each motif of these painted panels should have possessed the function of deceased's victory over death. Thus, above the peacocks there are garlands, which in logical compositional and symbolic system should associate this idea with the deceased herself, and with garlands on



Fig. 4. Viminacium, two peacocks and amphora in the tomb G-5464.

<sup>6</sup> Based on stylistic and iconographic analysis, as well as by the coins found in the tomb, the tomb has been dated to the time of Constantius II, between 346 and 350. (Korać 1993: 107-122; *idem.* 2007: 69-100).

her panel. Above the peacock on the north side one garland is painted, and on the southern two.<sup>7</sup>

In terms of style in the compositional concept of the tomb elements of symmetry prevail, to which individual scenes are also subordinated. Peacocks on the lateral walls stand in balance with each other, as well as depictions of the deceased and the servant on the frontal walls. Both figures of peacocks are disproportionate with the figures of the deceased and the servant. Although it is known that an older male peacock actually can grow up to more than 2 m, (Brem 1982: 309-310) the question is whether the artist really want-

ed to keep the natural dimensions of the animal on the image (as this is not the case with human figures), or this oversized image automatically should actually represent an oversized symbolism of peacock. It is unusual in funerary painting that a single motive takes over the entire wall, unless it is not a representation of the deceased. By observing this representation in a special religious context, Goran Janićijević (Janićijević 2009: 135-143) noticed in his paper that here depiction in pair is important, which aims to increase the basic meaning of the central representation.<sup>8</sup> So peacocks with a kantharos between them, facing a young woman, indicate that the deceased does not appear as a consumer of the image (icon of paradise) but that she herself is the icon of eternal life.9 Therefore, the basic iconographic and stylis-

9 Although the tombs are known as Pagan in literature, by observing the peacocks in it, Janićijević considered the



Fig. 5. Viminacium, detail of feet of the former figure of peacock in the tomb G-3130.

<sup>7</sup> Garlands are frequent motives on the sarcophagi, the so-called sarcophagi with garlands. There are relieves and tombstones with them, and sometimes they were used as a decorative element in architecture. As decorative elements on paintings, tradition of their representation dates back to the Hellenistic period. Christians also accepted them because of their meaning of triumph over death. Garlands incorporate dedication, honor, and they often play the role of assignment. In Roman funerary custom, they indicate life after death. The motif of garlands is also very common, there are to be found in almost every tomb of Illyricum. (Маријански – Манојловић 1987: 3)

<sup>8</sup> It is known that multiplication of deities increase powers and activities of a certain deity, so as to respect the trinity, so therefore the visual depiction would have had three persons. This is an example of the three Graces, three Fates and three Matres. (Μαρμħ 2003: 42-45).

tic idea of this tomb is the symbolic orientation of all composition's elements towards the portrait of the deceased. Hence oversized peacocks facing her reinforce the idea of her immortality.

Unlike precisely rendered figures and portraits of the deceased and the servant, the peacocks' bodies are rendered in a much more liberal manner, almost in impressionistic way of painting, with long and easy brush strokes. The drawing dominates, because it primarily builds the form, and it is filled with element of color. In all representation fine contour is visible, which describes the shape.

possibility of both religious frameworks. In both cases he perceives peacocks in the function of lasting, eternity and Elisium as eternal existence, i.e. as an antithesis to ephemeral (and as Resurrection reached through Christianity). (Korać 2007: 69-100; Јанићијевић 2009: 135-143).



Fig. 6. Viminacium, detail of peacock in the tomb G-5313.



Fig. 6a. Viminacium, detal of peacock in the tomb G-5313, drawing by Srđan Đurić.



Fig. 7. Viminacium, peacock on the southern side of the "Pagan tomb" G-2624.

In the so-called ''Tomb with Cupids'' marked as G-160 (Korać 2007: 125-140),<sup>10</sup> the western wall is damaged. Apart from the Cupid and figures of servants, all other motifs are zoo-morphic and floral. Panels filled with grape vines, plants, birds (doves) and peacocks, should suggest

the afterlife. In such context peacocks are again an allusion to paradise and bliss of the second life. In particularly framed panels on longitudinal north and south sides, in spaces next to the eastern, frontal wall, there are peacocks depicted, symmetrically, but as in a mirror, one on each side. They are facing the main scene, i.e. the image on the west.<sup>11</sup>

11 Western wall in the fresco painted tombs in the most cases is intended for the portraits of the deceased (an



Fig. 7a. Viminacium, peacock on the northern side of the ``Pagan tomb`` G-2624.

<sup>10</sup> On the basis of an eclectic manner of art prior to Constantine and of Constantine's time, paintings from the ``Tomb with Cupids`` could be dated to the beginning of the fourth century.

In front of them is a cone-shaped bowl or basket, filled with vivid colors which suggest flowers and fruits. Behind peacock's tail, in the distance, there is another similar basket.<sup>12</sup>

The remaining space of white background is filled with vegetable motifs, freely arranged plants, with large flowers on top. (Fig. 8, 8a) Because of the painted Cupids and vines, content of the tomb could be determined with Dionysian character. Certainly the usual interpretation of immortality and apotheosis can not be excluded, (Gerbran and Ševalije 2004: 679) and as always recognizable paradise and world of bliss, and typical in sepulchral art. Basket or bowl filled with fruit or herbs in front of the peacock also symbolizes fertility-yield, i.e., cornucopia, one that contains a drink of immortality. (Gerbran and Ševalije 2004: 345-347, 398, 689).

On the northern, lateral side of the tomb in Beška, (Đorđević 2007: 70-71; Маријански – Манојловић 1987: 17-32; Đurić 1985a: 5-18)<sup>13</sup> in the upper zone on a white background, three peacocks are depicted, two placed one opposite to another and the third one without pair. (Fig. 9) Peacocks' bodies are blue colored, wings are yellow with a black contour. Long tail is red with yellow and black accents and dotted blue ornament. Clusters and leaves fill the space between the peacocks. Common interpretations of vines, birds-peacocks who peck it, running spirals are peace and welfare of the deceased awaiting him

13 According to grave goods and coins, the tomb has been dated in early fourth century.



Fig. 8. Viminacium, peacock on the southern wall of the "Tomb with Cupids" G-160.



Fig. 8a. Viminacium, peacock on the northern wall of the ''Tomb with Cupids'' G-160.

after death. Imprecise division of the metope conditioned by architectural concept gives an impression that the artist started painting on the left. This created a bad conception of an image, including figures of peacocks, which are given in the form of frieze, so that the third, facing the opposite direction, lost his pair. Either as part of the heavenly landscape, or with kantharos in the Dionysian meaning, in the pagan character of the tomb, the peacock is a sign of victory over death, apotheosis and immortality.<sup>14</sup>

# **CHRISTIAN CONTEXT**

There was no ultimate break with the pagan past in early Christian art, but many themes and motifs have been transposed from its initial pagan into a Christian context. Philosophy of death and

individual or a married couple), so to this wall i.e. embodiment of physical presence of the deceased in the tomb, all other depicted motives and scenes are subordinated. (Валтровић 1906: 128-138; Стричевић 1956 – 1957: 411-413; Овчаров and Ваклинова 1978: 26 - 27; Димитров and Чичикова 1986: 33-35; Danov and Ivanov 1980: 105-121; Marijanski-Manojlović 1987: 17-32; Korać 2007: 101, 129).

<sup>12</sup> Since these utensils are placed in the context of the paradisiacal space, which is here granted with the presence of peacocks, we compare with a similar utensil with conical shape among scattered motives of paradise on the arch of ambulatory of the Church Sta. Costanza. (Oake-shott 1977: 57).

<sup>14</sup> About the peacock in the fresco painted tombs of Illyricum in: (Đurić 1985b: 221-224).



Fig. 9. Beška, three peacocks in upper zone of the northern side of the Beška tomb.

belief in the afterlife remained dominant ideas of Christian art, so artistic themes have been adjusted to this aspect of death. Besides Pastor Bonus and Oranta as the most frequent central motifs, scenes of grape harvest, vines and peacocks were more than an eagerly accepted heritage from the



Fig. 10. Viminacium, Christian paradise with peacocks and kantharos on eastern wall of the "Tomb with Christ's monogram" G-5517.

pagan past. (Volbach 1961: 12).

In the "Tomb with Christ's monogram" G-5517 (Korać 2007: 33-62)<sup>15</sup> as a match with the western scene with the monogram, on the east wall the Christian paradise is represented. There are painted peacocks over the kantharos, as a spring of life. Kantharos is here represented as a fountain from which holy water emerges, and behind each of the peacocks there is a tree of life. (Fig. 10) The peacock is, as we have seen, in many examples a specific symbol of immortality for pagans as well as for Christians. (Спасић-Ђурић 2002: 187-190) Kantharos between them is filled with blue color, therefore water. This is an already standardized image of peacocks who drink from "the spring of life", where they became symbols of human soul. (Јовановић 2009: 526). In combination with the tree of life, they are symbols of man's psychic dualism. (Gerbran and Ševalije 2004: 679-680). Tree of Life symbolizes the connection between

<sup>15</sup> Coins of Constantine I from the year 307 were found in the tomb, but based on analogies, and above all stylistic elements, the tomb has been dated to the end of the second and the beginning of the third decade of the fourth century.



Fig. 11 - Church of San Vitale in Ravenna, peacocks on the ceiling of the presbytery.

heaven and earth, death and resurrection, and sometimes suggests crucifixion. Together, water and the tree of life, according to the Biblical interpretation, are ensuring eternal life and bliss to the deceased (Revelation 22, 14).<sup>16</sup>

Thus, besides that he decorates and belongs to established arrangement of paradisiacal garden, in ecclesiastical books it is considered that in the Peacock immortality is embodied, resurrection and regeneration, because his body does not decay. (Мирковић 1982: 166).

The scene with peacocks is framed with red borders. It is an integral part of the circular course of narration, of the new narrative style of the Constantine's era. From the northern (the earthly rider), over the eastern (where the peacocks are), then south wall (the heavenly rider), the story ends with the depiction of Christ's monogram, on the western wall. Positions of the figures which dynamically aspire toward right, confirm the artist's idea of some kind of "kinetic" composition. In the representation of peacocks over the kantharos, the most common element of the composition is the symmetry, however here this was stressed with the turned head of the right peacock, toward the south wall, i.e. toward the depiction of the Heavenly rider, who is looking toward the focus of the composition, apropos Christ's monogram. The artist correctly accomplishes human and animal forms, and those forms he shapes with contours and lines, which describe the details of the faces, the drapery, and animals' bodies. Unlike precise lines of the monogram, peacocks are rendered with much more freedom in brush stroke and the manner of painting. Impressionistic poetics, which influ-

<sup>16</sup> With well-known motifs of the water of life-*aqua vitae* and the tree of life-*arbor vitae*, the artist illustrates the old Christian doctrine about eternal peace in paradise-*pax aeterna in paradiso*, i.e. Christian peace in paradise-*pax christiana in paradiso*. (Korać 2007: 43-48).



Fig. 12 – Bishop Theodore's sarcophagus in the right nave of the church of San Apollinare in Classe, Ravenna, peacocks with Christ's monogram.

enced the artist, is best seen on the figures of peacocks and vines. Colors which dominate are red and blue, on the northern and southern walls with representations of earthly and heavenly horsemen. The eastern wall with a scene of paradise makes colorful and then symbolic balance between red, color of earth and material, and apothropaic blue, color of the sky and higher spheres.

Peacocks with the same symbolic meaning are found in the analogous funerary art from nearby provinces, in *Moesia Inferior*,<sup>17</sup> then in *Pannonia Superior*,<sup>18</sup> *Dacia Mediterranea*,<sup>19</sup> in *Asia Minor*,<sup>20</sup> as well as in *Macedonia*.<sup>21</sup> Peacocks are the most common decoration of Roman catacombs, where their own symbolism is subordinated to universal cosmic drama. Here, besides central moving figurative motif, there are planets, elements, personifications of the seasons, combined with traditional allusions to the earth (vine, animals) and heaven, whose symbolic meaning is expressed with a bird, usually peacock.<sup>22</sup> This cosmological meaning of

22 With the pagan meaning, we find peacock in a small niche under the stairs among tombs of the necropolis on the Via Ostiense. (Della Portella 2000: 82-92). On the

<sup>17</sup> In Silistra peacocks over the kantharos are located in the lunette of the western wall, above the representation of a married couple. (Димитров and Чичикова 1986: 33-35, 53, figs. 41, 53, 57; Danov and Ivanov 1980: 105-121).

<sup>18</sup> In Pécs on the vault of the tomb on the eastern and western side kantharoi are located, flanked by peacocks. (Fulep, Bachman and Pinter 1988: 22-27).

<sup>19</sup> In the tomb marked with number 1 from the Sofia necropolis in the lunette of the south wall, peacocks are found with the cross. (Миятев 1925: 5-14).

<sup>20</sup> In Iznik on the east wall of the peacocks are displayed around the kantharos in the west were placed frontally. (Firatly 1974: 919-929).

<sup>21</sup> In tombs of Thessalonica. On the longitudinal side of the tomb 2 (Tomb of Eustorgios), among fruits and flowers, on the pedestal, there is a glass vase from which water emerges, with two peacocks on the sides. (Pelekanidis 1963: 8-12). In the lunette of the eastern wall of the tomb 3 (Tomb of the Good Shepherd), there are poorly preserved representations of two confronted peacocks, it is not certain what was exactly located between them. (Pelekanidis 1963: 12-18). In the tomb marked with number 5 on the narrower wall opposite of the entrance, in the upper part, two peacocks are represented, among them there is the vase full of fruits. (Đurić 1985b: 85). In the middle of the western lunette of the tomb marked with number 7, there are peacocks, which flanked a large handled kantharos. (Đurić 1985b: 88-89).



Fig. 13 – Transom in the Church of Holy Savior in Chora, Constantinople.

the Christian catacombs was transferred to the late antique and early Christian mosaic floors (usually of baptisteries, basilicas or churches in general). On the territory of today's Serbia, peacocks depicted on mosaics are found only in two places.

