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PRE – FEASIBILITY STUDY
ITINERARIUM ROMANUM SERBIAE

ABSTRACT

The main idea of the project named "Itinerarium Romanum Serbiae – IRS" (hereinafter: the Project and/or "IRS") is to improve and modernise existing infrastructure and other facilities on the route of Roman emperors, whereby the following would be enabled: linking all scientific cultural projects and routes related to Roman archaeology and Roman emperors both in Serbia and, if possible, internationally; a stronger foundation for further archaeological scientific research including the promotion of science; an opportunity for the further development of tourism in Serbia. The standardisation of these Roman sites, which are actually Roman Imperial cities, by the IRS would make it possible to attract at least 300,000 visitors per year and about EUR 300 million. With the opening and standardisation of these sites, foreign tourists would have the possibility to spend at least ten days in Serbia. In Germany only, there are about 400,000 highly educated tourists who are interested in this kind of tourism.

PROJECT BACKGROUND

In recent years, the Serbian government has made significant efforts in the field of science and scientific research. According to the new Science and Technological Development Strategy of the Republic of Serbia 2009-2014, Serbia plans to increase and diversify R&D expenditure and to invest more than €300 million in the scientific infrastructure. As a result of these investments and other activities aimed at promoting scientific research, the total share of R&D expenditures in GDP should increase from cca. 0.3% GDP in 2009 – among the lowest in Europe – to more than 1%

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*This study was written in 2007, when it was assumed that the project itself would be adopted at the state level. In 2009, it was published as a monograph Itinerarium romanum Serbiae by the authors M. Korać, S. Golubović and N. Mrdjić which, in a unique and appealing way, gave background information on the importance of the area during late antiquity and the importance of the further development of the project. It is still the basis on which ideas and strategies related to the formation of the route and its future exploitation are developed. However, one should take into account that the project itself, in the optimal form in which it was conceived hasn't yet started. The only segment of the project that has been progressing according to plan is the Viminacium Archaeological Park, which uses it as a model for the future development and presentation of the site, as it was conceived in the conceptual phase of the project.

of GDP in 2014.

The largest part of the financing of the planned investment should be derived from international financial institutions, particularly the European Investment Bank (EIB). In March 2010, Serbia and the European Investment Bank signed a contract to finance a project concerning a series of investments aimed at revitalising public R&D in Serbia. These investments, spread throughout Serbia, include upgrading existing research facilities and infrastructure, creating a new scientific centre to promote science literacy among the general public, the construction of student and young scientist accommodation and upgrading the academic computer network. Specifically, the investment sub-projects include:

A. Adaptation of existing buildings and laboratories

B. The Petnica Science Centre and the Mathematics High School campus

C. New capital equipment for research

D. Human Resources Programme aimed at attracting some of the nearly 1,400 Serbian scientists currently working abroad

E. Centre for the promotion of science in Belgrade

F. The creation of Centres of Excellence in priority research fields; energy and energy efficiency, environmental protection and climate change, materials science and nanosciences, agriculture and food, biomedicine and information and communication technologies

G. Upgrade of the academic computer network and infrastructure for the "Supercomputing Initiative"

H. New apartment buildings for young researchers in Belgrade, Novi Sad, Niš and Kragujevac

I. The creation of Science and Technology parks in Belgrade, Niš, Novi Sad and Kragujevac

J. Infrastructure for the Ministry of Science and Technological development

The total value of the project is estimated at €420.8 million, out of which €200 million will come from the EIB loan, €25.6 million will be derived from the EU fund (IPA), while the remaining €195.2 million should be drawn from our own sources (the Serbian budget).

In addition to the EIB loan, in 2010, the Government of the Republic of Serbia signed a financing agreement with the Council of Europe Development Bank (CEB) for: (1) the purchase of research equipment for public research units and laboratories and (2) to build non-commercial rental housing for researchers with the goal of improving living conditions, particularly for younger researchers with a total value of €35 million. The total value of funds intended for these purposes are planned to be €130 million, out of which €95 million will be financed by the EIB loan.

In order to effectively manage the related projects, the Government of the Republic of Serbia passed a Decree on the establishment of the company "PIU Research and Development Ltd", making it the key body responsible for the preparation and evaluation of tender invitations and coordination and other activities related to the implementation of the Research and Development in the Public Sector Projects.

Bearing in mind (1) the Government's commitment to supporting scientific activities; (2) the strong resource base i.e. funds to be invested in scientific infrastructure; (3) recent achievements in the field of archaeological research in Serbia; (4) the potential spill over effects of the implementation of the proposed project relating to the promotion of archaeology as a science, the broader positive effects and the promotion of Serbia and (5) Serbia's celebration of the 1,700[th] anniversary of the Edict of Milan in 2013, the Archaeological Institute of Belgrade, with the support of numerous relevant institutions in Serbia, nominated PIU Research and Development to fulfill the project named "Itinerarium Romanum Serbiae", with the joint support of the Serbian government and external (EIB) funds.

1. PROJECT OVERVIEW

The project *Itinerarium Romanum Serbiae – IRS* was founded in 1996 by Dr Miomir Korać from the Archaeological Institute in Belgrade.

The main idea of the project named "Itinerarium Romanum Serbiae" (hereinafter: the "Project" and / or "IRS") is to improve and modernise existing infrastructure and other facilities on the route of Roman emperors whereby the following would be enabled:

• The linking of all scientific cultural projects and routes related to Roman archaeology and Roman emperors, both in Serbia and, if possible, internationally;

• A stronger foundation for further archaeological scientific research, including the promotion of science;

• An opportunity for the further development of tourism in Serbia.

This would be achieved with the standardisation of archaeological sites along this Roman route, which would include five basic elements:

1. Each of the archaeological sites should be open for visitors 364/5 days per year. They should be closed only on the 1st of January.

2. Each site should have at least one covered object, in order to make the site functional and not have to rely on fair weather conditions.

3. Each site should always have at least one English speaking guide (with Serbian as their mother-tongue).

4. Each site should have a souvenir shop and a tavern (lat. *taberna*), in which tourists would be able to purchase souvenirs and refreshments.

5. Each site should have toilet facilities with at least ten cubicles.

The standardisation by the IRS of these Roman sites, actually Roman Imperial cities, would make it possible to attract at least 300,000 visitors per year and generate about €300 million turnover. With the opening and standardisation of these sites, foreign tourists would have the possibility to spend at least ten days in Serbia.

In Germany only, there are about 400,000 highly educated tourists who are interested in this kind of tourism.

During the project, planned to be completed by the end of 2014, 11 archaeological sites in Serbia will be modernised and adjusted to enable further scientific research and cultural and touristic promotion of Serbia as the birthplace of 18 Roman emperors. According to the agreement with EIB, the Project should be classified as component E – science promotion in Serbia.

International Viminacium Projects:

1. T-PAS, an international project, connecting *Aquileia* (northern Italy), via *Emona* (Ljubljana), to *Viminacium*, aiming to promote this tourist

Fig. 1 Roman siege machines

Fig. 2 Map of the Ptolemy, drawing according to original copy of the Roman map

route. The value of the project is €448,000.

2. OPENARCH, an international project of the Archaeological Open Air Museums (AOAMs), connecting Viminacium, actually Serbia, with eleven partners from seven countries (Sweden, Great Britain, the Netherlands, Germany, Finland, Italy, Spain). The value of the project is €2,500,000. Viminacium hosted the participants in 2014.

3. DANUBE LIMES BRAND, a project connecting Austria, Hungary, Slovakia and Serbia by placing Roman towns and forts under common UNESCO protection. The value of the project is in excess of €1,200,000.

4. Ionic-Adriatic Initiative, a project connecting Viminacium with Ancona and Bologna. It is currently being evaluated by the Commission of the European Union. The value of the project is in excess of €3,000,000.

The project is planned to consist of the modernisation and (re)construction of infrastructure and facilities at 11 different archaeologically important sites: (1) *Sirmium*, (2) *Viminaci-um*, (3) *Tabula Traiana*, (4) Trajan's Bridge, (5) Šarkamen, (6) *Mediana et Naissus*, (7) *Iustiniana Prima*, (8) *Diana,* (9) Kale Krševica, (10) Hisar and (11) Drenovac. In addition, the project should include the reconstruction of the Roman road, the construction of 18 busts of Roman emperors and the construction of road signs along the route. A detailed description of the sites and their archaeological importance is presented in part 2.

The project is not planned as a local cultural route, rather as an international project linking all scientific and cultural projects and routes related to Roman archaeology and Roman emperors in Serbia. The local cultural route plan is already emphasised on the main project map where routes to the closest and most important related Roman cities are marked. The project is, nevertheless, open to international cooperation. The Roman Empire was a predecessor of the European Union, but modern borders do not correspond with the Roman provinces. Due to that fact, projects related to the Roman era should not be viewed through present day "national filters", which could narrow
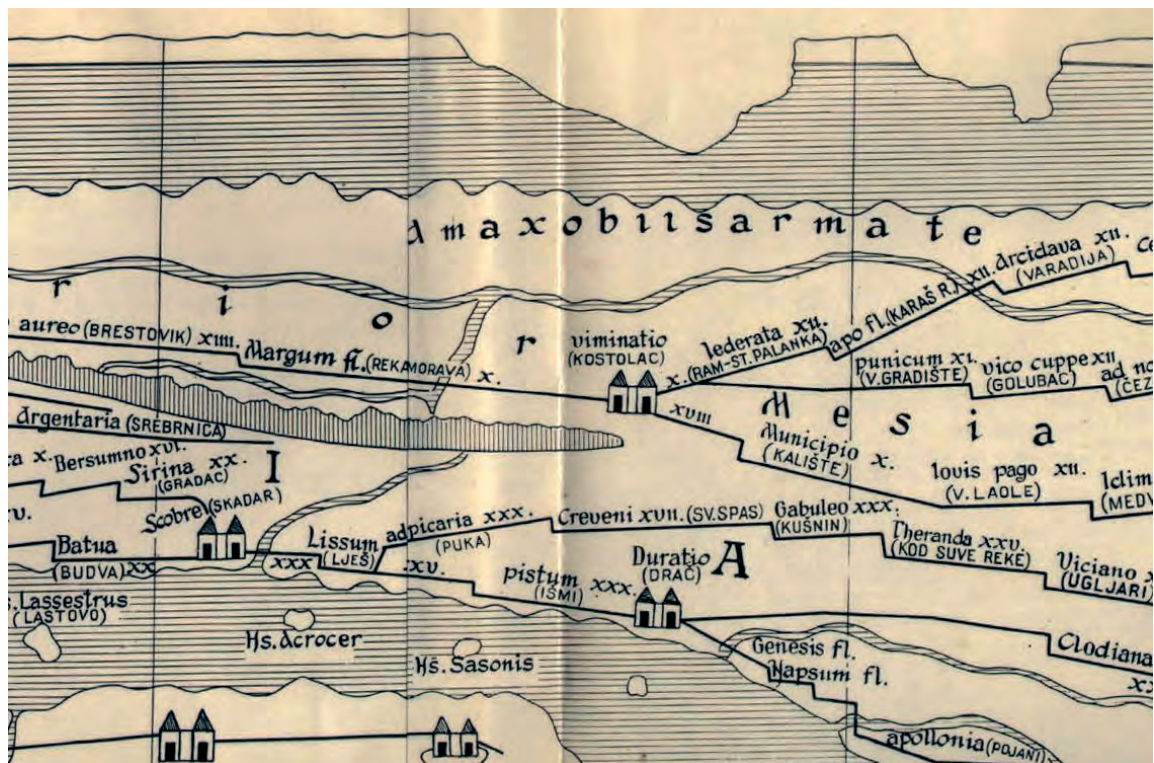
Fig. 3 *Tabula Peutengeriana*, drawing according to original copy of the Roman map

Sirmium	731,000
Viminacium	4,341,228
Tabula Traiana	1,006,093
Roman Road	384,605
Trajan's Bridge	2,307,291
Holographic View of Trajan's Bridge	1,260,000
Šarkamen	678,830
Mediana et Naissus	1,015,371
Iustiniana Prima	417,000
Diana	337,616
Kale-Krševica	260,646
Hisar	28,000
Drenovac	847,785
18 heads of Roman emperors	58,000
Road signs along the route	50,000
Total costs	**13,723,465**

Table 1 Estimated Investments / Costs per Archaeological Site, in €
Source: Archaeological Institute Belgrade

the presentation and vision of the Roman Empire and its Emperors. A complete presentation of the Roman heritage could only be achieved through international cooperation, a fact proven by many previous exhibitions. Thematic exhibitions, such as "Constantine the Great" in Trier, "Hadrian Empire and Conflict" in London, "Rome and Barbarians" in Venice etc., prove that an international vision of the empire is essential to understanding our past.

Roman cities, such as *Aquincum*, *Sopianae*, *Intercissa*, *Mursa*, *Siscia*, *Spalato*, *Pola*, *Emona*, *Poetovio*, *Nicopolis*, *Oescus*, *Ratiaria*, *Sarmizegetusa*, *Apulum*, *Doclea*, *Scupi*, *Heraclea*, *Stobi*, *Athena*, *Sparta*, *Olympia*, *Pompeii*, *Neapolis* and finally Rome, are sites which leave this project unfinished if they are not connected in one major cultural route. Only a project planned in a Roman perspective can achieve the full presentation of its cultural heritage. Only by finally connecting our sites to cities such as *Mediolanum*, *Trier* and *Nicomedia* can we fully present the Tetrarchial Age of Rome and the beginnings of Christianity's domination.

Project *Itinerarium Romanum Serbiae* is an international project of multiple levels and with multiple goals:

• It is planned as a combined project of science and culture using the latest methods in research.

• It is intended to revive and connect ancient Roman roads, of which many correspond to present day communications.

• A network of 100 boarding houses, replicas of Roman villas (*villa rustica*), resting places (*mutatio*) and motels (*mansio*) is planned to be built on this route.

• The aim is to employ the local population, according to a system of small, family run businesses. Boarding houses would employ 800 people.

• A further four times as many people (3,000-4,000) are planned to be employed in the business support of these boarding houses in the form of catering and souvenir production. They would be located in the natural en-

	2014p	2015p	2016p	2017p	2018p
Inflow	**648**	**918**	**1,008**	**1,098**	**1,188**
from tickets	440	620	680	740	800
from souvenirs	208	298	328	358	388
other	0	0	0	0	0
Outflow	**622**	**889**	**977**	**1,065**	**1,152**
Merchandise for resale	176	253	278	304	329
Material costs	45	64	71	77	83
Salaries	310	417	458	504	555
Marketing costs	50	50	50	50	50
Maintenance / reserves	40	105	120	130	135
Net cash	**26**	**29**	**30**	**33**	**35**

Table 2 Preliminary Cash Flow Analysis, in €000
Source: Archaeological Institute Belgrade

vironment, such as in forests, crop fields and pastures, and would mostly be along the rivers Sava, Danube, Morava and Timok.

Focal points of the project include:

• Science promotion: so far, much effort has been put into exploring all scientifically important issues. However, there is room for further investigation and this project should increase the foundation for such developments.

• Thematically linking all similar archaeological sites in this country and abroad.

• Development of the economy and tourism through: (1) the production of souvenirs, (2) the employment of new workers on sites and archaeological parks, (3) 100 boarding houses en route, in order to provide accommodation for visitors, (4) the building and development of local infrastructure and other.