In the western part of the nave of the triconh building outside the walls of Caričin Grad (Iustiniana Prima), remains of a mosaic composition of the central framed panel are located, which contains a symmetrical image of two peacocks and a kantharos with vine between them. (Цветковић-Томашевић 1978: 17, fig. 9; Мано-Зиси 1955: 127-168, fig. 52; Кондић and Поповић 1977: 135-139, fig. 99). Birds, fruits and curative herbs are situated on other panels. From the mosaic of peacocks only their legs and tails have been preserved. This mosaic is dated in the mid of the sixth century. "The mosaic with peacock", is mentioned in reports as one of the four floor mosaics found in Ulpiana (Iustiniana Secunda). It is from a later period than the previous three, early Byzantine and it was found in the southern part of the town. According to the published photograph of a peacock in a square section, Gordana Cvetković-Tomašević assumed that this is just one from a square mesh, which could have covered the rectangular area of the composition. (Цветковић-Томашевић 1978: 17-18, fig. 12; Čerškov 1969: fig. 8). In the neighboring countries, we find similar examples of church decorations, baptisteries or palaces floors from early Byzantine period (5th to 6<sup>th</sup> century), where in the cosmic symbolism

ceiling of Priscilla's catacomb cubiculum, a pair of quails (birds of the earth) alternates with a pair of peacocks (birds of the heaven) in basic parts, which rotate around the trigger force of the Good Shepherd. In private hypogeum at Via Dino Compagni, peacocks are painted over the kantharos with garlands, stylistically belonging to the manner of the Hellenistic painting. (Fiocchi Nicolai, Bisconti and Mazzoleni 2002: 95-98, fig. 107, 108, 115).



Fig. 14 – Church of Holy Savior in Chora (narthex), Constantinople, peacocks in the scene "Caressing of Mary".

birds of earth and birds of the haven are the main zoomorphic motifs, so peacocks are frequently appearing independently as heraldic symbols arranged around kantharos or in combination with other animals, whose symbolism continues to allude to baptism, the resurrection and paradise.<sup>23</sup>

Peacocks frequently appear here in the

themes of Christian cosmos,<sup>24</sup> baptism and resurrection with the sacramental blood of Christ and the wine of the Eucharist, symbolized with kantharoi with wine or grape vines and two peacocks, birds which in Christianity remain associated with paradise and immortality. (Ceka 1999: 46-48). Thus, in such a strictly symbolically defined context, peacock becomes a sign, the character of a sort of pictorial language.

Early Byzantine art develops the motive and the meaning of peacock, not only in floor mosaics, but also elsewhere in the temple, as well as on stone sculptures. On the wooden door of the Basilica of Sant'Ambrogio in Milan, among peacocks, birds of immortality stands *corona victoriae*, so these animals from here, and throughout whole

<sup>23</sup> One of the best preserved mosaics with peacocks is located in the baptistery of Episcopal basilica in Butrint. On the external side of the building, remains of a Roman mausoleum are preserved. This reference to the Roman funerary architecture was purposeful, because the symbolism of baptism was closely linked with death and resurrection. (Ceka 1999: 46-48, pl. 2). Likewise peacocks over kantharos alone or with other birds and animals we find in Roman provinces Macedonia Prima-Greece and FYROM-Republic of Macedonia (Philippi, Amphipolis and Heraclea Lyncestis), Macedonia Secunda-FYROM- Republic of Macedonia (Stobi) and New Epirus-FYROM- Republis of Macedonia (Ohrid). (Цветковић-Томашевић 1978: 19-21, 30-32, 33-34, 35, 35-37, 42, 48, 50, figs. 16, 18, 42, 46, 51, 52, 60, 74, 78).

<sup>24</sup> More about symbolic representations, interpretations and meanings of cosmos in: (Цветковић-Томашевић 1978: 87-101).

Ravenna art in stucco decoration, decoration of the sarcophagus, or *presbyterium* of the imperial church of San Vitale, become part of the complex angelic composition of Victory.<sup>25</sup> (Fig. 11, 12) In Byzantine art, peacock still appears in the usual iconographic repertoire, but also in many new places in his developed decorative and symbolic form.<sup>26</sup> (Fig. 13, 14, 15) Unlike the ancient compositions where zoomorphic, vegetable and geometric motifs, along with personifications and allegories, partici-

25 On the sarcophagi usually between two palm trees, peacocks flank Christ's wreath, monogram, cross or kantharos as a symbol of living water, as birds of immortality among the trees of life they are located in Eucharistic vine or on the top of the paradisiacal hill with four rivers. With the tree of life peacocks acquire the needed symbolic of resurrection in a complex program of presbytery in the Church of San Vitale in Ravenna. (Gerke, 1973: 138, 180, 217). On the barrel vault of the vestibule of the Archbishop chapel, on a golden background of the paradisiacal heaven, among multitude of birds there are peacocks too. (Bovini 1957: Tav. 13; G. Bovini 1969, fig. on page 47). Near the stairs which are leading from the central nave of the church in San Apollinare in Classe to the raised choir, three large carved marble slabs (transenna) are placed, decorated with a cross on the bowl from which vine emerges and on which there are two peacocks standing. Marble Pluteus (VI century) decorated with a bowl and Christ monogram, towards which two peacocks approach, on the vine. (ibid. : figs. on pages 127,131). Sarcophagi from 5<sup>th</sup> century, of Bishop Theodore (peacocks with the monogram of Christ) and a sarcophagus with six niches (peacocks with kantharos) in the right nave of the church of San Apollinare in Classe. (Bustacchini 1988: 88-89, figs. 3, 4, 153).

26 The first columns decorated with ``peacock's eyes`` are at Theodosius' forum in Mese street in Constantinople, Holy Cities Bethlehem (peacock appeared for the first time in front of the Bethlehem grotto) and Jerusalem their paradisiacal spaces and marks of places of birth and Calvary of Christ illustrate settled with peacocks (Rotunda of St. George in Thessalonica (IV century), the Church of Holy Savior in Chora (narthex) in the scene of Caressing of Mary (XIV century)), and there are peacocks also in the stone decoration (transom in the Church of Holy Savior in Chora and pillars of the Church of Constantine Lips (X-XIII century)). (Лазарев 2004: 21-35, 156-188, figs. 2, 465; Mathews 1976: 322-345). Spatially framed in a niche of the Church of St. Polyeuctus, spread tail of a peacock as architectural decoration today ornaments the lapidarium of the Archaeological Museum in Istanbul. Secular symbolism of peacock was recorded in the bedroom decoration of the new imperial palace of Basil I, in which, in the central medallion of mosaic on the floor, a peacock with shining red plumage was depicted. (Дил 2007: 21-22).



Fig. 15 – Archaeological Museum in Istanbul, niche from the Church of St. Polyeuctus, spread tail of a peacock.

pate in a large mythological or pastoral narrative, in Christianity, each animal itself carries a certain quality of its symbolic character, with which it is being included in the narration, sometimes with more or less associations. Animals, plants, certain celestial spheres, the earthly elements, due to their specific characteristics, played an important role in man's life. Thus, their sign language was created, with which they acted in art, religion, rites, and magic.

From Hera's and Juno's attributes, through the Garden of Eden in the world of the blessed, providing apotheosis to the deceased, peacock as an ancient symbol, in Christianity obtained his well-known features which will mark him up to the present day. An ancient sacred bird became a Christian bird which means holiness. Because of the belief that his flesh is eternal, falling plumes and its re-growth in the spring, in Christianity peacock became the dominant symbol of renewal and resurrection. (Biederman 2004: 291-292).

The eyes of his tail are interpreted as the "Allseeing Church". (Јовановић 2009: 526). Negative interpretations he acquired in the early Christian Physiologist,<sup>27</sup> after which, in books about animals,

<sup>27</sup> Collection of the symbolic and allegorical stories (letters) about animals, plants and minerals. It originated somewhere from the East, perhaps from Alexandria, between second and fourth century. It has been translated

through the Middle Ages, peacock is mentioned as an animal which symbolizes loft, vainglorious, vanity, luxury and proud. (Ferguson 2002: 23). The long tradition of veneration of these birds in art and religion, led to a general acceptance of peacock in folk beliefs and rites. According to folk belief, it was assumed that peacock's plumage is an amulet for protection against evil eyes, because of numerous buds on the tail plumage, and eye as an amulet has long been known to some nations. (Срејовић and Цермановић-Кузмановић 1979: 97-98; Влаховић and Ацић 1953: 228-239). As an animal which protects from spells as well as an animal with beautiful colorful plumage, with which he could symbolize splendor, he incorporated the ornament of nature. People extolled him in songs, named dances by his name, compare him with the gods, so to this day the frequency and importance of this bird is reflected in Serbian personal name Paun or surname Paunović. (loc. cit.).

> Translated by Jelena Anđelković

D to is into many languages, and had a long tradition in the Byzantine Empire. Letter about peacock the bird: Peacock is very beautiful, walks with great beauty, shimmers in his silken and extols very much. And when he sees his foot, he calls sadly and says: Oh Lord, why don't you create my foot as my body! So you too, man, take care of all the wonders which God gave you. So with mind you envy and you do not know from where it came to you. You are looking at gold and silver on you, and don't remember the poor

#### at gold and silver on you, and don't remember the poor. Take a lot of the God's talents and give them to poverty to make for your soul eternal life. If you get a wound, you ask for a doctor to cure you. Cure your mental wounds, because the medicine is church and charity for the soul. Six days the Lord gave you to work and the Holy Sunday to stand before God with fear that your sins may be forgiven. (Trifunović 1973: 17).

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#### REZIME

# PAUN KAO ZNAK U KASNOANTIČ-KOJ I RANOHRIŠĆANSKOJ UMET-NOSTI

KLJUČNE REČI: PAUN, ZNAK, UMETNOST, SLIKARST-VO, KASNA ANTIKA, RANO HRIŠĆANSTVO, GROBOVI, FRESKE, MOZAIK.

Zbog osobitih prirodnih karakteristika, naročito okaca na repnom perju, paun je vrlo rano dobio izuzetno mesto u verovanjima, običajima, religiji i umetnosti mnogih naroda. Poreklom sa Cejlona i Indije, preko Male Azije dospeo je u Evropu, u kojoj je postao sveta ptica grčke boginje Here i rimske Junone. Preko ove boginje povezan je sa rimskim caricama, pa je čest motiv na reversima njihovog novca. Zbog svojih simboličkih funkcija, paun je nezaobilazni deo scenskog repertoara raja u funerarnom slikarstvu. U kasnoantičkim i ranohrišćanskim fresko os-

likanim grobnicama, sa prostora današnje Srbije i okolnih zemalja, u paganskom kontekstu paun se preko vinove loze, grožđa i vina najčešće povezuje sa Dionisom, ali je takođe atribut najvećeg ženskog božanstva Rimljana - Junone. U paganskom kontekstu paunove nalazimo predstavljene u šest grobnica Viminacijuma (G5464, G4734, G3130, G5313, G2624 i G160 ) i u grobnici u Beškoj. Prikazani samostalno ili u paru, kao drevni simboli pobede nad smrću i besmrtnosti, od paganske apoteoze paunovi u hrišćanstvu postaju deo hrišćanskog raja. U hrišćanskom funerarnom slikarstvu, paunove nalazimo nad kantarosom ispunjenim vodom i sa drvetom života u viminacijumskoj "Grobnici sa Hristovim monogramom" G5517. Čest je motiv na ranohrišćanskim podnim mozaicima krstionica ili crkava. Na ovakvim mestima simbolički aludira na krštenje, vaskrsenje i raj, najčešće u temama hrišćanskog kosmosa. Sa ovim značenjem paunove nalazimo na dva podna mozaika sa teritorije današnje Srbije: u trikonhosu u Caričinom Gradu (Iustiniana Prima) i u Ulpijani (Iustiniana Secunda). Kao kontinuirani motiv u paganskoj i hrišćanskoj umetnosti, u simbolički strogo definisanom kontekstu, ova ptica vremenom je dobila osobinu znaka, karaktera svojevrsnog slikovnog pisma. Preko ravenske i carigradske srednjovekovne umetnosti, paun je svoje značenje i istaknuto mesto u vizuelnoj kulturi istoka i zapada zadržao sve do danas. Duga tradicija poštovanja ove ptice u umetnosti i religiji, dovela je do opšteg narodnog prihvatanja pauna u verovanjima i običajima, pa se smatralo da je njegovo perje amajlija za zaštitu od zlih pogleda. Narod je pauna poredio sa bogovima. Deci, pesmama i igrama davana su imena po ovoj ptici.

Maria E. Xagorari-Gleißner, Institut für Klassische Archaeologie der Universität Erlangen-Nürnberg, Germany m.xagorari@gmx.net UDK 904:726.8"652" 73.032.044(38)"-04/-03" Wissenschaftliche Originalarbeit

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# DIE ERFORSCHUNG DER ATTISCHEN GRABKUNST KLASSISCHER ZEIT: EIN ÜBERBLICK

# ABSTRACT

Mehr als 3500 attischen Grabmäler klassischer Zeit (430-317 v. Chr.) sind uns heute erhalten: Reliefierte Grabvasen, naiskosförmige Reliefs, reliefierte Bildfeldstelen und weitere einfachen Reliefs vermitteln einen Eindruck der athenischen Gesellschaft in der Zeit der Demokratie. Seit den Anfängen der griechischen Archäologie ziehen sie selbstverständlich das Interesse der traditionellen altertumswissenschaftlichen Forschung. Im folgenden Aufsatz werden die heutigen Forschungstendenzen und Problemen skizziert.

Schlüsselwörter: Griechenland; Klassik; attische Grabkunst.

# FORSCHUNGSGESCHICHTE DER ATTISCHEN GRABKUNST

Die attischen Grabmäler, speziell die Reliefs (Abb. 1), sind schon seit dem späten 19. Jahrhundert Thema wissenschaftlicher Abhandlungen. Sie sind in Corpora<sup>1</sup> und Datenbanken (Arachne) gesammelt, die ständig mit neu entdecktem Material bereichert werden. Dass diese Monumente in Attika hergestellt wurden, ist außer Zweifel, da ihr Material attisch ist, nämlich pentelischer oder hymettischer Marmor oder anderer lokaler Stein. Durch Inschriften ist gesichert, dass ein großer Teil der Monumente Athener Bürgern und ein kleiner Teil Nicht-Athenern – Fremden, Sklaven, Metöken<sup>2</sup> – gehörte (Abb. 2). Die Namensinschriften auf attischen Grabmäler sind von statistisch untersucht worden<sup>3</sup>. Die Forscherin kam zum Ergebnis, dass Namensinschriften im späten 5. Jh. noch spärlich waren, aber seit den 60er Jahren des 4. Jhs. zunahmen. In dieser Steigerung sieht die Autorin das wachsende politische Bewusstsein der Athener, die durch ihren Namen auf ihren Grabmälern bekannt werden wollten. Die Gründe für dieses Verhalten sind allerdings nicht geklärt. Zu betonen ist, dass mehr als die Hälfte der Inschriften weder Demotikon noch Ethnikon tragen, so dass der genaue Status der Besitzer

<sup>2</sup> Fragiadakis 1988.