• Improving the standard of local communities through: (1) special attention being paid to the economical development of poor regions (Southern and Eastern Serbia); (2) the development of small local industries and family workshops; (3)the revival of old craftsmanship, which ceased due to economic crises; (4) the rising standard of local communities

• Development of archaeological tourism on the national level.

• Promotion of national treasures and reputational improvement of the Republic of Serbia, especially focused on the celebration of the 1,700[th] anniversary of the Edict of Milan.

Total cost of the project is estimated at €13,723,465 with distribution as follows.

Estimated investments / costs do not include VAT, in accordance with the agreement signed with EIB.

Representing an interesting tourist attraction, IRS will be able to generate assured cash inflow, which provides for the Project's sustainability.

The Project is expected to be completed by the end of 2012.

Fig. 4 Route Itinerarium Romanum Serbiae
Source: Archaeological Institute Belgrade

2. DESCRIPTION OF LOCATIONS AND ANALYSIS OF PLANNED ACTIONS TO BE IMPLEMENTED

2.1 Introduction

Eighteen Roman emperors were born in the current territory of Serbia. That is nearly a quarter of all Roman emperors from the Roman Empire territory of the period from the 1st to the 6th century. To date, this fact has been neglected by Serbian and western European historiography, with their disregard for its importance and usefulness. In the context of scientific content, cultural inheritance and tourism, it represents a worldwide brand. Eighteen Roman emperors is not just an incredible number, but they helped overcome a crisis and gave the Roman Empire a new energy from the 3rd (when the Roman Empire entered its crisis) until the 5th century. Constantine the Great, born in Niš, was certainly one of the most influential Roman emperors. He helped the Roman Empire enter a new period in which a new progressive civilisation emerged. In 313 A.D. in Milan, Constantine issued the famous Edict of Milan, whereby Christians became equal to other citizens of the Roman Empire. Europe and the world formally celebrated the 1,700th anniversary of the Edict of Milan in 2013. Predictably during this year Serbia, and in particular Niš, was expected to represent one of the main visitor locations, not only in the region, but in Europe as well.

Bearing these facts in mind, the opportunity to connect all the towns and cities where the Roman Emperors were born, and to form one unified route arose as a logical solution. For these reasons, this archaeological, cultural and tourist route was named "*Itinerarium Romanum Serbiae* (IRS)" or "On Serbian roads of Roman emperors". The route is over 600 km long and connects nearly the whole of the Serbian territory, stretching from north to south, from Sremska Mitrovica (*Sirmium*), Belgrade (*Singidumum*), Kostolac

(*Viminacium*), to Djerdap, *Tabula Traiana* and Trajan's Bridge (Kladovo), Šarkamen (Negotin), Gamzigrad near Zaječar (*Felix Romuliana*), Niš (*Naissus et Mediana*) and Caričin Grad near Lebane (*Iustiniana Prima*). Apart from these Roman cities, exceptional archaeological finds from other periods are also located on this route: Vinča (Neolithic), Ram and Golubac (Middle Ages), Lepenski Vir (Mesolithic), Diana (Rome and Paleobyzantine), Paraćin (Neolithic), Hisar kod Leskovca (Copper and Iron Age) and Kale Krševica near Bujanovac (Hellenism).

The connection of these locations has two overlapping goals:

1. Popularisation of archaeological science,

2. Economic profit based on the presentation of archaeological findings.

The example of Turkey, which has invested heavily in the archaeological exploration of sites from the Greek and Roman period during the past ten years proves that this could be realised in a very short period of time and be both successful and economically sustainable. In addition to Turkey, Hungary, Austria and Slovakia are hastily working on projects of Roman limes in their own territories and intend to proclaim them as world cultural heritage sites.

The route of *Itinerarium Romanum Serbiae* (IRS), or On Serbian roads of Roman emperors, could and should realise its strong economic potential which has the capacity to attract over 200,000 international visitors. The idea is to create, by connecting these locations, a single chain of archaeological finds. In this way, each site could be visited by each of the route's visitors.

An extremely important fact is that IRS runs alongside the Danube. More than 600 large, luxurious tour ships travel the Danube, carrying between them over 250,000 tourists. Many of these ships, starting from Rotterdam, Regensburg, Vienna and Passau and sailing to the Danube Delta, stop in Novi Sad, Belgrade and *Viminacium*. Using detailed research of these tourists, findings related to their national heritage, age structure, ed-

ucational level and for how long they used toilet facilities (not as bizarre as it might sound given the need for projections of the number of such facilities required) were gathered. Around 50% of tourists come from Germany, Austria and Switzerland, 30% from the USA, 10% from France, 4% from Japan, and 6% from other countries. It is notable that the number of Japanese tourists is expanding and that their interest in the Roman culture of this area is growing.

Another extremely important parameter, which points to the importance and profitability of this route, is the amount of visitors to archaeological locations.

Each of these locations should be accessible and with certain necessary service quality standards:

1. To operate throughout the year,

2. To enable the visit of tourists regardless of the weather (covered and protected),

3. To incorporate professional guide services with at least one English speaking guide,

4. To have a constant maintenance service,

5. To facilitate adequate sanitary facilities with at least 10 toilets,

6. To incorporate a gift shop with specific souvenirs.

Some locations, such as *Sirmium, Viminacium*, Lepeski Vir and *Felix Romuliana*, already posses the necessary infrastructure and can accommodate the aforementioned number of 250,000 tourists. At *Viminacium*, a tavern was
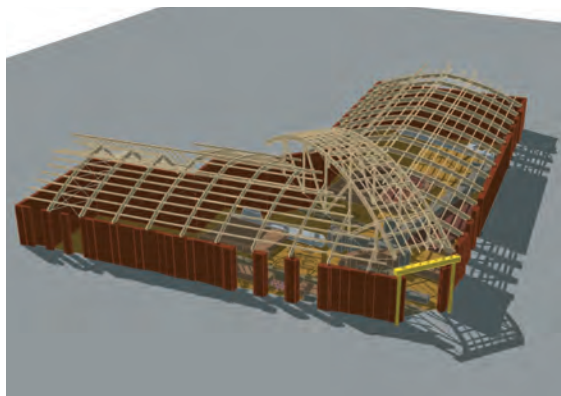
Fig. 5 Sirmium - Protective construction above the imperial palace

built which can host 205 guests, with an air-conditioned sanitary facility housing 13 toilets. Also at this location is a gift shop (150m² in size) where visitors can choose from 700 different souvenirs. Some archaeological locations are already covered and protected (*Sirmium*, Lepenski Vir and *Viminacium*), however, over the next two years, the same protection should be provided at other locations (*Mediana* near Niš, Kale Krševica and Drenovac), or these locations should be differently presented, as at *Iustiniana Prima* and Hisar.

On the IRS route, visitor centres should be constructed. One such multipurpose building which, along with others, represents one of the science popularisation centres of the Braničevo district, is *Domvs Scientiarvm Viminacium*, in the archaeological park at *Viminacium*. This object has an area of over 4,500m² and is designed in the form of a Roman villa with five atriums. The construction started at the beginning of 2008 and, to date, the roof structure has been completed. Its purpose is to accommodate researchers, tourists and devotees of archaeology from both home and abroad. It will incorporate a museum, a library, a laboratory, a research area, accommodation for nearly 130 guests, a dining room and Roman *thermae*.