<sup>3</sup> Meyer 1993.

<sup>1</sup> Conze 1893, CAT 1993, ARMA 2009, SEMA 2006.

vieler Namenstelen unbekannt bleibt.

zahlreichen In den bisherigen Abhandlungen über die attischen Grabmäler<sup>4</sup> werden erwartungsgemäß die attischen Bild- und Formelemente hervorgehoben und die gesamte Gattung als Zeugnis der Selbstpräsentation der Athener Bürger betrachtet<sup>5</sup>. Der attische Einfluss auf lykische, karische und sidonische Grabmäler<sup>6</sup> sowie auf die neuzeitliche Grabkunst<sup>7</sup> ist schon in der Literatur notiert<sup>8</sup>. Ob aber einzelne Bildelemente, wie z. B. Waffen, Geräte und Gefäße, als einzige Dekorelemente oder ganz individuelle Szenen auch von anderen Kulturkreisen beeinflusst wurden, ist bisher wenig untersucht worden<sup>9</sup> (Abb. 3). Allgemein ist das Ausmaß des Einflusses anderer Völker auf das Griechenland klassischer Zeit noch nicht vollständig untersucht worden.

# DIE GRIECHEN UND IHRE NACHBARN

Der Hellenozentrismus prägte die Forschung des 19. und 20. Jahrhunderts. Der ist einigermaßen legitim, zumal die Mehrheit der antiken schriftlichen Quellen von griechischen Autoren und in der griechischen Sprache überliefert sind, die Auskunft über die auswärtigen Tätigkeiten der Griechen berichten. Durch *Apoikies* (= Kolonien) und *Emporia* (= Handelsniederlassungen) sorgten die Griechen für die Verbreitung ihrer Produkte und ihrer Kultur.



Abb. 1. Attisches Grabrelief eines Ehepaares, frühes 4. Jh. v. Chr., Athen Nationalmuseum, Inv. 4507.

Der Export griechischer Produkte, vor allem von Wein und Olivenöl sowie von Luxusgütern wie Grabstelen, ist an vielen Orten der antiken Welt belegt<sup>10</sup>. Die letzten Jahren aber interessiert sich die Forschung für die Interaktion der Griechen mit ihren Nachbarn in den Kolonien und den Handelsniederlassungen<sup>11</sup>. Darüber hinaus wird die Kultur von nicht-griechischen Völkern und Stämmen intensiv untersucht<sup>12</sup> und in der Öffentlichkeit präsentiert<sup>13</sup>. Da die Makedonen

<sup>4</sup> Grundlegend: Diepolder 1931, Schmaltz 1970, Stupperich 1977, Schmaltz 1983, Kokula 1984, Scholl 1996, Bergemann 1997, Bäbler 1998, Himmelmann 1999, Adak 2003, Posamentir 2006.

<sup>5</sup> Besonders Bergemann 1997.

<sup>6</sup> Maaß 2008.

<sup>7</sup> Hildebrandt 2007.

<sup>8</sup> Dazu auch die Arbeiten über den sog. Klagefrauensarkophag von Sidon mit seinen attischen Stilelementen: Fleischer 1983.

<sup>9</sup> Vgl. Melonenfrisur als importiertes Bildelement in die attische Kunst aus der Region der Skythen oder der Thraker: Lopes 2009.

<sup>10</sup> Vgl. Boardman 1999, Petropoulos 2005, Grammenos and Petropoulos 2003, Pogiatzi 2003, Carter and Posamentir 2006, Kreuz 2007.

<sup>11</sup> Vgl. Tsetskhladze 2006, Ders. 2008, Bilde and Petersen 2008, Morin 2009.

<sup>12</sup> Perser: Miller 1997, Bakir 2001. Thraker: Bouzek 2005, Popov and Fol 2010. Lykien: Seyer 2009.

<sup>13</sup> Vgl. Ausstellungen über die Phönizier: Gehrig and Nie-



Abb. 2. Attische Grabreliefstele des Ktesileos aus Erythrae (Böotien) und der Theano, um 400 v. Chr., Athen Nationalmuseum, Inv. 3472.

eine aufkommende Macht bildeten, wird der Einfluss der makedonischen Kunst unter anderen auch auf die attische Kunst und Lebensweise notiert und manchmal sogar überbetont<sup>14</sup>.

Die Erforschung der Kultur der nicht-griechischen Völker warf eine neue Forschungsfrage auf, nämlich die des ethnischen Selbstbewusstseins der Menschen in der Antike<sup>15</sup>. Dabei scheint aber eine Definition des Begriffs "ethnicity" noch unklar – oder sogar oft unpassend – zu sein. Der Begriff ist z. B. für die Kolonisten geeignet<sup>16</sup>, denn diese Gruppe setzt eine gemeinsame geographische Herkunft oder einen gemeinsamen Vorfahren voraus. Mit

meier 1990, die Skythen: Danailov 2004, die Perser: Koch 2006.

15 Hahn 1993, Hall 1997, Fless and Treister 2005, Halles and Hodos 2010.

dem Bewusstsein einer ethnischen Identität als Ausgangspunkt kommt ANTONACCIO zum Ergebnis, dass eine andere Menschengruppe, die Oberschicht, eine "transcultural hybridity" bildet, da sie eher durch ihren Sinn nach Luxus, *habrosyne*, gekennzeichnet wird<sup>17</sup>. Die Diskussion über die Identität in der Antike geht also weiter.

# DIE GRABNAISKOI: FORSCHUNG MIT PERSPEKTIVE

Eine neue Form von Grabmälern taucht kurz vor der Mitte des 4. Jhs. v. Chr. auf, die Naiskoi (Abb. 4). Eine kurze Auflistung des Materials legte DESPINES in einem kurzen Aufsatz im Neugriechischen vor<sup>18</sup>. Darin geht der Forscher auf keine Analyse des Materials ein, bietet aber für viele seiner aufgelisteten Stücke eine gute photographische Dokumentation. Der Autor erwähnt eine Reihe von vollplastischen fragmentiert erhaltenen Figuren, die er aus technischen Gründen - nämlich wegen ihrer eher flachen und grob bearbeiteten Rückseite insgesamt einunddreißig Naiskoi zuordnet. Dem Forscher geht es nicht um eine Rekonstruktion von Naiskoi, sondern allein um die Erkenntnis, dass diese Gattung von Grabmälern im spätklassischen Attika ziemlich verbreitet war. Seine Liste ist nicht vollständig; die Stücke aus dem Kerameikos, wie z. B. der Naiskos der Philoumene aus dem Grabbezirk der Messenier<sup>19</sup> sind nicht eingeschlossen. Ausnahme, die die Regel bestätigt, ist der Naiskos des sog. Persers<sup>20</sup>. Despines datiert alle diese Grabmäler aus stilistischen Gründen in das letzte Drittel des 4. Jhs. v. Chr. (also 330-300 v. Chr.). Diese Datierung ist zwar interessant, aber problematisch. Interessant, weil dadurch manche Naiskoi in die lykurgische Zeit (338-325 v. Chr.) und manche in die Zeit der makedonischen

<sup>14</sup> Palagia and Tracy 2003.

<sup>16</sup> Gosden 2004.

<sup>17</sup> Antonaccio 2010.

<sup>18</sup> Despines 2002.

<sup>19</sup> Kovacsovics 1990.

<sup>20</sup> Scholl 2000.
Herrschaft über Athen (ab 322 v. Chr.) hineinfallen. Problematisch, weil die politische Situation in Athen in diesen Jahren sehr stark schwang, nämlich von der unabhängigen Polis in der Zeit Lykurgs zum Anhänger einer globalisierten Welt unter den Makedonen. Der Athener Staatsmann Lykurg hatte in den Jahren 338-325 v. Chr. die politische Führung inne und leistete enormen Widerstand gegen die makedonische Herrschaft. Sein Widerstand lag weniger im militärischen, sondern mehr im politischen Bereich. Dabei versuchte er, das Bewusstsein der Athener und der in Attika wohnhaften Fremden - der Metöken - zu stärken und das positive Image Athens in der Außenwelt wiederherzustellen. Sein Programm ist in der attischen öffentlichen Baukunst ersichtlich und sowohl bei antiken Schriftstellern überliefert als auch in der neuzeitlichen Literatur erkannt. In einer Gesellschaft, in der der Bürger sich durch seine öffentliche Funktion verstand, ist zu fragen, wie die Politik Lykurgs auf die private Grabkunst der Bürger, privilegierten Fremden und der Nicht-Bürger einwirkte. Darüber hinaus durften nach dem Grabluxusgesetz des Demetrius Phalereus (317-307 v. Chr.) monumentale Grabmäler nicht mehr errichtet werden. Demetrius Phalereus wurde von den Makedonen in seine Position als Statthalter eingesetzt. Wenn er also die luxuriösen und monumentalen Grabmäler verboten hat. sind die monumentalen Naiskoi nicht in das letzte Drittel des 4. Jhs. sondern nur in die lykurgische Zeit zu datieren. Und dies ist ein erklärungsbedürftiges Phänomen.

Die Datierung der attischen Grabmäler generell ist ein Problem bei ihrer Erforschung, da sie auf der Basis einer zweifelhaften stilistischen Entwicklung basiert. Die Mehrheit dieser Monumente wurden im späten 19. Jh. gefunden und einfach gesammelt. Ein Versuch, diese Werke in einen Fundkontext einzuordnen, wurde damals nicht gemacht, da die Forschung andere – kunsthistorische – Akzente setzte. In den Corpora von Conze wird oft eine allgemeine Fundangabe



Abb. 3. Attische bemalte Grabstele eines Geten beschriftet "Geto", um 400 v. Chr., Athen Nationalmuseum, Inv. 2611.

gemacht, z. B. Athen; Kerameikos; Nordfriedhof vom Piräus und ähnliches. Der Fundkontext wurde nicht berücksichtigt. Einen Versuch einer näheren Bestimmung der Fundorte haben Petrakos und seine Mitarbeiter neulich gemacht<sup>21</sup>, allerdings ohne Erfolg bei den meisten Monumenten. Die zeitliche Anordnung jener Grabkunstgattung

<sup>21</sup> SEMA 2006.



Abb. 4. Attischer Grabnaiskos des Nikeratos aus Istros und seines Sohnes Polyxenos, um 330-317 v. Chr., Piräus Museum Inv. 2448+2447+2451.

sowie die Frage nach der Identität ihrer Besitzer gehören zu den Aufgaben der Forschung in der Zukunft.

## ZUSAMMENFASSUNG

Das Feld der archäologischen Forschung ist heute sehr weit und breit und tauchen immer viele neuen Fragen auch für die alten Funden auf. Das gilt vor allem für die attischen Grabmäler klassischer Zeit, die trotz ihrer hundertjährigen Erforschung immer wieder von Neuem entdeckt werden.

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# REZIME ISTRAŽIVANJE ATIČKE NADGROBNE UMETNOSTI KLASIČNOG PERIODA: PREGLED

KLJUČNE REČI: ATIKA, NADGROBNA UMETNOST, KLASIČAN PERIOD, METECI

Do danas je sačuvano preko 3500 nadgrobnih spomenika klasičnog perioda (430. do 317. g.p.n.e.): reljefne nadgrobne vaze, reljefi u obliku naiskosa, reljefne stele sa prikazima izdeljenim u polja i ostali jednostavni reljefi prenose sliku atičkog društva iz perioda demokratije. Od početka grčke arheologije, oni naravno privlače interesovanje tradicionalnog proučavanja klasike. U ovom tekstu će biti skicirane današnje tendencije u istraživanju i problemi vezani za njih.

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# ARCHAEOLOGICAL PARK AS A PRODUCT OF EMOTIONAL DESIGN: DESIGN AND ORGANIZATION OF A PARK BASED ON THE EXPLORATION OF VISITORS' EMOTIONS

# ABSTRACT

Methods of presentation within an archaeological park are always related to the period of history which is represented, but also to the atmosphere in which the park is created. However, any form of representation must be subordinated to observer and his experience. There is no universal organization of archaeological parks, but in different scientific fields of sociology, psychology and philosophy, principles can be found upon which individual presentations are functioning and evoke similar reactions by every observer. By applying a model originating from the experience of these sciences, architects, planners, designers and management of archaeological parks can together reach adequate proposals for creation of physical elements and processes which make the park itself. A special role in this approach belongs to the scientific field that has long been known in architecture and design, apropos in theories of perception and acceptance of space and that is phenomenology. The creation of elements, processes and finally of the complete area of archaeological parks, thus obtains all characteristics of emotional design.

Key words: archaeological park, emotional design, phenomenology, presentation, tourism, Viminacium.

## **INTRODUCTION**

Professor of history of architecture and urbanism at Cornell University, Medina Lazansky (D. Medina Lasansky) (2004), describes tourism as one of the world's largest industries. After archeological excavations in the eighteenth century, historical places are slowly becoming "have been redesigned and packaged for mass consumption via various venues of mass media, scholarship and popular myth" (Lasansky 2004: 1) Architects and designers, planners and urbanists, artists and scientists, politicians and entrepreneurs, but also local population and tourists all together convert historical sites into tourist destinations. Organization and design of all tourist

<sup>\*</sup> The article results from the project: Viminacium, Roman city and military legion camp – research of material and non material of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalisation and 3D visualisation (no 47018), funded by Ministry of Education and Science of the Republic of Serbia.

sites around the world, including archaeological parks, arise from different experts thinking about perception and interpretation of the place by residents or tourists, their behavior caused by a variety of presentations, but also with the experience that they bring. In 1999 economists Joseph Pine II and James H. Gilmore predicted that the economy of experience will replace agrarian, industrial and service economy. (Pernecky and Jamal 2010) However, it is important to emphasize that tourist operators with their services cannot provide experience of visitors, but only create atmosphere or the environment itself in which they can experience it. (Murray, Foley and Lynch 2010) Tourist spots thus become "a culturally created spectacle" which can be felt and understood by different people in different ways. (Lasansky 2004: 2)

In the last decade, emotional design has become a very important direction in the scope of design research field. The study of human emotional responses to the environment allows teams of designers to discover different ways of human acceptance of some product, including options for its design. Design relates to people, that is why perceptions and feelings of designers and consumers play a major role in the success of the product. (Formosa 2007) The topic of this paper is presentation of the model of the archaeological park whose application has the aim to enhance positive experiences of its users, apropos visitors. The model is based upon the theory of emotional design and two researches of different authors in the field of sociology and psychology. After a theoretical explanation of work, based on this model, a study on a selected example of the archaeological park can be deduced, which explores sources of visitors' emotions, reveals their interpretations, and finds opportunities for design of creation of "tangible elements" and "intangible processes"<sup>1</sup> (Pui Ying LO 2007: 5 of 18)

Archaeological park thus represents a tourist product of experience economy, whose creator is emotional design.

# EMOTIONAL DESIGN AND THEORY OF DONALD NORMAN

Emotional design is an approach to design that emphasizes the importance of positive emotional responses caused by the users. (Pui Ying LO 2007) With this approach, the field of design research and design practice, have been extended outside the function, form and usability of products on the emotional dimension, enriching user's experience. (Pui Ying LO 2007)

According to Donald Norman, a professor of psychology, philosophy and computer science at several universities across the United States, there are three different aspects of design that we can perceive in a product. (Norman 2004) Visceral aspect is related to the appearance of the product, its sound, its smell, and every other feeling which it awakes at the first moment of encountering with it. Behavioral aspect includes the easiness or difficulty with which we use some product and our satisfaction or dissatisfaction as a result of that. Reflective aspect carries with it a rationalization and intellectualization of a product, apropos creates the final impression in the minds of consumers.

Responses of users' to visceral aspect of design of some product are automatic evaluation of its perceptual features and their rapid classification. (Norman 2004) Such reactions are not based on experience or extensive knowledge about the meaning of objects, and sense at this level of design is unconscious and not to be interpreted. (Norman and Otorny, 2006) This is the aspect which any product can easily be based upon, because the reactions to it are equal for all people and all cultures. (Norman 2004) In behavioral aspect of design, it's all about func-

<sup>1</sup> The author Cathy Pui Ying Lo in her research describes tangible elements as tangible objects, their functions, layout and presentation, while the mechanisms of offering tangible elements and different services she described as

intangible elements.

tion and use of a product. Donald Norman writes about it as follows: "Appearance doesn't really matter. Rationale doesn't matter. Performance does." (Norman 2004: 69) Before creation of design, it is necessary to understand the needs and ponder the behavior of those who will use a product. (Norman 2004) Responses to this design are not biologically based, but have been taught, so here skills and routines are important, which vary from person to person and from culture to culture. (Norman and Otorny 2006) Processes at this level are still unconscious and automatic, but since skills and routines we attain with learning and thus in this processes we include experiences and expectations, yet awareness is present. (Norman and Otorny 2006) The reflective aspect of design has to do with message and meaning which a product carries. Reflection is the highest level of intellectual functioning in a person where we find review, understanding of one's actions, guilt, but also emotions such as pride, shame, admiration and gratitude. Processes at this level are conscious. (Norman and Otorny 2006) Operations at reflective level determine the overall impression of a product for users, so at this level negativities of some of the previous aspects are diminished. (Norman 2004) The impression reaches its end, through "reflection - in retrospective memory and reassessment". (Norman 2004: 88). This aspect of design is thus the only way related to the experience which we permanently carry after use of a product and that "a personal touch and a warm interaction ... a pleasant reflective memory" that "can overcome any prior negative experiences". (Norman 2004: 88) This aspect of design was influenced by experience and culture, age and social groups, but also fashion, however, it can be different for individuals in different times and depending on situation in which it is located. (Norman and Otorny 2006).

As design has three aspects, thus our cognitive and emotional systems have three similar levels of receiving affections from the outside which are constantly coliding with each other. (Norman 2004) What people really do can be quite different from what they think they do. Our behavior is mainly subconscious and then it is made of visceral and behavioral reactions. Many of our opinions are already determined before they reach consciousness, and reflective reaction, apropos consciousness, in the processes of information in brain comes later. (Norman 2004) The appearance and usage value of objects play a relatively insignificant role in the acceptance of a product by consumers. The most important thing is the connection with the object, associations which a person has about it and memories which are awaked with it. We are not related to the object itself, but to the meaning it carries and the feeling which is produced in us. (Norman 2004)

No successful product can be based only on one aspect of design. Different products generate different reactions by different observers. That is why designer must know his own target group of users and design with which we provide experience to a user must originate from consideration of all of the three aspects. (Norman 2004)

# MODEL OF AN ARCHAEOLOGICAL PARK BASED UPON THEORY

An archaeological park consists of archaeological objects, modern service facilities, communications that connect them, but also different processes, apropos cultural and entertainment shows that are taking place in it. Although methods of presentation in an archaeological park are linked to history that is represented, they are also linked to people and area in which the park is located today, so every form of representation must be orientated towards the viewer and his experience. We can say that there is no universal organization of an archaeological park, but general principles can be established upon which individual performances are functioning and thus causing a relatively similar response of every observer.

In this paper, a model of an archaeological park that creates connections between tourists' emotions and tourist offers of the park is proposed, with an emphasis on design. Therefore, an archaeological park we observe represents a product based upon three aspects of emotional design by Donald Norman. However, to get the model, it is necessary to develop spatial and organizational principles from these aspects, from which recommendations for the creation of concrete physical elements in the park could originate.

Researchers Karen Puren, Ernst Drewes and Vera Roos (2006) set up three spatial principles for design and organization on the example of a proposal for the improvement of one archaeological site in South Africa. These principles, only modified, can be applied to every archaeological park. An important segment of their research is that all three spatial principles derived from considering concept of place's spirit. According to Christian Norberg-Schulz, the spirit of place (genius loci) is an ancient Roman concept, according to which every being has his own genius, apropos his own spirit who guides him. (Norberg-Schulz 1980) The Spirit of place thus gives life to people and places, follows them from birth to death and determines their nature or essence. (Norberg-Schulz, 1980).

The first principle which the authors appoint can be connected to visceral aspect of design, apropos visceral level of receiving affections. They call it *the feeling of coming to another place – sense of arrival*. According to them, this feeling is related to clear identification that we are within an area, increasing its visual legibility and contributes to a feeling of welcome which it provides. This is achieved by setting visible elements at the input places which are pre-defined with traffic solution. Their design must emphasize the passage from the outer to the inner environment. This is important that visitors get a sense that they are within an archaeological park, apropos within

one place which evokes different feelings from the place which is beyond it. This design must be in accordance consistent with the character of external, natural environment, lest to disturb our sense of space which is inside. (Puren, Drewes and Roos 2006)

The second principle can be related to behavioral aspect of design, apropos behavioral level of receiving affections. Authors call it sense of orientation. Tourists must be able to orientate themselves within the site. The quality of overall legibility of a particular place is reflected in its structure, which implies places of movement (roads, pedestrian paths, etc.) and public spaces (squares, social contents, etc.). There are proposed plates on nodes of communication and names of roads, and everything with the aim of better visitors' orientation. Names of roads should reflect identity of a site, as seen by today's local residents, which may serve to reinforce their identity as a community. Gravel roads and pedestrian paths essentially reflect the character of the area and visitors use them more than arranged roads, so they are recommended. By its surface, the main road should be separated from the secondary ones. It is necessary to use different materials at the starting points of roads, change of direction or at their ends. The edges of roads should be accentuated to emphasize the road itself, which can be achieved with planting of local trees or using diverse roadsides. Contents of social life have a role of node when some place is in creation. Main node may be the place of economic, educational, cultural and informational contents. The character of nodes should be in accordance with places in which they are located. Most of parks are located outside the city, so the character of their nodes should not be urban or suburban, but rural. (Puren, Drewes and Roos 2006).

The third principle we associate with reflective aspect of design, apropos reflective level of receiving affections. According to the authors mentioned above, this is *sense of experience*. (Puren, Drewes and Roos 2006) According to Christian Norberg-Schulz, modern tourism is proving that experience of different places is the main human interest. (1980) According to the authors Puren, Drewes and Roos (2006), it is necessary to emphasize those natural qualities which create feeling of the place for visitors to their extent, apropos those points where the spirit of the place is the strongest. Places in archaeological park should be linked, physically or through the concept of architecture, to create a strong public structure throughout the site. In this way, a network of small public spaces arises to increase the overall experience. What is meant with the implementation of this principle is the harmonization of designers' interventions with previously brought plans of height regulation and zoning. With this a defined line of horizon is protected, which is very important for the perception and experience of space, as a pre-designed development of the area. (Puren, Drewes and Roos 2006)

Since the visceral aspect of emotional design is completely dependent on the first, immediate influence of a product to the user and his reactions, the product simply "has to feel good, look good". (Norman 2004: 69) Archaeological park has to attract visitors immediately, with the appearance of the first plate at the entrance and the smell of grass beside the road. As for behavioral aspect, everything in the archaeological park has to function flawlessly. The spatial organization of the park must be conducted thus that all roads pass through important historical contents of the park, and their intersections have cultural, service or entertainment contents. After fulfilling both the first and the second aspect of design and besides man's natural desire for knowledge about the past and the human fascination with ruins, the third, reflective aspect of design must be successful. It provides an unforgettable experience for tourists.

Archaeologist and professor of archeology at universities in England, Tim Copeland (2004) researches and sets out three forms of presentation at an archaeological site, which we can observe as recommendations for the creation of various elements of the organization further designing influence on visitors. This author has developed a theory according to researches of American psychologists in the field of theory of learning, Jerome Seymour Bruner.

ENACTIVE REPRESENTATIONS	ICONIC REPRESENTATIONS	SYMBOLIC REPRESENTATIONS
experimental archaeology	photographs	plans
touching	drawings	excavation reports
re-enactments	reconstructions	audio tours
walking around the site	3D views	guided tours
	models	guidebooks
	TV programmes	lectures
	information panels	information panels
	maps	
	multimedia presentations	
	the layout of the site	
	directional signs	

Chart 1.

The first form of presentation Tim Copeland called enactive (through action) and it is linked to various events in which visitors of the park are physically engaged. Another form is *iconic* and it is linked to presentations from the domain of visual media. The third form author called symbolic and associated it with different written and sound presentations with words and numbers. (Copeland 2004) As a part of the result of research Copeland has assigned specific elements of organization and processes to each of the three forms of presentation mentioned, (Copeland 2004) which we observe as products (Chart 1.). In order to make each of these elements and processes act as a successful product, it must be based upon all of the three aspects of design, apropos act on all three levels of receiving affections of users. However, for each product one aspect always predominates and the product has its greatest impact on user at one of three levels. It depends on the purpose of the product, but also on user's character. Accordingly, the three kinds of presentations apropos their elements and processes can be linked to certain prevailing levels of receiving affections. Action form of presentation can be connected to the reflective level, iconic form with behavioral and symbolic form with the visceral level of receiving affections.

Some of the many researchers of presentations in archaeological parks have concluded that tourists prefer exhibitions of crafts, skills, costumes and weapons, but also partial reconstruction of buildings and representations of past events with actors. (Copeland 2004) Some other researchers have concluded that the most successful in keeping tourists' attention are also performances with costumed actors and animals, as well as films and historically furnished rooms. (Copeland 2004) Different studies have shown that presentational panels and book guides do not help tourists much in understanding what is displayed. (Copeland 2004) Comparing these studies with a previously established relationship of aspects of design and types of presentations, actually their elements and processes (Chart 1.), the theory of Donald Norman (Norman 2004) is confirmed, according to which the reflective aspect of the design plays a major role in understanding the meaning of a product or process by users. Behavioral aspect of design is somewhat less important for this understanding, while emphasizing the visceral aspect designers achieve the lowest success for long-term acceptance of a product.

The conclusion based on the research of Tim Copeland is that with design of exactly those elements and processes which the author assigned to his groups of presentations, it affects visitors and their emotions in a way which is pre-determined. Thus, designers and architects can focus their activities on those elements which are important for a certain level of receiving affections, depending on situation in which a certain element is located. From these theories and researches the model of

A SPECTS OF DESIGN	SPATIAL DRINCIPLES	REPRESENTATIONAL	EMOTIONAL RESPONSES
ASPECTS OF DESIGN	STATIAL FRINCIPLES	MEDIA	OF THE VISITORS
			sense of being
visceral	sense of arrival	symbolic	welcomed when we
			first enter the site
hih avi anal			pleasure when we use
omeviorai	sense of offentation	Iconic	the park offer
			unforgettable
reflective	sense of experience	enactive	experience after we
			leave the park
making visitors' emotions and experiences positive			

Chart 2

archaeological park originates (Chart 2), which aims to develop positive emotions and experiences of visitors. With further, practical research among visitors of a certain park, we can obtain details about design and organization of the park, apropos the arrangement, look, color, size, sound or smell of the elements and processes that make a park. Model of an archeological park connects theory and research across three levels of receiving affections from the environment, assignment of a certain spatial principles and types of presentations to the relevant aspects of design. Developed emotions of visitors can be acceptance at the first contact with the park, which takes place on the visceral level, satisfaction in individual situations as a feature of the process at the behavioral level, and then a memorable experience as a result of receiving affections from the environment at the reflective level.

# **RESEARCH BASED ON A MODEL**

In order to concretize theoretical recommendations for design and spatial organization of archaeological park, and according to the previously obtained model, practical research on a selected example can be carried out. Urbanists, architects and designers create space, but it becomes a place only at the end of a process, in which its inhabitants and visitors participate, apropos those who use it and experience it. (Pui Ying LO 2007) As Donald Norman writes, quoting other authors "the best that the designer can do is to put the tools into their hands". (Norman 2004: 224) Therefore, practical research relates to different methods of observation and inquiry of visitors and interpretation of their reactions and responses.

This practical research can be accomplished at any archaeological park, and the first step in developing some research is setting of basic questions on which it should give an answer. In the case of this research, these are the following questions:

1 What are specific physical elements and processes of design and spatial organization of a selected park which influence visitors' emotions and experience?