One third of DOMVS is intended for researchers from Serbia and other parts of the world (rooms have already been secured by researchers from the universities of Bologna, Ancona, Aquileia and Munich). An agreement was reached with Munich's leading laboratory allowing DOMVS to become their SEE unit for strontium analysis, based on which the heritage of citizens from the entire territory of the Roman Empire can be determined. The next third houses a museum, where the rich archaeological material from the necropolis excavation of Viminacium will be exhibited. Over 14,000 graves with over 50,000 items, out of which 1,000 are gold or silver, were found at the *Viminacium* necropolis. This is the largest necropolis of the Roman Empire so far researched. The last third is intended for tourists who want to

Fig. 5 Reconstruction of Sirmium
(drawing according to M. Jeremić)

be a part of the archaeological excavations. This represents a novelty at Serbian archaeological locations, yet it is increasingly becoming a common practise elsewhere in the world. The model for archaeological excavation enthusiasts is present in areas such as Italy, England, Germany, and countries in South and Middle America. These enthusiasts often retired and full of enthusiasm to fulfil a lifelong dream of familiarising themselves with archaeology can, for between €8,000 and €12,000, enjoy a two week stay at an archaeological location.

The goal is to establish this route in the next two years and to complete it by the end of 2012. The IRS route should be connected with other parts of the Roman Empire and discussions with colleagues from *Aquileia*, Italy (northern Italy), *Emona*, Slovenia, Croatia, *Vindobona* and *Carnuntum* and Austria (near Vienna), as well as those from Romania, Hungary, Bulgaria and Macedonia, have already been started, with a plan to completely functionalise the Roman road network and to build a Roman *mansion* (a type of tavern) and a *mutacio* (serving as accommodation

Fig. 6 Sirmium- Monumental sun clock

Geophysical exploration	**471,900**
Geomagnetic research	72,800
Resistivity method "twin"	117,000
GPR research	145,600
GPS positioning and linking of data with GIS	18,200
3D scanning and 3D terrain models production of those archeological sites	75,400
Transport costs, accommodation costs and handling costs	42,900
Coverage of archeological objects	**793,800**
Roman amphitheater (m^2)	604,800
Roman aqueduct (m^2)	189,000
Continued construction of scientific-research center for Roman Archaeology "DOMUS SCIENTIARUM VIMINACIUM"	**2,799,077**
Building trades construction works	2,042,887
Doorman's room	0
Tavern	0
Mausoleum	0
Swimming pool	0
Sanitary facilities	0
Heating water pump	1.178,351
Wiring	164,907
Telecommunications	22,985
Mechanical installations	161,066
Infrastructure	248,281
Parking	0
Horticulture	0
Furniture and equipment	15,600
Museum - Mosaic	165,000
Roman emperors head	0
Site presentation	**14,000**
Other costs	**262,451**
Preparation of project documentation	74,986
Supervision	37,493
Other costs (unexpected costs - archeological ...)	149,972
Total costs	**4,341,228**

Table 3 *Viminacium* – Preliminary Estimation of Investments, in €
Source: Archaeological Institute Belgrade

for horses and postal carriages). Recognising the importance of this route, the EU has already granted the project "*Aquillea-Emona-Viminacium*" the sum of €183,000.

Characteristics of the sites are presented further in the text.

2.2 Sirmium

Sirmium was one of the imperial and most important cities in Serbia during ancient times, being a legionary camp, one of the four imperial cities, as well as a diocesan centre. It was originally the administrative centre of the province of Lower Pannonia (*Pannonia Inferior*) and, following Diocletian's administrative reforms, it became the centre of Second Pannonia (*Pannonia Secunda*). From 324 AD onwards, it became the seat of the Illyrian diocese of the great prefecture of *Italia Africa Illyricum*. The original settlement was set up on the territory of the autochthonous tribes, the Sirmians and the Amantines (*civitas Sirmiensis et Amantinorum*). During Flaviuses' or, most likely, Domitianus's reign (81-96 AD), *Sirmium* gained the status of a colony. There are epigraphic records of *Sirmium* as *Flavia Sirmium, colonia Sirmium, Sirmensium or Sirmiensium*. The importance of the city of *Sirmium* can be confirmed by the fact that it has been mentioned

as the place where *Marcus Aurelius* died and also the place where he had an imperial palace. Additionally, *Maximinus* of Thrace, he usurpers *Ingenuus* and *Regulianus*, as well as *Aurelian*, *Probus* and *Claudius Gothicus, Galerius,* and *Licinius* stayed in *Sirmium* for some period of time. It is a well known fact that Constantine the Great expelled *Licinius* from this city in October 314 AD. *Sirmium* developed rapidly, primarily thanks to its waterways, although the land routes leading from the West to the East also ran directly through this area. *Sirmium* was founded at the intersection of several communication lines. One of the most important was the route starting in *Aquila* in northern Italy and called *Via Militaris.*

Total investment for this archaeological site is estimated at €331,000 and refers to activities related to the presentation of the site.

2.3 Viminacium

Viminacium was the capital of the province of Upper Moesia (*Moesia Superior*), subsequently First Moesia (*Moesia Prima*), and the permanent camp of the Seventh Claudia Legion (*VII Claudia Pia Fidelis*). Based on the most recent archaeological findings, it is estimated that the military camp was probably set up in the first decades of the 1st century AD. Stereoscopic analysis and the

Construction of terrace and access stairs	**76,219**
Construction of terrace around table	31,500
Construction of access stairs	44,719
Conservation of the table	**240,000**
Site presentation	**264,328**
Other costs	**25,547**
Preparation of project documentation	7,861
Supervision	1,965
Other costs (unexpected costs - archeological ...)	15,721
Total costs	**606,093**

Table 4 *Tabula Traiana* – Preliminary Estimation of Investment, in €
Source: Archaeological Institute Belgrade

Fig. 7 *Viminacium, Domus Scientiarum Viminacium*, aerial view

Fig. 8 *Viminacium, Domus Scientiarum Viminacium*, central peristyle

Fig. 9 *Tabula Traiana*, imperial tablet
celebrating building of the limes road in the Iron Gate

Fig. 10 Iron Gate, remaining part
of the Roman road

digital soil samples indicate that the original camp (*castrum*) was twice the size of a camp normally considered to be billeting for the 7th Claudia Legion. This is unequivocal proof that, immediately after it was created, *Viminacium* was the base for two legions. During the rule of Hadrian, this civilian settlement was granted the status of a municipality (*municipium*), however, the discovery of the *thermae* indicate that life in this city was

already very dynamic at the time of Domitian (81-96 AD). The *municipium* status also implied civilian administration. During the reign of *Gordian III* (238-244 AD), it became a colony (*colonia*) of Roman citizens and was given the right to mint its own local currency.

The fact that *Viminacium* is located in the furrows, among the fields, and that there is no modern settlement built over the Roman ruins,

Fig. 11 Iron Gate, 19th century litograph
by W.H. Bartlet

Fig. 12 Iron Gate, 19th century litograph
by W.H. Bartlet

Geophysical exploration	**43,540**
Geomagnetic research	6,720
Resistivity method "twin"	10,800
GPR research	13,440
GPS positioning and linking of data with GIS	1,680
3D scanning and 3D terrain models production of those archeological sites	6,960
Transport costs, accommodation costs and handling costs	3,940
Archeological exploration	**27,000**
Reconstruction of the Trajan's bridge	**480,000**
Trajan's bridge models in the length of 30 m (m)	**1.640,000**
Site presentation	**15,000**
Other costs	**101,751**
Preparation of project documentation	31,308
Supervision	7,827
Other costs (unexpected costs - archeological ...)	62,616
Total costs	**2,307,291**