2 Which emotions and what kind of experience is caused with each of the elements and processes?

3 What are the characteristics of design and spatial organization of a chosen park which can reduce negative emotions and experiences and to increase the positive ones? It is therefore necessary to choose an appropriate approach to research. For this paper, we can choose an interpretative phenomenological approach. According to David Seamon, professor of architecture at Kansas State University and researcher in the field of human behavior in accordance with the environment (environment-behavior research), every object, event, situation or experience that one can see, hear, smell, physically or intuitively feel, know, understand or survive, can be a topic of a phenomenological research. (Seamon 2000) According to the author, phenomenology is, in simple terms, interpretive study of human experience. (Seamon 2000) Tomas Pernecky and Tazim Jamal, professors of tourist sciences at the universities of New Zealand and Texas, write that phenomenology in tourist sciences serves as a theoretical method for describing or understanding tourists' experiences, but also the local community, service providers and any other interest groups who takes part in the phenomenon of tourism. (2010) The aim of interpretative phenomenological approach thus becomes research of the way in which participants understand and experience life around them as well as their own lives. (Smith and Osborn 2008)

Data for this study can be collected with various qualitative methods. Among these methods there are inquiries, in the form of questionnaires or in different forms of interviews, personal diaries of examinee, observation of examinee by service research, discussions within the focal groups, various visual methods such as collecting photos or videos by examinees, based on preset requests of examiners, and other. Questions to which examinees give answers must be composed by experts from different scientific fields. In the research framework among visitors of an archaeological park, questions should be related to impressions made with concrete physical elements in the park itself and to processes which are taking place in it. It is important to note and understand the similarities and differences in perception, understanding and experiences of the environment, and that among all inquired visitors. The analysis of obtained data is then practiced based upon interpretative phenomenological approach. Data obtained from each tested participant are analyzed separately, and the ultimate results of all analyses represent answers to pre-asked questions of research related to design and spatial organization of the park.

In respect of design, conclusions should show what elements and processes from three types of presentation of adopted model, in certain park develop positive or negative emotions of each of the examinees. It is important to find out whether the reason for negative emotions is design itself, and if so, how it can be improved. It may happen that some of the mentioned presentation elements in a park studied do not exist and it is necessary to introduce them as a novelty. It is possible to conclude that some of the elements are no longer required as part of certain park's offers, perhaps because in such environment they do not affect the emotions of the majority of examinees, apropos do not influence them at any level of receiving affections. Conclusion related to the organization of an archaeological park shows which elements of the spatial organization of the park, implied with the three spatial principles in the model, are not in accordance with these principles, apropos do not provide a sense of place, a sense of orientation, to most of the visitors, or possibly develop a negative experience. It is possible to conclude that some contents no longer have a place within the park, because most visitors do not use them any more. From this the decision follows about the need of their further existence or about the improvement of overall organization by changing the existing or introducing new contents.

Data interpretations obtained from all users give a conclusion on which improvement of the design of some elements and processes is based, as well as the spatial organization of a park, because maybe they do not performed their prevailing aspect of emotional design that is implied, but also new elements and contents are introduced, which in time have proven their justification. In the framework of visceral and behavioral aspects, the data obtained help to create proposals for design of concrete objects which will affect our senses apropos organization and design which will enable a better functioning and interrelationship of the park area, while in connection with the reflective aspect, different social events or individual performances are anticipated.

For future practical research with the help of the model obtained, authors of this paper propose the archaeological park Viminacium.<sup>2</sup> This park was chosen because of a small ammount of visible material remains which cause numerous visitors' reactions. This is achieved by ancillary facilities, but primarily with different stories and presentations which introduce visitors into the park, guide through its expanse and finally conduct out of it.

<sup>2</sup> Viminacium was the capital of the Roman province of Upper Moesia, and its administrative, military, commercial and production center. However, today this Roman city, which is located near the mouth of the river Mlava into the Danube, twelve kilometers far from Pozarevac in Serbia, mostly is under the ground. Although the research of the site began back in the end of 19th century, the development of archaeological park has just begun in 2002, and excavated sites have become available for tourists in 2006. Since then, the development of the archaeological park is rapidly taking place. In 2009 Viminacium was visited by 72,000 tourists. (information taken from: Maksin, M. et al 2011: 340)

enactive representation	iconic representation	symbolic representation
Picture 1	drawings	
Parties of Poetracities		Picany 16
miling argand the site	Poters 8	
Picture 4 participating to scientific investigations		Picture 18
		THE MALE A ZASVE
	Neur III and a presentation	A DECEMBER OF

Long ago, the archaeological park Viminacium thus became a product whose creator is emotional design. However, this park was created and continues to develop with spontaneous processes which consist of thinking about visitors' perception, interpretation and behavior caused by a variety of presentations, then check and test of these presentations, and ultimately expectation of their efficiency. By applying the model proposed, through conducted practical research, in the future it could be quicker to reach creation of new, always successful elements and processes of this archaeological park, which would thus expand its tourist offer. Also, practical research would immediately point out to the existing successful elements or processes which will cease to be successful in the future, so with the results' analyses of such research different suggestions for their improvement would be obtained.

# CONCLUSION

In this paper, we have tried to create a model of an archaeological park with representation of a theory from the domain of design and two studies from the fields of sociology and psychology. The basis of this model originates from the theory of emotional design by Donald Norman, while the concretization in design itself follows a model obtained from various researches. The conclusion of this paper is the confirmation of a thesis from its beginning, which asserts that all aspects of design are necessary in order to make an archaeological park function as a successful product. According to three aspects of design, the best presented archaeological park is the park in which all of the three spatial principles are accomplished and all three groups of presentations are represented. Individual elements and processes in the frame of presentation of the park have to be changed or replaced in time, depending on a particular park.

The paper shows that reflective aspect of

emotional design makes the greatest impression on consumers of a product, creates the deepest emotions, and provides final experience. It is necessary for them to wish to use that particular product again. This means that with the prevailing action at the reflective aspect of design within an archaeological park, a visitor's desire to return to the same place is created. The first evidence of the validity of Viminacium as a product of emotional design, even without the performed proposed practical research, we can see if we analyze chart 1 and the above mentioned forms of presentation in the park (see appendix). It is interesting to see the richness and diversity of presentations within all of the three types. The most common are iconic presentations, apropos small, easily accessible and easily achievable physical elements which are usually most numerous, both in theory (chart 1) and in practice (there are usually in all of the archaeological parks). It is important to check the efficiency of all types of mentioned presentations with further practical research, and most of attention should be paid to the development of action presentations which make the greatest impression on visitors. In a number of archaeological parks, action presentations almost do not exist. However, in the archaeological park Viminacium, a large number of presentations of this type create an unforgettable feeling of experience for visitors. It is therefore necessary to recognize all presentations which have a negative influence, as well as those which positively influence visitors, in accordance with these to arouse procedures of their promotion, but also to establish some new elements and processes of presentation which have not yet existed.

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## REZIME

# ARHEOLOŠKI PARK KAO PROIZVOD EMOCIONALNOG DIZAJNA: DIZAJN I ORGANIZACIJA PARKA NA OSNOVU ISTRAŽIVANJA EMOCIJA POSETILACA

KLJUČNE REČI: ARHEOLOŠKI PARK, EMOCIONALNI DIZAJN, FENOMENOLOGIJA, PREZENTACIJA, TURIZAM, VIMINACIJUM.

Arheološke parkove je neophodno neprestano unapređivati, jer nikad ne možemo reći da je stvaranje nekog arheološkog parka završeno. Kao i kod svakog drugog proizvoda, bitno je stalno istraživati tržište i činiti zadovoljstva korisnicima. Uspeh koji dolazi posle racionalnog upravljanja arheološkim parkovima treba iskoristiti za unapređenje nauke koja je ih u osamnaestom veku, uz radoznalost velikog broja zaljubljenika, i stvorila. Arheologija je privlačna i prijemčiva nauka za veliki broj ljudi i jako doprinosi razvoju turizma. Svako njeno ulaganje se kroz ovu granu privrede može višestruko isplatiti.

Model nastao tokom istraživanja u ovom radu zasnovan je na teoriji emocionalnog dizajna, razvijen uz pomoć društvenih nauka i istraživanja prostora, i namenjen upravama arheoloških parkova i svima onima koji učestvuju u dizajnu i organizaciji jednog parka. Vršenje praktičnih istraživanja među posetiocima će dati rezultate koji će pomoći da se unapredi ukupna prezentacija parka. Ona će dalje učiniti da emocije i iskustva posetilaca budu uvek pozitivni i prepričavaju se. Na taj način jedan arheološki park predstavlja uspešan proizvod emocionalnog dizajna.

Predloženo istraživanje prema izvedenom modelu emocionalnog dizajna može koristiti različite metode kojima se prikupljaju podaci, a na osnovu kojih se istražuju emocije posetilaca i njihove interpretacije sopstvenih emocija. Sakupljeni podaci se mogu analizirati preko ovde predloženog interpretativnog fenomenološkog pristupa na osnovu čega će se dobiti zaključci o mogućnostima unapređenja elemenata i procesa koji su deo jednog arheološkog parka.

Iako je u ovom istraživanju arheološki park Viminacijum predstavljen kao primer uspešnog turističkog proizvoda, neophodno je još mnogo raditi na njegovom unapređenju i neprestano razmišljati o njegovom daljem razvoju, da bi emotivni odgovori posetilaca na njegov dizajn, odnosno da bi prihvatanje, zadovoljstvo i nezaboravno iskustvo posle posete ovom parku, bili uvek prisutni kod posetilaca, čak i onih koji u Viminacijum ne dolaze prvi put. Potrebno je napraviti i jednu vrstu plana razvoja ovog parka gde bi se postavili određeni ciljevi i njihovi rokovi ostvarivanja3. U procesu stvaranju ovog plana bi zato od velike pomoći bilo i praktično istraživanje prema modelu emocionalnog dizajna opisano u ovom radu.

<sup>3</sup> Videti Maksin, M. et al. 2011: 328-345.

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# **VULNERABILITY MANAGEMENT AND PATCHING IT SYSTEMS**

# ABSTRACT

In this paper, problems are presented which occur most frequently in informative systems, as well as profile of people being interested in their abuse. An overview of attack types is also given and their different motives through examples of electronic warfare. In this paper, security managemet is suggested which prevents abuse of vulnerability of IS systems within an organisation, which again is being introduced through vulnerability management and patching IT systems. Proactive scanning of systems was conducted at the Mathematical Institute of the Serbian Academy of Science and Arts and an overview is given in this paper.

Key words: Information security, Vulnerability Management, Patch Management, Reducing Costs, botnet

# **1. INTRODUCTION**

Introducing the practice of patch and vulnerability management – PVM system represents a precaution measure which prevents abuse of vulnerability of an IT system within an organisation.

The results include reduced costs concerning human resources (time), as well as reduction of costs caused by patching and abuse of system's vulnerability. On the other hand, information about potential new threats is increased.

With proactive management of system's intern

vulnerability, potential abuse is reduced or eliminated, while duration and effort are much reduced in comparison to these activities when abuse already took place.

To whom is PVM intended? The use in predominantly intended for national institutions, banks and other public institutions possessing large information systems which, if endangered, could endanger security of vital institutions , which could further lead to severe consequences in relation to the security of the country and its citizens, no matter whether these systems posses internet access.

<sup>\*</sup> The article results from the project: *Viminacium, Roman city and military legion camp – research of material and non material of inhabitants by using the modern technologies of remote detection, geophysics, GIS, digitalisation and 3D visualisation (no 47018)*, funded by Ministry of Education and Science of the Republic of Serbia.

# 2. PROBLEMS RELATED TO INFORMATION SYSTEMS

A common thing for all the large information systems (further IS) is the presence of a large number of different software and servers with different purposes, but on the other hand, the IS is limited with costs of the Information System, through which human resources considering the number of employees is limited.

Budgets are usually limited and it is a common case that the number of people maintaining servers and working stations, updating software and offering support to local users is insufficient. A special problem includes low level of education, causing insufficient knowledge and the lack of people who are in charge of security. In case when there is someone in charge, which is rare, that person usually only possesses basic net knowledge, meaning that he/she never attended a security course abroad and cannot recognize any of the hacking technologies. In other words, patching management is completely neglected (one is leaning on automatics) and vulnerability of the system is not the main concern.

By using similar IS and software on other locations, a larger number of individuals automatically becomes acquainted with the same IS, and in the case of vulnerability there is a greater number of attack spots.

Certain enabling circumstances and bad trained employees, informational and security unawareness contribute to the magnitude of errors, so therefore even social engineering is possible. Examples are numerous: stickers with users data for logging usually taged onto a screen or housing, questions like "What was your password?" etc. Cases are known that even when suggestions are given to improve the net, there is an answer that our net is secure enough, that there were no intrusions and even if the net was not secure, we would ot be interesting enough: "who would attack us, we have no confidential data and they would be of no use for anyone". The question whether anyone would intrude is wrong, since one would actually have to know whether someone already broke in. Even if there are no interesting data on the existing net and that the user is of no interest for the intruders, the net itself as a source for attacking nets of other users is a very intriguing matter and that is exactly the most usual case.

Still, one has to admit that a great number of public institutions advanced their security by introducting serious logging systems, but in practice it is shown that this alone is not enough. As a result of all the named facts, it turns out that the bigger the IS, the greater the vulnerabiliy of the system from different directions.

In order to gain a better insight into this problem regarding the profile of abusers of Information systems, some examples of the IS abuse shall be presented further on in this paper.

# **3. INFORMATION SYSTEMS AND THEIR ABUSE**

Who is an individual or a group being interested in using system's vulnerability and abusing it? And what is the purpose – information, material income or damage?

Individuals or groups with a similar or identical aim could be of different demographic structure from adolescents to students, amateurs and professionals, employees or former employees, to people who are curious about confidential information like criminals, terrorists working for profit only, up to informatically extremely well trained enemies who, by making public services inaccessible, wish to destabilize and paralize the state and make enormous economic damage.

The greatest degree of abuse is possible in the case of electronic warfare (Cyber War) which aims towards paralizing, destruction, disabling or deleting systems of public or military importance, like in cases of switching off the IS of electric suppliers, paralizing banks, the infrastructure of



Figure 1 Quartal display of vulnerability

cellular or fixed telephones, traffic internet and disabling the IS for country's defence.

Individuals within such a group permanently follow inovations of modern technologies and possess an high degree of knowledge, even higher than an average knowledge of an IT sector employee.

A group or an inidivdual motivated to abuse IS possess unlimited resources and time. Such an individual possesses main features which include: programming knowledge, knowledge about operative systems, excellent knowledge about nets, an average knowlegde of cryptography, as well as an excellent knowledge about data bases and web applications.

Still, there are huge differences between individuals and groups of individuals ,,working together". Cooperation does not necessarily mean that there was a joint action in order to use and/or abuse an error within an IS.

There is an assumption that such a group of people involved in hackering are actually some kind of software companies or even huge organisations which, instead of creating softwares for legal organisations do exactly the opposite.

Cooperation of groups and individuals can be simple exchange of experiences on a forum, sending exploita to public lists and groups, even on exclusive sites dealing only with security topics and existing only to inform the public about potential security abuses, latest threats and vulnerability. The titles of sites involved in this kind of informing are The Open Source Vulnerability Database<sup>1</sup>, National Vulnerability Database<sup>2</sup>, Common Vulnerabilities and Exposures (CVE)<sup>3</sup>. On figure 1 vulnerability is displayed in quartals, within the period from 2004 to 2011 on 22nd of September 2011 (source http://osvdb.org/).

<sup>1</sup> http://osvdb.org/

<sup>2</sup> http://nvd.nist.gov/

<sup>3</sup> http://cve.mitre.org/

## **4. ELECTRONIC WARFARE**

Security of the internet is getting more and more critical with the expanion of the internet. Lately, the cyber space is observed as one of the biggest security challenges of 21st century. We testify the always growing number of attack attempts on PCs, phishing attacks, hackernig, spreading of worms and viruses. All of these elements represent a sort of electronic warfare. Data from different strategic documents of leading countries like the USA and China show how huge a security challenge the cyber space is. In these military strategic documents as battlefields land, sea, air and the Universe are mentioned, but recently also the cyber space.

Some examples of the "Electronic warfare" shall be listed below (Carr 2009; Clarke and Knake 2010; Kramer, Starr, S. and Wentz, L. 2009).

#### Great Britain

In 2007 the British Information Agency discovered that Chinese hackers had priviledges on servers of some of the British banks and companies.

In 2009 Gordon Brown became the first national "cyber-security" minister.

#### Germany

In 2007 the PCs of the German cancelor and three ministries were infected with the Troyan virus. This attack opened acces to the infected PCs and sensitive data to the hackers.

## France

In 2007 hackers attacked French state sites, including the site of the Ministry of Defense with much success.

The official news connected to this case were that the hackers tested the security of the IS and were not interested in stealing sensitive data.

## **United States**

In April 2009 the "Wall street Journal" informed the public that security around the Penthagon's project "Joint strike fighter", which is several million dolars worth, was compromized and that several terabytes of data were stolen by unknown hackers. A hypothesis remained that the hacker attack originated from China.

In May 2009 the Americal president Barack Obama announced that he shall introduce a cyber coordinator who shall develop cyber security strategy.

In July 2009 a DDos<sup>4</sup> attack occured of a rather small capacity against 25 sites of the American goverment. Some of them remained inaccesible for several days (among others there were the Federal Trade Commission<sup>5</sup> and the Department of transportation).

#### Kyrgyzstan

In January 2009 hackers attacked three out of four ISPs (Internet service providers) and 80% of the country was left without internet, e-mail and web for several days. The motif of the attack remained unknown, as well as who was responsible for it. One of theories was that the Russian goverment forced the president of Kyrgysztan to close his air-bases in Manas for the USA air-traffic. Another theory was that the president himself engaged Russian non-govment hackers to interrupt air-traffic to prevent the opposition to use the internet as fighting weapon against the leading party, since there were political tensions growing within the country.

<sup>4</sup> A denial-of-service attack (DoS attack) or distributed denial-of-service attack (DDoS attack) is an attempt to make a computer resource unavailable to its intended users.

<sup>5</sup> The Federal Trade Commission (FTC) is an independent agency of the United States government, established in 1914 by the Federal Trade Commission Act. Its principal mission is the promotion of consumer protection and the elimination and prevention of what regulators perceive to be harmfully anti-competitive business practices.



Figure 2: Hacking activities during the last 30 days

#### Estonia

In April 2007 hackers attacked the Estonian IS, ministries, political parties, means of public informing and banks. The Estonian minister of defence let NATO solve the problem. In literature, places can be found in which the Estonian case is described as the WWI – web war one.

#### Israel

In 2009, due to the Hamas conflict in Gaza, the sites of Israel were attacked with DOS (denial-of-service) and damaged with the power of 15 million hits per second from half a million PCs from the whole world (botnet<sup>6</sup>). Both government and civil sites were under attack. One of the features of this cyber event is participation of the state (Israeli Defense Forces and Hamas), which does not occur often.

# South Korea

On 4th of July 2009, a DDOS attack brought down both state and commercial sites in South Korea, while American sites were attacked simultaneously. Although South Korea held North Korea responsible for the attack, the identity remained unknown. In 2009, the defense minister of South Korea stated in public that in 2004, North Korea started a five-year education of 600 hackers, which ended in 2009. Their goal was conduction cyber wars mostly against the United States, South Korea and Japan.<sup>7</sup>

#### Iran

During the controversal presidential elections held on 14th of June 2009, over 100.000 of citizens protested against the results of the elections, stating that they were fraud. One of the means of protest was the usage of DDOS attacks aimed against the Iran governent. The social web Twitter was used as a platform for the organization of this DDOS attack.

<sup>6</sup> In information technology, a botnet is a collection of compromised computers connected to the Internet, termed bots, that are used for malicious purposes. When a computer becomes compromised, it becomes a part of a botnet. Botnets are usually controlled via standards based network protocols such as IRC and http.

<sup>7</sup> http://www.docstoc.com/docs/3878208/Biznis-and-Finansije-1

#### Zimbabwe

In December 2008, the African scientists published a paper entitled "Glass Fortress: Zimbabwe's Cyber Guerilla Warfare". It was stated in the paper that Mugabe's goverment silenced the opposition by using obstruction techniques of the internet and controlling all of the e-mails. For at least five years, the techniques of DDOS attacke were used as well.

#### Serbia

Between 1999 and 2011 similar attacks also occured in Serbia, like hackering state sites and sites with Serbian character. Such stations were usually defaced. In March 2011, the site of the Media research Centre (Medijski istraživački centar - MIC) from Niš was attacked by Albanian and Kosowo hackers.<sup>8</sup> In September 2011, the Kosowo hackers brought down the site of the Studenica monastery and of the ombudsman of Vojvodina.<sup>9</sup> Hackering activities during the last 30 days can be seen on Fig. 2.

White parts unfortunately do not mark spots in which there were no activities, but about which there are no data.

Another important fact, especially ever since the event in Estonia in 2007, is that the NATO activity engaged because of cyber threats dramatically increased. In 2008, a NATO document entitled "Cyber Defence Policy", and another one entitled "Cyber Defence Concept" were formed, in which threats, vulnerability risks and precaution measurments are estimated. In all of these NATO documents it is mostly stated that the NATO states are responsible for protecting their cyber space, but NATO is there to help and coordinate these activities, as well as educate staff. In 2008, an Expert centre was established in Estonia out of seven members for Cyber Defense (Clarke R. and Knake R. 2010). It is interesting to notice that this centre is never mentioned as a part of the NATO, but as an international organisation supported by NATO. For Serbia as a participant of the Partnership for Peace it is important that in 2009 a frame was formed for cooperation between the NATO and partners.

## **5. BOTNET FEATURES**

On the Israeli example one can notice that half a million of PCs worked as one and generated 15 million hits per seconds, attacked by the "denial-of-service" (DOS).

The group of PCs having the same goal and preforming the same command are called botnet.<sup>10</sup>

The action of creating a botnet is shown below, used in order to send spam mail<sup>11</sup> as one of the means of attack:

1. Botnet operator (the conductor of botnet) sends viruses or worms containing malicious applications – the bot, aiming to infect users' PCs.

2. On an infected PC, the bot becomes controlled by C&C servers (command and control). It is usually either the IRC server or the Web server.

3. Spamer buys access to the botnet from the botnet operator.

4. Spamer sends instructions to the infected PCs over the IRC server, ordering them to send spam mails to mail servers.

When PCs are concerned, most of people have their PCs turned on for 24 hours and each of the PCs or servers being directly or indirectly on the internet can potentially be a art of such a botnet and might already perform scanning or attacking a system without user's knowledge!

One immediately asks whether "Antiviruses keep us safe?". The answer is that an antivirus program reduces the possibility of a PC to become a part of a botnet, but that it is still possible that a virus is within a PC and that it is a part

<sup>8</sup> http://www.blic.rs/Vesti/Hronika/240918/Albanski-hakeri-napali-srpski-sajt

<sup>9</sup> http://www.vesti.rs/Svet/Gr%C4%8Dka/Hakovani-Studenica-i-ombudsman-3.html

<sup>10</sup> Bot is an abbrevation of RoBot, while net is an abbrevation of Network.

<sup>11</sup> http://en.wikipedia.org/wiki/Botnet



Figure 3: From Troyan to botnet.

of botnet even when the latest antivirus program is installed.

The problem is serious, but it is not treated seriously enough. In order to become aware of how much such a problem is complex, we shall state some types of botnet attacks:<sup>12</sup>

Spam e-mail – messages masked in such a way that the addressee thinks that they come from a familiar person, but are actually either advertisments or of malicious content or both.

Denial-of-service attacks<sup>13</sup>

Adware<sup>14</sup> – its purpose it to advertise a commercial entity without knowledge or aprovement of the user, by changing banners of the advertisment on web pages with some other advertisment content.

Spyware<sup>15</sup> – is a program which sends data to its createor about activities of the user. Usually, information about passwords, credit-cards and other useful information are gathered, which could be sold at the black market. Compromising machines situated within huge corporations are even more worth (in the botnet sense), because they contain huge numbers of confidential information.

Click fraud – is created when user's PC visits a web site without the knowledge of the user himself, creating false "web" traffic for personal or commercial purposes.

Fast flux – represents a DNS technique of botnet, with the intention to hide sites delivering "malware" and phish by hiding behind compromizing machines presented as proxy server.

<sup>12</sup> http://en.wikipedia.org/wiki/Botnet

<sup>13</sup> http://en.wikipedia.org/wiki/Denial-of-service\_attack

<sup>14</sup> http://en.wikipedia.org/wiki/Adware

<sup>15</sup> http://en.wikipedia.org/wiki/Spyware



**Figure 4:** Graph of announcing a patch compared to announcing vulnerability.<sup>16</sup>

Brute-forcing – organizing bots in such a manner that, by coordinated action, they break in (by a brute-force attack) services like FTP, SMTP and SSH.

Scareware – making useres buy a false antivirus in order to clean the PC from a suspected infection. The scareware itself could install a virus an vice versa. They could possess ,,worm" features, i.e. the botnets could be created in such a manner to infect other PCs automatically.

This is a list of some of the most famous botnets spread throughout the cyber space:

BredoLab – 30 million bots Mariposa – 12 million bots Conficker – over 10.5 million bots Kraken – half a million bots Srizbi – half a million bots Bobax – 185.000 bots Rustock – 150.000 bots Cutwail – 1.5 million bots Storm – 160.000 bots Grum – half a million bots Onewordsub – 40.000 bots Mega-D – half a million bots Spamthru – 12.000 bots

On the Israeli example one was able to see what the number of half a million (500.000) PCs could cause, which took part in the attack. This directly pionts out to the potential hackers have at their disposal. The question arises whether hackers are leaders in technology.

The answer would be that not all of them are, but what they have in common is to abuse system's vulnerability while it is vulnerable and in such a manner sell PC by PC or server by server to their resources.

For instance, after discovering and announcing security ommissions, pathces are not awailable for a while, until they are announced by software producers.

The example at Fig. 4 shows how fast MS reacts and how fast a patch for OS is delivered.

Actually, the time in which there is no patch

<sup>16</sup> Izvor: http://www.techzoom.net/publications/0-daypatch/index.en 2008



Figure 5: An overview of window of exposure and announcing a patch compared to announcing vulnerability.<sup>17</sup>



Figure 6: Depiction of a "zero-day window of exposure", when vulnerability is announced simoultaneously with announcing a patch.<sup>18</sup>

(window of exposure) is the time during which system's vulnerability is abused, Troyans are posted and one's PC and server become parts of botnet or a hackers' target (Frei and Tellenbach and Plattner 2008). This time approximately includes 20 days, while practically this time measures between 0 and 180 days. This gives a completely different awareness about automatic patching and system's updating which is provided by system's producer.

Still, in some cases patches are quickly announced, which is called Zero Day Exploit. It is usually system's vulnerability discovered and admitted by software producer himself, when along with the announcement of vulnerability a system's patch is also announced, thus making window of exposure zero (Frei and Tellenbach and Plattner 2008).

## 6. VULNERABILITY MANAGEMENT

After the definition security ommission is an error in a software system which can lead towards working against its documented design and could be compromized in documented security policy (Organization for Internet Safety 2004). Security ommissions represent permanent threat for PC users and even the internet itself. All the ommissions of this kind represent vulnerability of a system.

From all the stated facts it turns out that it is necessary to track vulnerabilities which occur

and if IS possesses a vulnerability which could be abused, it is in such a case necessary to close it or to do everything to prevent abuse until a patch is announced.

Vulnerability mangement is serious work for huge teams and requires a long time and resources even with a smaller IS. The bigger the IS is, the more hetherogenous and complex the problems are involved. Problems are so complex that companies like Master Card and Visa required that if they do business or process payment cards, their parnters need to possess "Vulnerability Management". In such a way, "Vulnerability Management" became part of security standard for payment cards PCI DSS (Payment Card Industry Data Security Standard).

Since huge resources are needed for vulnerability tracking, it was logical that firms were established dealing with this matter exclusively and offering tools which automaticaly search for vulnerabilities within the IS, report, give risk estimations and abusement possibilities of such a system. The risk caused with security errors can be reduced if they are identified, examined and solved early enough. With support of scientificresearch unit, quality of software products is improved by detecting security threats, methods to avoid them and conditions under which threats appear, which is an additional benefit.