Table 5 Trajan's Bridge – Preliminary Estimation of Investment, in €
Source: Archaeological Institute Belgrade
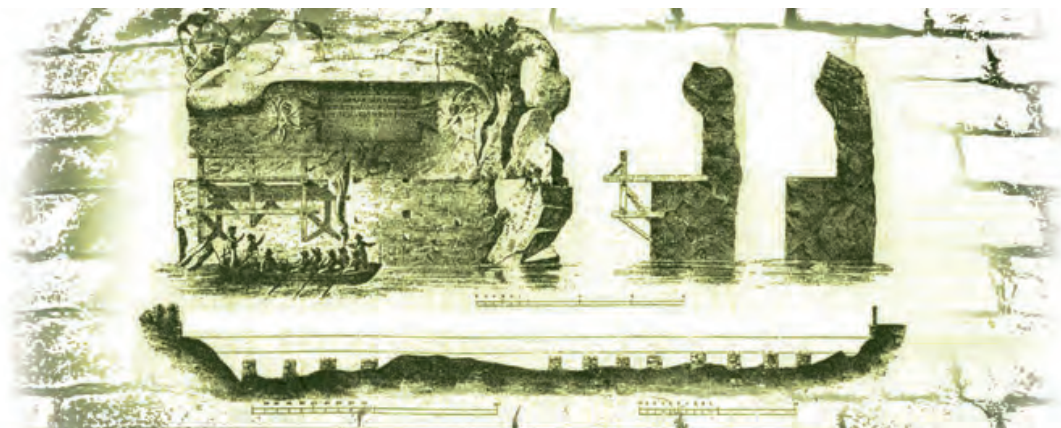
Fig. 13 Roman road through the Iron Gate (drawing by P. Vašarheli)

Holographic view of Trajan's bridge over the Danube	**360,000**
Color laser projector	900,000
Water jet system	370,000
Infrastructure and construction works	90,000
Total costs	**1.260,000**

Table 6 Holographic View of Trajan's Bridge over the Danube.
Preliminary Estimation of Investments, in €
Source: Archaeological Institute Belgrade

Geophysical exploration	**79,170**
Geomagnetic research	12,040
Resistivity method "twin"	19,350
GPR research	24,080
GPS positioning and linking of data with GIS	3,010
3D scanning and 3D terrain models production of those archeological sites	12,470
Transport costs, accommodation costs and handling costs	8,220
Coverage of residential and memorial quarter (m²)	**562,124**
Site presentation	**14,000**
Other costs	**23,536**
Preparation of project documentation	7,242
Supervision	1,810
Other costs (unexpected costs - archeological ...)	14,484
Total costs	**678,830**

Table 7 Šarkamen – Preliminary Estimation of Investment, in €
Source: Archaeological Institute Belgrade

provides a unique opportunity to learn about all aspects of life in ancient times.

The *Viminacium* Scientific-Research Centre (*Domus Scientiarium*) was designed as a multi-purpose facility. Apart from the fact that scientists from Serbia and abroad will use its studies, libraries and atria for research, workshops will be held for students and summer schools conferences and topical meetings will be organised, it will also serve to accommodate tourists who show an increasing interest in visiting *Viminacium*.

Total investment for this archaeological site

Fig. 14 Roman road in the Iron Gate (litograph by G. Hering)

Geophysical exploration	139,920
Geomagnetic research	21,000
Resistivity method "twin"	33,750
GPR research	42,000
GPS positioning and linking of data with GIS	5,250
3D scanning and 3D terrain models production of those archeological sites	21,750
Transport costs, accommodation costs and handling costs	16,170
Coverage of Constantine's villa (m²)	**186,000**
Constantine's portal in bronze (art work that won at contest)	**590,361**
Site presentation	**9,000**
Other costs	**90,090**
Preparation of project documentation	27,720
Supervision	6,930
Other costs (unexpected costs - archeological ...)	55,440
Total costs	**1,015,371**

Table 8 *Mediana et Naissus* – Preliminary Estimation of Investment, in €
Source: Archaeological Institute Belgrade

is estimated at €6,541,000 and refers to the construction of the scientific-research centre and the coverage of the Roman amphitheatre and Roman aqueduct.

2.4 Tabula Traiana

Tabula Traiana is a Roman inscription dedicated to the Roman Emperor Trajan, placed on carved rock above the Iron Gates gorge. It is part of the ensemble of Roman monuments on the Roman route that encompass the remains of the bridge built by Trajan over the Danube. These monuments date back to Trajan's expedition against the Dacians, 100-103 AD. The bridge was built as a supply route on a military road.

These events were immortalised in scenes depicted in the lower part of the Trajan column in Rome. The bridge was a wooden construction with brick pillars, which is the typical technology of that time. Trajan also regulated the flow of Danube, caused by the rapids and, until then, considered impossible to navigate.

Total investment for this archaeological site is estimated at €406,000.

2.5 Trajan's Bridge

During his elaborate preparations for the second Dacian War, Emperor Trajan undertook a number of construction works, of which probably the most imposing one was the construction of a bridge on the Danube, downstream from Kladovo near the village of Kostol. Access to the bridge was protected by two fortifications: *Pontes* (on the right bank of Danube) and *Drobeta* (on the left bank). The architect *Apolodorus* of *Damascus* managed to span the river using twenty stone pillars. It was built between 103 and 105 AD. It was 1,127 meters long, placed on 20 pillars spaced at 50-meters intervals. Being that long and over the turbulent waters of this river, it is one of the biggest bridges built in ancient times. However, the most recent excavations have led to the interesting assumption that there were, in fact, two bridges. The smaller one was situated on the right bank

Geophysical exploration	**7,200**
GPS positioning and linking of data with GIS	1,400
3D scanning and 3D terrain models production of those archeological sites	5,800
Archeological exploration	**25,000**
Construction of centre for visitors (type 3) (m²)	**276,250**
Site presentation	**9,000**
Other costs	**20,166**
Preparation of project documentation	6,205
Supervision	1,551
Other costs (unexpected costs - archeological ...)	12,410
Total costs	**338,616**

Table 9 *Diana* – Preliminary Estimation of Investment, in €
Source: Archaeological Institute Belgrade

of the Danube, spanning the Sipian Canal, which was also built at the time of Trajan. Even the very name *Pontes,* the form meaning bridges in the plural, supports such an interpretation. The best resource for investigating this bridge is Trajan's Column in Rome which details the outline of such an incredible structure.

Total investment for this archaeological site is estimated at €1,667,000, out of which €1,307,000 is for the reconstruction of Trajan's bridge and model construction, and €360,000 is for a holographic view of Trajan's bridge over the Danube.

2.6 Šarkamen

Šarkamen is an ancient Late Roman residential and memorial site. It is situated approximately 25km west of Negotin, in a narrow and closed valley called Vrelo, in a remote area away from any communication lines, trade routes and any traces of modern life. The name Vrelo is derived from the name of the river Vrelo, which emerges from a nearby cave. The entire area, consisting of a narrow valley created by the river Vrelo, from its source up to the village also named after the river, is known as Šarkamen. A simplified

Fig. 15 Trajan's Bridge (drawing by A. Marsigli)

Geophysical exploration	**43,540**
Geomagnetic research	6,720
Resistivity method "twin"	10,800
GPR research	13,440
GPS positioning and linking of data with GIS	1,680
3D scanning and 3D terrain models production of those archeological sites	6,960
Transport costs, accommodation costs and handling costs	3,940
Cover construction over research area (m²)	**189,000**
Site presentation	**13,000**
Other costs	**15,106**
Preparation of project documentation	4,648
Supervision	1,162
Other costs (unexpected costs - archeological ...)	9,296
Total costs	**260,646**

Table 10 Kale-Krševica – Preliminary Estimation of Investment, in €
Source: Archaeological Institute Belgrade

version of Kanitz's statement that Šarkamen was a Roman *castrum* protecting the road between Prahovo (*Aquae*) and Donji Milanovac (*Taliata*), actually survived until the start of systemic excavations in 1994 when the explorations were taken over by Professor Dragoslav Srejović. In a space of 500 m by 300 m, there are five architectural cores, which have only been partially defined: the fortification, memorial grounds, a large representative building, a barn and bridge.

Total investment for this archaeological site is estimated at €479,000.