As far as commercial leaders in the "Vulnerability Management" field are concearned, there are Rapid7 and Saint companies. Their soft-

<sup>17</sup> Izvor: http://www.techzoom.net/publications/0-day-patch/index.en 2008

<sup>18</sup> Source: http://www.techzoom.net/publications/0-daypatch/index.en 2008

Shell - Konsole
Session Edit View Bookmarks Settings Help
🛃 🖷 Shell
Alix 2/28/10 2:20 PM: [172.23.202.1:53] dns-bind9-predictable-query-id (d
ns-bind9-predictable-query-id) - NOT VULNERABLE VERSION
Alix 2/28/10 2:20 PM: [172.23.202.1:433] SSH-SSHINC-0005 (ssh-sshinc-shor
t-password-auth-bypass) - NOT VULNERABLE VERSION
Alix 2/28/10 2:20 PM: [172.23.202.1:53] dns-bind9-recursive-query-insist-
failure-dos (dns-bind9-recursive-query-insist-failure-dos) - NOT VULNERABLE VERS
ION
Alix 2/28/10 2:20 PM: [172.23.202.1:53] dns-bind9-sig-query-dos (dns-bind
9-sig-query-dos) - NOT VULNERABLE VERSION
Alix 2/28/10 2:20 PM: [172.23.202.1:53/tcp] [rev axfr] Sending reverse zo
ne transfer query for [172.23.202.1]
Alix 2/28/10 2:20 PM: Attempting reverse zone transfer for [172.in-addr.a
rpa]
Alix 2/28/10 2:20 PM: [172.23.202.1:53] dns-kaminsky-bug (dns-kaminsky-bu
g-bind) - NOT VULNERABLE VERSION
Alix 2/28/10 2:20 PM: [172.23.202.1:25] smtp-general-relay-nodomain (smtp
-general-relay-nodomain) - NOT VULNERABLE
Alix 2/28/10 2:20 PM: [172.23.202.1:587] smtp-general-openrelay (smtp-gen
eral-openrelay) - NOT VULNERABLE
Alix 2/28/10 2:20 PM: [172.23.202.1:25] smtp-general-relay-frompercent (s
mtp-general-relay-frompercent) - NOT VULNERABLE
Alix 2/28/10 2:20 PM: [172.23.202.1:25] smtp-general-debug (smtp-general-
debug) - NOT VULNERABLE VERSION
Alix 2/28/10 2:20 PM: [172.23.202.1:25] smtp-general-expn (smtp-general-e

Figure 7: Rapid7 NeXpose<sup>19</sup> searching for system's vulnerability.

19 Rapid7 NeXpose Unified	Vulnerability Management	(http://www.rapid7.com/)

🛃 🗯 Shel	n).					Ba
P port 2	5, closed TCP	port 1,	closed UDP po	rt 7		
Alix	2/28/10 2:	16 PM: [	172.23.202.1]	<b>IP</b> Fingerprinting	g OS, using	openPort
=25 close	edPort=1 close	dUdpPort	=7			
Alix	2/28/10 2:	16 PM: [	172.23.202.1]	Completed IP Fing	gerprinting (	0S
Alix	2/28/10 2:	16 PM: [	172.23.202.1]	<b>IP</b> Fingerprinter	detected OS	[Linux
2.6.19 -	2.6.31]					
Alix	2/28/10 2:	16 PM: [	172.23.202.1]	<b>IP</b> Fingerprinter	detected OS	[AXIS 2
07 Netwo	rk Camera (Lin	ux 2.6.1	6) or 2410 Vi	deo Server]		
Alix v24 SP1	2/28/10 2: (Linux 2.4)]	16 PM: [	172.23.202.1]	IP Fingerprinter	detected OS	[DD-WRT
Alix	2/28/10 2:	16 PM: [	172.23.202.1]	<b>IP</b> Fingerprinter	detected OS	DD-WRT
v23 - v2	24 (Linux 2.4.	20 - 2.4	.37)]			
Alix	2/28/10 2:	16 PM: [	172.23.202.1]	<b>IP</b> Fingerprinter	detected OS	[Sveaso
ft (Linu:	x 2.4.20)]					
Alix	2/28/10 2:	16 PM: [	172.23.202.1]	SystemFingerprin	t [[architec	ture=nul
l][certa:	inty=0.6654442	87729196	[description	=Linux 2.6.19 - 2	.6.31][devic	eClass=G
eneral][	family=Linux][	product=	Linux][vendor	=Linux][version=2	.6.19]] sour	ce: IP s
tack ana	lysis					
Alix	2/28/10 2:	16 PM: [	172.23.202.1]	SystemFingerprin	t [[architec	ture=nul
l][certa:	inty=0.6654442	87729196	[description	=AXIS 207 Network	Camera (Lin	ux 2.6.1
<ol><li>6) or 24:</li></ol>	10 Video Serve	r][devic	eClass=Web ca	m][family=Linux][	product=Linu	x][vendo
r=AXIS][1	version=2.6.16	)]] sour	ce: IP stack	analysis		
Alix	2/28/10 2:	16 PM: [	172.23.202.1]	SystemFingerprin	t [[architec	ture=nul
l][certa:	inty=0.6649499	28469241	7][descriptio	n=DD-WRT v24 SP1	(Linux 2.4)]	[deviceC.

Figure 7.1: Rapid7 NeXpose precise system detecting.

Site Name	Start Time	End Time	Total Time	Status
	November 17, 2009	N/A	N/A	Unknown
	14:17, CET			

The audit was performed on 5 systems, 5 of which were found to be active and were scanned.



There were 165 vulnerabilities found during this scan. One critical vulnerability was found. Critical vulnerabilities require immediate attention. They are relatively easy for attackers to exploit and may provide them with full control of the affected systems. 12 vulnerabilities were severe. Severe vulnerabilities are often harder to exploit and may not provide the same access to affected systems. There were 152 moderate vulnerabilities discovered. These often provide information to attackers that may assist them in mounting subsequent attacks on your network. These should also be fixed in a timely manner, but are not as urgent as the other vulnerabilities. Critical vulnerabilities were found to exist on 1 of the systems, making them most susceptible to attack. 2 systems were found to have severe vulnerabilities. Moderate vulnerabilities were found on 3 systems. No vulnerabilities were found on the remaining 2 systems.

Figure 8: Report of the Rapid7 NeXpose-a: Vulnerability compared to the level of risk.



There were 149 occurrences of the http-generic-webdav-enabled vulnerability, making it the most common vulnerability. There were 266 vulnerabilities in the Web category, making it the most common vulnerability category.

Figure 8a: Report of the Rapid7 NeXpose-a: The most common vulnerabilities.



The dns-bind-libbind-off-by-one-vuln vulnerability poses the highest risk to the organization with a risk score of 225. Vulnerability risk scores are calculated by looking at the likelihood of attack and impact, based upon CVSS metrics. The impact and likelihood are then multiplied by the number of instances of the vulnerability to come up with the final risk score. There were 3 operating systems identified during this scan.



The Linux operating system was found on 2 systems, making it the most common operating system. There were 16 services found to be running during this scan.



The HTTP and SSH services were found on 4 systems, making them the most common services. The HTTP service was found to have the most vulnerabilities during this scan with 214 vulnerabilities.

Figure 8b: Report of the Rapid7 NeXpose-a: Vulnerability of OS and service.

wares do not offer only vulnerability management, but also the test itself represents a proof whether the system is ajusted to security standards (PCI DSS, NIST, SCAP, NERC-CIP, SCADA ...). Pentest (penetration test)<sup>20</sup> is also performed, focused

20 Pentest or penetration test is a method for estimating security of PC's system or net by simulating a malicious insider (persons with legal access to the sysytem on some level) and outsider attack (persons with no legal access on intelligence. Actually, testing of the whole IS system is performed in such a way that it is not endangered.

By introducing one of the Rapid7 NeXpose or Saint solutions, the IS of a complete organisation is covered, i.e. network security, web applica-

to organisation's system) Source: http://en.wikipedia.org/ wiki/Penetration\_test

#### 3.2.8. FTP access with anonymous account (ftp-generic-0002)

#### Description:

Many FTP servers support a default account with the user ID "anonymous" and password "ttp@". It is best practice to remove default accounts, if possible. For accounts required by the system, the default password should be changed.

#### Allocted Nodes:

Affected Nodes:	Additional Information:
	Running vulnerable FTP service. Successfully authenticated to the FTP service with credentials: uid[anonymous] pw[jce@] realm[null]

Reterences;

Source	Reference
GVE	GVE-1999-0497

#### Vulnerability Solution:

Remove or disable the account if it is not critical for the system to function. Otherwise, the password should be changed to a nondefault value.

default value.

#### Figure 9: Unwanted anonimous FTP access.

Source	Reference
URL	http://httpd.apache.org/security/vulnerabilities_13.html
URL	http://httpd.apache.org/security/vulnerabilities_20.html
URL	http://httpd.apache.org/security/vulnerabilities_22.html

Vulnerability Solution:

•Apache >= 1.0 and < 2.0

Upgrade to Apache version 1.3.39

Download and apply the upgrade from: http://www.apache.org/dist/httpd/apache\_1.3.39.tar.gz

Many platforms and distributions provide pre-built binary packages for Apache. These pre-built packages are usually customized and optimized for a particular distribution, therefore we recommend that you use the packages if they are available for your operating system.

#### •Apache >= 2.0 and < 2.1

Upgrade to Apache version 2.0.61

Download and apply the upgrade from: http://archive.apache.org/dist/httpd/httpd-2.0.61.tar.gz

Many platforms and distributions provide pre-built binary packages for Apache. These pre-built packages are usually customized and optimized for a particular distribution, therefore we recommend that you use the packages if they are available for your operating system.

#### •Apache >= 2.1 and < 2.3

Upgrade to Apache version 2.2.6

Download and apply the upgrade from: http://archive.apache.org/dist/httpd/httpd-2.2.6.tar.gz

Many platforms and distributions provide pre-built binary packages for Apache. These pre-built packages are usually customized and optimized for a particular distribution, therefore we recommend that you use the packages if they are available for your operating system.

3.2.10. Apache Signals Sent to Arbitrary Processes Denial of Service (http-apache-mod-prefork-mpm-dos)

#### Description:

Some versions of the Apache HTTP server do not verify that a process is an Apache child process before sending it signals. A local attacker with the ability to run scripts on the HTTP server could manipulate the scoreboard (worker\_score and process\_score arrays) to reference an arbitrary process ID and cause arbitrary processes to be terminated which could lead to a denial of service.

#### Affected Nodes:

Affected Nodes:	Additional Information:	
	Running vulnerable HTTP service: Apache 2.2.3.	
	Running vulnerable HTTPS service: Apache 2.2.3.	

References:

Source	Reference
BID	24215
CVE	CVE-2007-3304
SECUNIA	26273

Figure 10: Vulnerability of Web Server to DOS attack.

tion security and database security. When vulnerability management of an IS is concearned, this represents an adequate solution.

# 7. APPLICATION OF SCANNING SYSTEMS WITH THE RAPID7 NEXPOSE

Software for vulnerability management at the mathematical institute of the serbian academy of sciences and arts

This aprticular system scanning was performed at the Mathematical Institute, agreed by the same Institute.

The complete report has 154 pages, while here only parts as examples are given (Davidovac, Z. 2010: 71-76).

Remark: Due to professional and security reasons, the IP addresses and names were left out or erased.

In one case, it was discovered that on one of the systems, there is an active FTP server, making anonimous access to the server possible, which is shown within the report in Fig. 9.

It can also be seen when and where the error and security recommendation were published, as well as what to do in order to eliminate the problem.

From the examples given (Fig. 9, 10) can be seen that there is always a vulnerability within an IS which was not noticed at all.

Obviously, an update of the web server was needed in order to solve problems on systems and provide security from a potential DOS attack.

Figures 8, 8a and 8b are graphs showing system's vulnerability, give direct answers that a system is maintained but not unvulnerable. According to present knowledge, it was possible to intrude into the system and abuse it.

One needs to stress that scanning with a Rapid7 Nexpose tool could be performed both internally and externally, but for the most precise data it is necessarry to remove the firewall and remove IDS/IPS durign scanning, in order to gain exact information, since firewall and IDS/IPS devices can give a false security image of the IS.

# 8. RESUME

Security practice preventing abuse of vulnerability of an IT system within an organisation represents introducing vulnerability management and patching T systems. It results in saving money in human resources (time) and reducing costs arising from patching and abuse of system's weaknesses, as well as increase of information about potential new threats. Proactive management of system's vulnerability reduces or elliminates potential compromising of an IT system and with that, time and effort are reduced, according to time and effort spent when abuse already took place. In this paper, attack types are shown to which information systems could be exposed and how much harm can they cause.

Results of a Rapid7 NeXpose scanning of servers directly shows where the problems are and what to do in order to solve them. It also shows to the IT personell where to focus and where the most critical problems are which should be solved immediately.

By intoroducing such a proactive approach into an information system, the complete information system of an organisation is covered, actually network security, web application security and database security. This represents an adequate solution when vulnerability management of an information system is concearned.

As a result, it appears that certain parts of an information system are thoroughly and detailed scanned in order to find out whether the system was abused, after which the system becomes updated.

After updating the system, it is necesarry to re-check the system againg, because of human factor which can cause some errors, which could again lead to system's compromizing.

Finally, as a result of vulnerability management of an IS, security is increased and stability in the work of the complete system is secured, while finances and human resources are reduced.

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# REZIME UPRAVLJANJE RANJIVOŠĆU I ZAKRPAMA IT SISTEMA

Ključne reči: Informaciona bezbednost, upravljanje ranjivošću, upravljanje zakrpama, smanjenje troškova,botnet

U radu su prikazani problemi koji se najčešće događaju u Informacionim sistemima kao i ko je sve zainteresovan za njihovu zloupotrebu. Takođe dat je i prikaz tipova napada kao i njihovi različiti motivi kroz primere elektronskog ratovanja. U radu se predlaže bezbednosna praksa koja sprečava zloupotrebu ranjivosti IS sistema unutar organizacije, koja se ostvaruje kroz uvođenje upravljanja ranjivosti i zakrpa IT sistema. Proaktivno skeniranje sistema izvedeno je u Matematičkom institutu SANU i u radu je dat prikaz.

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## DOCUMENTA ARCHAEOBIOLOGIAE 2, Staatssammlung für Anthropologie und Paläoanatomie München, gegründet 2000, Gisela Grupe und Joris Peters (Eds.), *Conservation policy and current research*, Verlag Marie Leidorf GmbH, Rahden / Westf. 2004.

Živko Mikić

Posle predgovora koji govori o povezanosti očuvanosti koštanog materijala uopšte i savremenih istraživanja, u drugom broju časopisa Documenta Archaeobiologiae koji je štampan 2004. godine kroz sadržaj je usledilo 13 referata interdisciplinarnog karaktera. - Poglavlju o strategiji čuvanja pripadaju istraživanja ljudskih ostataka u muzejima (P. L. Walker), Antropološkim zbirkama u Beču (M. Teschler-Nikola i saradnici), mađarski arheozoološki materijal (L. Bartosiewicz), čoveku u arheologiji (C. S. Sommer i T. Neski), terenskoj arheologiji u Bavarskoj (H. Bender), kao i bioarheološkim zbirkama (G. Grupe i saradnici). Aktuelna istraživanja su prezentovana u tri dela. Najkraće rečeno, to su praistorijski čovek, arheozoologija i primati. - Detaljno se obrađuje jedna ranosrednjovekovna nekropola (A. Czermak i A. Ledderose), zatim sledi rekonstrukcija paleoekosistema u ranom neolitu (T. Asam i saradnci), riblja fauna iz Aka Kama / Džibuti (W. van Neer i J. Lesur), kao i ostaci životinja bronzanog i gvozdenog doba iz Kinnereta / Izrael (H. Manhart i A. van den Driesch). Treći deo su genetičke studije na orangutanu (J. Helbe i H. N. Poiner), mineralizacija u kostima Hominida (C. Nedaie), kao i mumije primata iz Tun el Gebela / Egipat (A. van den Driesch i saradnici).

Našim kolegama će svakako biti interasantan prilog P. L. Walkera, (Caring for the dead: Finding a common ground in disputes over Museum Collections of human remanins), u kome se govori o iznaleaženju zajadničke osnove u sporovima sa muzejskim zbirkama koje bi trebalo da adekvatno čuvanju ljudske skelete. Nažalost, u našoj sredini taj problem nije adekvatno pravno regulisan, tako da je tokom XX veka za nauku izgubljeno preko 300 skeletnih serija (prema ličnoj evidenciji autora ovog prikaza).

## DOCUMENTA ARCHAEOBIOLOGIAE 3, Staatssammlung für Anthropologie und Paläoanatomie München, gegründet 2000, Gisela Grupe und Joris Peters (Eds.), *Feathers grit* and symbolism – Birds and humans in the ancient Old and New Worlds, Verlag Marie Leidorf GmbH, Rahden / Westf. 2005.

Živko Mikić

Treći broj ovog internacionalnog i u svakom pogledu interdisciplinarnog časopisa posvećen je odnosu ljudi i ptica, a rezultirao je posle simpozijuma Internacionalnog koncila za arheozoologiju (ICAZ) održanog 2004. godine u Minhenu. U ovom broju je štampano 29 priloga, koji su podeljeni u 4 poglavlja: I – Bird remains in non-anthropogenic contexts and methodological issues, II – Beyond macroscopic analysis of bird bones, III – Birds in prehistorical contexts, IV – Birds in historical contexts.

U prvi deo su svrstana 3 priloga: Z. M. Bochenski i K. E. Campbell Jr. - The identification of turkey remains to species - a metrical approach. Oni su referisali o važnim različitostima posle obrade fosilnih i koštanih nalaza sa arheoloških lokaliteta Meleagris gallopavo i Meleagris ocellata. A. von den Driesch je govorio o lokalitetu koji se nalazi u slivu Dunava i čiji delovi pripadaju srednjem paleolitu centralne Evrope. Između ostalog, naglašava da je pregledano 879 celih ili fragmentovanih ptičjih kostiju, pri čemu su konstatovane najmanje 52 različite vrste. J. R. Stewart – The use of modern geographical ranges in the identification of archaeological bird remains, ispituje domene arheozoologije i kvartarne paleontologije u smislu rasprostiranja pojedinih vrsta ptica, a što je aplicirano i na odgovarajućim geografskim kartama.

Drugi deo ovog broja časopisa *Documenta Archaeobologiae* obuhvata 3 priloga. G. Grupe i A. M. Mekota – Stable isotope analysis of archaeological avian bones, su prikazale rezultate merenja izotopa recentnih prica koji su poređeni sa raspoloživim rezultatima sa neolitskog lokaliteta

Pestenacker u Bavarskoj, a sa ciljem da bi se pokazalo koliko su ptice u prošlosti učestvovale u ekologiji, odn. u lancu ishrane. T. O'Connor i S. O'Connor-Digitising and image-processing radiographs to enhance interpretation in avian palaeopathology, s obzirom na vrlo retko radiografisanje kostiju ptica, uz činjenicu da su one vrlo tanke i osetljive, zalažu se za digitalizaciju rentgenskih snimaka u smislu dobijanja pouzdanijih podataka za paleopatologiju. N. Strott - Histomorphometric examination on different poultry species, se u svom prilogu bavila razdvajanjem Osteona i Haversovog kanala u mikrostrukturi životinja. Jasno razdvanjanje kao kod konja i svinja, nije moguće ustanoviti u kostima većine ptica. Ustanovila je jednu očiglednu tendenciju između gusaka i golubova.

Treći deo – ptice u praistorijskom kontekstu – obuhvata 11 priloga, a prostor nam dozvoljava samo da ih nabrojimo:

I. Cartajeno, L. Nunez and M. Rrosjean – Die Vogelnutzung während des frühen Archaikum in der westlichen Puna de Atacama / Nordchile, H. J. Döhle – Birds in bone assemblages: species spectrum and ecological relevance, M. Eda, H. Koike, F. Sato and H. Higuchi – Why were so many albatros remains found in northern Japan ? M. Gala, J. P. Rayand i A. Tagliacozzo – Bird remains from the Mousterien levels of Baume – Vallee (Haute-Loire, France): preliminary results, L. G. Petit – Recent studies on prehistoric to medieval bird bone remains, V. Laroulandie – Bird exploatation pattern: the case of Ptarmigan Lagopus sp. In the Upper Magdalenien site of La Vacha (Ariege, France), K. Mannermea i L. Lougas – Birds in the subsistance and cultures in four major Baltic Sea Islands during the Neolithic, P. Martinez – Lira, E. Corona, J. Arroyo-Cabrales and J. P. Carpenter – Bird bundles from La Playa, Sonora, Mexico, R. McGovern-Wilson – Feathers flying in paradise: the taking of birds for their feathers in prehistoric Polynesia, J. Peters, A. van den Driesch, N. Pöllath and K. Schmidt – Birds in the megalithic art of Pre-Pottery Neolithic Göbekli Tape, Southeast Turkey, i D. Serjeanston – Archaeological records of a gadfly petrel Pterodroma sp. from Scotland in the first millennium AD.

Četvrti deo – Birds in historical contexts, zauzeo je najveći broj priloga (12). Prema redosledu u sadržaju to su: U. Albarela – Alternate fortunes? The role of domestic ducks and geese from Roman to Medieval times in Britain, L. Bartosiewic – Crane: food, pet and symbol, C. Becker – Birds, mice and slaughter refuse from an Islamic mosque in Siria – a puzzling mixture at a peculiar location, O. Bogatkova and V. Kalyakin – A medieval avifauna from the Kama river basin, M. Sun Chun – Ung Kol Pang, 14th century Korean treatise ofn falconry, E. Corona – Archeozoology and the role of birds in the traditioanl meicine of pre-hispanic Mexico, E. Gal – New evidence of fowling and poultry kepping in Pannonia, Dacia and Moesia during the period of the Roman Empire, M. Hochmuth, M. Hochmuth, N. Bencke and M.Witteyer – Cocks and song birds for Isis Panthea and Mater Magna: The bird remains from a sunctuary in Mogontiacum Mainz, M. Moreno-Garcia, C. Pimenta and M. Gros – Musical vultures in the Iberian Peninsula: sounds through their wings, W. Prummel – The avifauna of the Hellenistic town of New Halos, Thessaly, Greece, T. Tyrberg – Place-names as a complement to archeozoological data – a survey of bird-related place-names in Sweden, S. Wells – Cerved for consumption: birds in english meieval misericordia.

Posle ovog našeg prikaza trećeg broja časopisa *Documenta Archaeobiologiae*, u kome su obrađivani razni aspekti odnosa ptica i ljudi, praktično je nemoguće uputiti neku kritiku. Može se samo konstatovanti da u tematskim zbornicima, posle određenih simpozijuma ili naučnih konferencija, mesto za kritiku ostaje prazno. Nasuprot predgovorima ili uvodima, koji su redovno prisutni, pisati određenu vrstu pogovora ili zaključka zaista nije potrebno. Jednostavno, prilozi sa takvih internacionalnih skupova govore sve. Takvu situaciju smo imali u ovom slučaju.

## DOCUMENTA ARCHAEOBIOLOGIAE 4, Staatssammlung für Anthropologie und Paläoanatomie München, gegründet 2000, Gisela Grupe und Joris Peters (Eds.), *Microscopic* examinations of bioarchaelogical remains – Keeping a close eye on ancient tissues, Verlag Marie Leidorf GmbH, Rahden / Westf. 2006.

Živko Mikić

Kao što je u predgovoru kurator Državne antropološke zbirke Bavarske, G. McGlynn, naglasio, prvi mikroskop potiče iz XVI, a samo ime iz XVII veka, možemo videti da je ovaj broj vezan za mikroskopske analize kostiju. Podeljen je u tri poglavlja: I – Histomorphological perspectives of human and animal bone, and soft tissue, II – Histological features of tooth cementum, dentin and enamel and their use in age estimations of mamals i III – Reconstructing ancient economies and past enviroments, s tim što prvo ima 4 priloga, a drugo i treće poglavlje po 3 priloga.

S. Pfeiffer – Cortical Bone Histology in Juveniles, je analizirala mikrostrukturu 17 individua mlađih od 19 godina skeletne serije Spitalfields (XVIII vek, Hugenatten, London). Najkraće rečeno, ona se menja u starosti do 2 godine života i izmeđi 14 i 16 godina, upravo u vreme bržeg rasta i razvoja, a što otvara mogućnost daljih istraživanja na ovom planu.

S. Doppler, F. M. Neubauer i G. Grupe – Histomorphology of archaeological human compact bone: a neglected morphological approach, prikazali su prve rezultate histomorfološke sistematske inspekcije kompaktne mase ljudskih kostiju. Obuhvaćene su 4 grupe kostiju: 31 femur odraslih osoba iz ranosrednjovekovnih nekropola u Bavarskoj, zatim 103 femura iz bolničkog groblja u Bazelu iz XIX veka, 36 recentnih anatomskih femura, kao i 75 femura osoba mlađih od 20 godina iz ranosrednjovekovnih nekropola Bavarske. Ti rezultati pokazuju da mikrostrukturalna organizacija kostiju može dati podatke o vremenu smrti, aktivnostima tokom života koji su rezultirali mehaničkim naprezanjima, kao i o zdravstvenom statusu skeletnih individua.

K. Dittmann, G. Grupe, H. Manhart, J. Peters and N. Strott – Histomorphometry of mammalian and avian compact bone, pokazuju koliko je važan odnos osteona i Haversovih kanala u kompaktnom delu kostiju sisara i uopšte kičmenjaka. Važno je napomenuti da ovaj prilog prati katalog sa 35 ilustracija, isto toliko tabela na istom broju stranica, što je svakako izuzetno instruktivno.

A. M. Mekota i M. Vermehren – Histological and immunohistochemical analysis of ancient mummified tissues, je prilog koji se odnosi na egipatske mumije (nekropola Zapadna Teba / Gornji Egipat). Mukoidne promene su dokazane pomoću acidnog plavljenja, a što je prikazano sa 6 ilustracija u koloru.

Autori prvog referata u drugom poglavlju četvrtog broja *Documenta Archaeobiologiae* su G. A. Klevezal, I. V. Krillova N. I. Shishina, A. A. Sokolov and Yu. E. Trunova-Selkova – Growth layer in tooth dentin and cementum: problems and perspectives of their use in the study of fossil and subfossil mammal remains including humas, govori o važnosti celularnog i acelularnog cementa, kao i dentina, uz apostrofiranje problema koji proističe iz njihovog odnosa.

K. Pasda – Assessment of age and season of death of West Greenland reindeer by counting cementum incrementa in molara, analizira 63 molara poteklih od odraslih irvasa centralnog dela Zapadnog Grenlanda, koji su uginuli na prirodan način. Uz iznošenje svojih rezultata i problema, napominje da će istraživanja biti nastavljena.

K. Schmid – Age determination in horses using incremental layers, je ispitivala anulaciju zubnog cementa kod 46 recentnih i 6 rimskih konja. Međutim, primarne razlike do kojih je došla, smatra da za sada ostaju bez odgovora, u smislu da li su uslovljene ishranom ili oboljenjima.

Treće poglavlje počinje prilogom M. Bloiera i J. Petersa – Archaeological and malacological findings from the Verige Bay, on Veli Brijun, Istra. Veli Brijun kao najveće ostrvo Brionskog arhipelaga je 1996. i 1997 godine arheološki istraživano kroz saradnju Zavoda za zaštitu spmenika Hrvatske i Univerziteta Passau. Navedeni rezultati se odnose na rekonstrukciju biotopa i ekološku aktivnost na Brionima u doba antike.

W. van Neer, Sh. Hamilton-Dyer, R. Cappers K. Desender and A. Ervynck – The Roman trede in salted Nilotic fish products: some examples from Egypt, timski su prezentovali dva kompleksa ribljih kostiju: iz Mons Claudianus-a (rimskog nalazišta u istočnoj pustinji Egipta, kao i iz Quseir el-Quadim-a, takođe rimskog naselja na Crvenom moru). Treba naglasiti da su njihovi dobijeni rezultati upoređeni sa starijim i sa recentnim podacima.

B. Eichhorn – Charcoal analysis and vegetation reconstruction in arid areas – a case study from Northern Namibia, je analizirala drveni ugalj koji je od posebnog značaja za rekonstrukciju klime i vegetacije. Na svojim istraživanjima je bazirala hipotezu, da ne samo padavine nego i visoke temperature pokazuju jasna kolebanja, naravno kada se radi o tlu Sverene Namibije, koja se nalazi između Atlanskog okeana i Angole.

U smislu zaključka treba reći da je cilj predstavljanja *Documenta Archaeobiologiae* u časopisu *Arheologija i prirodne nauke*, u brojevima 5 i 6, a verovatno i dalje, da se s jedne strane prikaže danas neophodna interdisciplinarnost u arheologiji uopšte, a s druge, da se našim kolegama ukaže na časopis koji sa svojih desetak objavljenih brojeva je samo jedan deo istraživačke i publicističke aktivnosti Ludvig Maksimilijan Univerziteta iz Minhena.

# GUIDELINES FOR SUBMITTING MANUSCRIPTS FOR THE PERIODICAL ARHEOLOGIJA I PRIRODNE NAUKE (ARCHAEOLOGY AND SCIENCE)

Editorial staff of the periodical *ARHE*-*OLOGIJA I PRIRODNE NAUKE* decided to apply *Akta o uređivanju naučnih časopisa*<sup>1</sup> (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 key-words 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

<sup>1</sup> 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

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 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 Forti-

*fication*, 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 Classical 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, H. (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: Vi-

#### king.

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 example

- Abbrevation *i.e.* (lat. *id est*) - actually.

**12.** All of the quoted references are listed after alphabetic order, if written in English or some other foreign language, initial's order within author's surname or the initial letter within the quoted title (if the author or editor are not stated).

## SUBMITTING PAPERS

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