Fig. 16 Šarkamen, golden jewelry from the imperial mausoleum

Geophysical exploration	**9,492**
GPS positioning and linking of data with GIS	1,680
3D scanning and 3D terrain models production of those archeological sites	6,960
Transport costs, accommodation costs and handling costs	852
Cover construction over the part of settlement (m²)	**378,000**
Construction of visitors centre for prehistorically archeology (m²) – type 2	**399,750**
Site presentation	**10,000**
Other costs	**50,543**
Preparation of project documentation	15,555
Supervision	3,888
Other costs (unexpected costs - archeological ...)	31,100
Total costs	**847,785**

Table 11 Drenovac - Preliminary Estimation of Investment, in €
Source: Archaeological Institute Belgrade

2.7 Mediana et Naissus

Naissus is an important Roman and early Byzantine city which was on the site of what is today the city of Niš. Later fortifications and the present-day settlement have almost completely destroyed the remnants of this ancient city. The Romans inhabited the area of the city as early as the 1st century AD after they defeated the Darda-nians. It's location on an important commercial route conditioned its rapid economic development, which was particularly evident in the 4th century AD, when it was home to a workshop for the manufacture of arms and a workshop for making silverware. Of particular interest are its findings, such as a bronze bust of Emperor Constantine, a statue of the emperor seated on a throne and a store containing silver plates made to celebrate

Fig. 17 *Mediana*, Archaeological Park

Fig. 18 *Iustiniana Prima, Basilica*

the tenth anniversary of Licinius's reign.

Total investment for this archaeological site is estimated at €2,015,000 and is mainly related to the coverage of Constantine's villa.

2.8 Iustiniana Prima

Caričin Grad or *Iustiniana Prima*, as it was referred to in the paleo-Byzantine age, is known as one of the most important Byzantine cities in the Balkan Peninsula. Tsar (Emperor) *Iustinian* I, whose origins are related to the highlands of southern Serbia, decided to build a city in his homeland that would glorify his name. It is situated not far from Lebane, near Leskovac, in the hills away from major roads.

Total investment for this archaeological site is estimated at €417,000 and relates to activities connected with the presentation of the site.

Fig. 19 *Iustiniana Prima*,
3D Reconstruction by Č. Vasić

Fig. 20 *Iustiniana Prima*,
3D Reconstruction by Č. Vasić

Fig. 21 *Diana* fort, South Gate

Fig. 22 *Diana* fort, Building with hypocaust

	2010
Sirmium	7,000
Viminacium	70,000
Tabula Traiana	500
Trajan's Bridge	1,000
Šarkamen	1,000
Mediana et Naissus	5,000
Iustinana Prima	3,000
Kale-Krševica	2,000
Drenovac	1,000
Total	**90,500**

Table 12 Number of Visitors of IRS, 2013
Source: Archaeological Institute Belgrade

2.9 Diana

Diana is one of the most important auxiliary forts situated on the right bank of Danube. It is an extremely well preserved camp dating from between the 1st and 6th centuries AD that protected the Roman and early Byzantine channel, a safe detour around the treacherous Danube cataracts of the area. Together with the Archaeological Museum of the Iron Gate in Kladovo, this is one of the most interesting sites along the route.

Total investment for this archaeological site is estimated at €337,616 and relates to the construction of a visitors' centre.

Fig. 23 *Diana* and *Pontes*, ideal reconstruction of the complex (drawing by M. Korać)

	2014p	2015p	2016p	2017p	2018p
No of visitors, in 000	130	190	210	230	250
Viminacium	90	120	130	140	150
Other	40	70	80	90	100
Ticket price, in EUR	3.4	3.3	3.2	3.2	3.2
Viminacium	4.0	4.0	4.0	4.0	4.0
Other	2.0	2.0	2.0	2.0	2.0
Ticket revenues	**440**	**620**	**680**	**740**	**800**
Viminacium	360	480	520	560	600
Other	80	140	160	180	200
No of souvenir buyers, in 000	65	95	105	115	125
Viminacium	45	60	65	70	75
Other	20	35	40	45	50
Souvenir price, in EUR	0.5	0.5	0.5	0.5	0.5
Viminacium	3.5	3.5	3.5	3.5	3.5
Other	2.5	2.5	2.5	2.5	2.5
Souvenir revenues	**208**	**298**	**328**	**358**	**388**
Viminacium	158	210	228	245	263
Other	50	88	100	113	125
Total direct revenues	**648**	**918**	**1,008**	**1,098**	**1,188**

Table 13 Revenues Calculation, in €000
Source: Archaeological Institute Belgrade

2.10 Kale Krševica

Kale-Krševica is an Ancient Greek archaeological site of more than 4 hectares. So far, around 1,000 squares of a former fortified town in the hills of Krševica overlooking Bujanovac and Vranje, to the south of Ristovac in southern Serbia have been excavated. It has a history reaching back to the 13th century BC, as a settlement with elements of an acropolis. However, the main preserved characteristics are from a Greek-Mediterranean style urban town in the 5th or 4th century BC (Bronze Age) with stone walls and a necropolis. Findings of coins of Philip II, Alexander III, Cassander, Demetrios Poliorketes and Pelagia correspond, in general, to the chronological span of the archaeological material discovered in the course of excavations and it may be considered the northernmost Ancient Macedonian city. The Paeonian tribe of Agrianes dwelt in this region. The Scordisci are believed to have razed the town to the ground in 279 BC. The town had at least 3,000 inhabitants in the 3rd and 4th century.

The town had an exceptionally strategic position on a plateau that descends from Mt Rujan towards South Morava and the Vranje valley. On the slopes of the plateau there is a village where houses are often built using stone blocks from the ancient settlement. The town's acropolis and suburban area encompasses 4 hectares, extending to the valley of the river Krševicka.

Total investment for this archaeological site is estimated at €261,000 and relates to archaeological research and activities connected with the presentation of the site, as well as the coverage of the research area.

Fig. 24 Kale-Krševica, planed protective construction

2.11 Hisar

The archaeological site at Hisar hill, near the Serbian town of Leskovac, where there have been settlements present from the Neolithic, Copper and Bronze Age, Roman and Byzantine times, is one of the richest locations in Serbia in terms of archaeological material.

What makes Hisar particularly interesting is evidence that, as far back as the period between the 1350 and 1100 BC, a centre for ferrous metallurgy existed, making it one of the oldest in Europe. Also, extensive proof of the developed metallurgical industry is present: ovens, blowers, tanks for the production of charcoal, iron ore, and objects that were produced here.

These findings completely integrate the theory of the migration of people in the period between the 13th and 12th centuries BC, according to which the Dorians moved from the north, completely changing the ethnic makeup of the Balkans. Significant archaeological material from the Byzantine period has been found at Hisar, more specifically from the period when Stefan Nemanja expanded the state into the South Morava River basin.

The total area of Hisar is 130 hectares. To date, only 20 hectares have been investigated.

Total investment for this archaeological site is estimated at €28,000 and relates to activities connected with the presentation of the site.

2.12 Drenovac

Drenovac is an archaeological site from the Neolithic period. The site is located near the Serbian town of Paraćin, and dates back to the sev-

	2015			2016			
	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Feasibility study	🟥	🟥					
Financial affordability analysis	🟥	🟥					
Project implementation			🟥	🟥	🟥	🟥	

Table 14 Proposed Project Timeline
Source: Archaeological Institute Belgrade

enth millennium BC.

Total investment for this archaeological site is estimated at €848,000.

3. BUDGET ESTIMATION

The preliminary calculation of the budget for the implementation of the Project is based on estimates by relevant experts from the Archaeological Institute. Costs for the reconstruction of all archaeological sites are calculated separately, while total costs are estimated at €13,723,465.

The IRS development project is intended to be financed within the scope of the general project for revitalising public research and development, as a separate project sub-component of the €200 million finance contract signed on March 4th 2010, between the Republic of Serbia and the EIB. The total project cost, as laid out in the agreement, is €420.8 million and the EIB has committed to €200 million, while other sources should be the Republic of Serbia and EU funds.

4. EXPECTED RESULTS AND ECONOMIC EFFECTS OF THE PROJECT

Implementation of the Project will have multiple effects on both the promotion of science and research in archaeological sites and the promotion of Serbia as a cultural and tourist destination, particularly in the light of the celebration of the 1,700[th] anniversary of the Edict of Milan.

Implementation of the Project should result in:

• IRS encouraging further archaeological research and archaeological science development

• IRS contributing to the economic development of municipalities where archaeological sites are located, resulting in multiple positive effects of the Project implementation

• IRS promotion of Serbia as an attractive scientific, cultural and tourist destination

• IRS offering a favourable social environment for alternative methods of education – the possibility to provide lectures in an interesting environment and new possibilities for social interaction

• IRS offering significant support for primary and secondary education – excursions and study visits can transform traditional methods in the Serbian education system and promote archaeological science to young generations

Unlike other sub-projects within the EIB funding, IRS should be economically sustainable. *The route of Roman emperors could represent strong economic potential, with approximately 200,000 visitors annually.* Thus, the modernisation and reconstruction of the archaeological sites will enable the generation of revenues from these sites. The main source of revenues is expected from ticket and souvenir sales, while other revenues could come from restaurant income as well as from the rental of conference halls and lecture rooms.

Revenue projections are based on the ex-

pected increase in the number of visitors and their spending on tickets and souvenirs. A very important fact is that the route of Roman emperors largely coincides with the river Danube. Around 600 large, luxury boats, with around 250,000 tourists, cruise the Danube annually, which represents a huge potential tourist market for these archaeological sites.

Relevant domestic and international experience suggests that such attractions could attract the planned 250,000 visitors per year. Projected sales of tickets and souvenirs could generate an income of cca €1.2 million by 2016.

Projected cash outflow is lower than cash inflow; excess cash could be used for further archaeological research and site development. It is obvious that the Project is not highly profitable, but it could generate enough cash to sustain itself in the future.

Apart from self sustainability, the Project implementation could have a solid impact on regional economic development. This particularly arises from the fact that almost all investments are intended for sites in municipalities with unemployment rates higher than the Serbian national average.

5. OTHER RELEVANT ISSUES

Upon the preliminary acceptance of the Project, the following further steps will be taken:
• feasibility study;
• financial affordability analysis including a presentation of a detailed budget and financial plan;
• Project implementation.
The Project is expected to be completed by the end of 2012.

REZIME

PRELIMINARNA STUDIJA - ITINERARIUM ROMANUM SERBIAE

Ključne reči: Domus Scientiarum Viminacium, Sirmijum, Vinča, Viminacijum, Lepenski Vir, Golubac, Ram, Pontes, Trajanov most, Trajanov put, Dijana, Feliks Romulijana, Šarkamen, Mora Vagei, Naissus, Justinijana Prima, IRS, Put rimskih imperatora, Srbija, Rim, Mezolit, Neolit, Srednji vek, Tvrđave, Kastrum.

Ključna zamisao idejnog tvorca projekta nazvanog Putevima rimskih imperatora, odnosno Itinerarium Romanum Serbiae (IRS), dr Miomira Koraća sa Arheološkog Institua iz Beograda, još 1996. godine bila je da unapredi i modernizuje postojeću infrastrukturu i druge objekte na putu rimskih imperatora kojim bi se omogućilo sledeće:
- povezivanje svih naučno-kulturnih projekata i puteva vezanih za rimsku arheologiju i rimske imperatore, kako u Srbiji, tako i, ako je moguće, na regionalnom nivou;
- jačanje baze za dalja arheološko-naučna istraživanja uključujući promociju nauke;
- šansa za dalji razvoj turizma u Srbiji.
To bi se postiglo standardizacijom arheoloških lokaliteta duž ove rimske rute koja bi uključivala 5 osnovnih elemena:
1. Da svaki od lokaliteta duž ove rute bude celodnevno otvoren i to 354/5 dana u godini i da ne radi samo 1. januara.
2. Da ima bar jedan pokriveni objekat kako funkcionisanje lokaliteta ne bi zavisilo od vremenskih uslova (kiša, sneg, sunce, vetar).
3. Da ima stalnog bar jednog vodiča koji govori engleski (podrazumevajući da srpski jezik zna).
4. Da ima suvenirnicu i tavernu gde turisti mogu da kupe primerene suvenire i da se osveže.
5. Da ima sanitarni čvor sa najmanje 10 mesta.

Standardizacija ovih rimskih lokaliteta, odnosno rimskih carskih gradova na IRS-u, omogućila bi posetu bar 300.000 posetilaca na godišnjem nivou uz oko 300 miliona evra obrtnih sredstava. Otvaranjem i standardizacijom ovih lokaliteta inostrani turisti bi dobili mogućnost da u Srbiji borave najmanje 10-tak dana. Samo sa teritorije Nemačke postoji zainteresovanost preko 400.000 visokoobrazovanih turista sklonih ovoj vrsti turizma.

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UNPUBLISHED GRAVE-GOODS OF BELT-SETS WITH RING-SHAPED BUCKLES FROM VIMINACIUM

ABSTRACT

The subjects of this paper are two belt-sets discovered in skeletal graves from the Viminacium cemeteries "Više grobalja" and "Rit". They both contained ring-shaped buckles buttoned with buttons with calotte-shaped heads. One of the sets presented here also included a pair of strap terminals with a ring in the middle.

Keywords: belt-sets, grave, Viminacium, buckle, buttons, belt-tongue.

During the excavations of 2013 at the Viminacium sites "Više grobalja" and "Rit", two graves with skeletal burials were discovered, containing belt-sets with ring-shaped buckles as grave-goods.

At the first site, the grave G-2272 was excavated, with the deceased placed in a simple pit in a crouching position facing right (Fig. 1). Grave-goods consisted of the following objects: buckle (1a), two

Fig. 1 The site "Više grobalja", grave G-2272.

Fig. 2 The site "Rit", grave G-10.

strap terminals with a ring in the middle (1b-c), three buttons with calotte-shaped heads (1d-f) and three buttons with flat hammered heads (1g-i).

In the second case, grave G-10, constructed from bricks, was discovered at the site "Rit" (Fig. 2). The grave is missing its cover, which certainly existed, and was destroyed during a robbery. This is also the reason due to which the bones of the deceased were dislocated. The grave-goods from this grave consisted of a fragmented buckle (2a), a calotte-shaped button (2b) as well as a coin minted in Nicaea during the second quarter of the 3rd century.

Sets containing ring-shaped buckles, as well as with buttons with calotte-shaped heads were named "*Ringschnallencingulum*" by J. Oldenstein (Oldenstein 1977: 218-219). The buckles presented here are round and decorated with concentric incisions. In the territory of Serbia, examples of ellipsoidal or round cross-sections without decoration were discovered, along with those decorated with faceting (Redžić 2013: 96-104, T. XIX-XXII, 150-168). They are often discovered with one or more buttons with a calotte-shaped head and a flat base. Images on tombstones were used to reconstruct belt-sets of this type, on which the perforated ends of the belt-straps were pulled through the
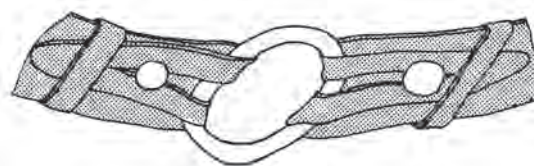
Fig. 3. The method of binding ring-shaped buckles (Oldenstein 1977, 168, Abb.2)

buckle and tied to the buttons, as shown on Figure 3. Since quite a number of buckles were discovered with only one button, it can be presumed that here, perhaps, one side of the strap was tied only by simply being wrapped around the buckle. Proof of this can be found in the image of a horseman from the Vatican museum shown on Figure 4.

Buckles from the territory of Serbia were mostly made of a copper alloy, like the example presented in 1a, but another buckle will also be mentioned which is made of ivory and discovered at the *Viminacium* site "Pirivoj" (Redžić 2013: 99, T. XIX, 150). Another example, from the site "Više grobalja", and similar to the example presented in 2a, was made of silver (Redžić 2013: 102, T.XXI, 164). Finds of this type are also often encountered outside Serbia, like an example made of bone from Saalburg (Oldenstein

Fig. 4 The method of binding a belt-set with a single button (James 2004,63, Fig. 32, c)

Fig. 5 Two possible methods of fixing swords onto baltea using buttons (Miks 2007, 287, Abb. 64)

1977: 218, Tafel 79, 1052) and the finds from *Intercisa* (Oldenstein 1977: 168, footnote 555), *Dura Europos* (James 2004: 76-77, Fig. 37, 43-47), *Aquincum* (Topál 1993: 12, plate 9, Grave 12, 7,8), *Apulum* (Ciugudean, Ciugudean 2000: 205-209, Fig. 2).

According to the head shape, buttons can be divided into two variants. The first variant includes buttons with convex heads (1d-f, 2b), while the other includes examples with a flat-hammered head (1g-i) (Redžić 2013: 303-312, T. LXVII-LX-VIII, 750-780). What they have in common is a flat base, used for fixing buttons to the base. Apart from being used for buttoning belt-sets, the buttons with convex heads were also included in horse-equipment. This is indicated with their 5-10 mm long axis, capable of connecting two leather straps. By following this principle, buttons with axes shorter than 5 mm were most likely used as decoration or possessed some other function, which was common for buttons with flat-hammered heads. Buttons with calotte-shaped heads were used for fixing a sword to a balteus, as shown with an *in situ* discovery from the site Illerup Adal (Miks 2007: 286-287, Abb. 63-64). The two possible reconstructions are shown on Figure 5. A similar situation was confirmed in *Viminacium*, where these buttons were discovered as parts of belt-sets which included buckles with thorns and knives (Redžić 2013: 305). Since no buttons were used for buttoning such belt-sets, we can presume that they were used for fixing

knife scabbards to the belt.

Both variants are often encountered in sites throughout the Empire, which makes it redundant to list them individually. Still, a mould for making five pieces of the buttons with calotte-shaped heads from Regensburg should be mentioned, indicating the existence of a workshop for their production in this town (Fischer 1988: 188). Just like the examples presented here, most of these finds were made of a copper alloy, while only sporadically, examples were made of bone, ivory or silver.

Strap terminals with a ring in the middle (1b-c) were decorated with faceting and had a broader upper axis ending which was perforated to allow it to be put through a leather strap and then fixed with a nail. On the spot where the axis and the ring meet, there are four bulges. Apart from single finds from *Dura Europos* (James 2004: 85-86, Fig.40, 151) and *Apulum* (Ciugudean, Ciugudean 2000: 205-209, fig. 2; 8, 10), a larger number of strap terminals of this type was discovered in the territory of Serbia, all of them made of a copper alloy (Redžić 2013: 346-351, T. LXXIII-LXXIV, 872-890). According to the examples presented here, as well as the finds from *Apulum*, we can conclude that they were worn in pairs, just like other types of strap terminals used during the 3rd century.

Since such types of belt-sets and their parts were most frequently discovered along the Roman Limes, we can conclude that their main users were
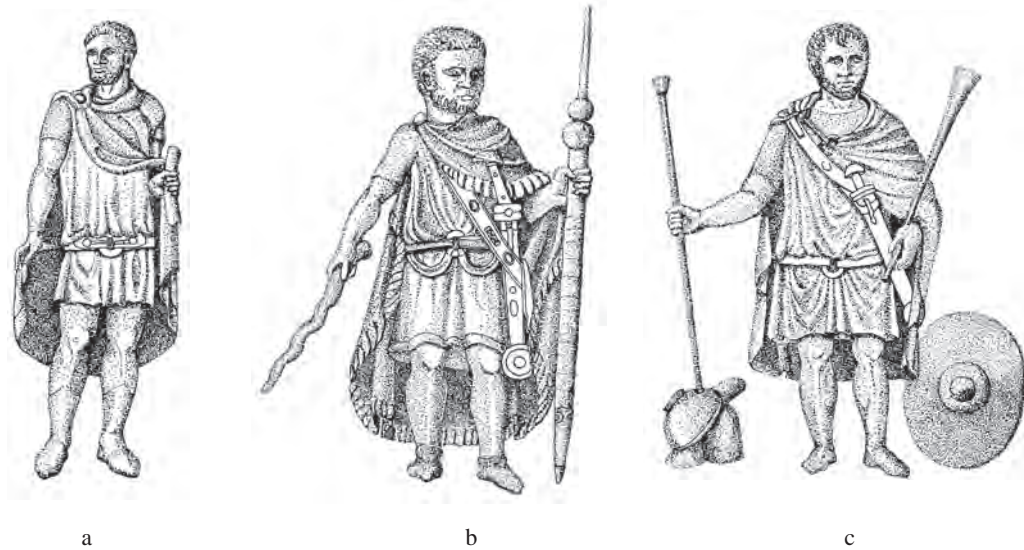
Fig. 6. Tombstones with images of soldiers:
a) Tertiolus, b) Aurelius Lucianus, c) Aurelius Suro (Oldenstein 1977, 232, Abb.13, 1a, 2; 233, Abb.14, 2)

soldiers. Direct proof of that are the numerous images on tombstones, some of which are presented in Figure 6. In addition to the tombstones presented here are two sculptures of soldiers from Apulum (Ciugudean, Ciugudean 2000: 214-215, Fig. 4-5), as well as the famous Tarentius' fresco from Bello's temple in *Dura Europos*, on which at least one soldier wears such a belt-set (James 2004: 41, Fig.19, G; 61). The fact that they were not worn exclusively by soldiers is indicated with finds of such belt-sets in graves of children and women in the cemeteries of *Viminacium* (Redžić 2013: 97).

A ring-shaped buckle, similar to the examples presented here, from the site Apulum was discovered in grave number 19, along with buttons, a shackle, two fragmented strap terminals with a ring in the middle, a T-shaped fibula and a coin of *Faustina* II (Ciugudean, Ciugudean 2000: 205-209, fig. 2). According to the find of a T-shaped fibula, the grave was dated into the 3rd century, but according to other finds, it is clear that its dating should be limited to the first half, or at least the beginning of the second half, of the 3rd century. Another belt-set of this type from Apulum was dated into the period from the beginning of the 3rd century until the end of its third quarter by D. Ciugudean (Ciugudean 2010: 454). The same author claims that the earliest dating of a ring-shaped buckle is its image on an altar from Eining, dated into the year 211 (Ciugudean, Ciugudean 2000: 209).

Dating of this type of belt-set from the Viminacium graves is indicated with coins, like the example published here in figures 2a-b, which was discovered with a coin minted during the second quarter of the 3rd century. Finds from other Viminacium graves were also dated according to numismatic finds. The oldest example was discovered with a coin minted during the shared reign of Marc Aurel and Lucius Verus. The buckle with a bone button was discovered in a grave with a VTERE FELIX fitting and with a coin dated in the 2nd century. A set consisting of a buckle, a button and a shackle was discovered along with two coins, one of them minted during the reign of Caligula and the other during the reign of Emperor Commodus (172-180). In a double grave with buried infants there was a set discovered together with a coin of Geta. Another set was discovered in a grave with a coin of Gordian III, while the youngest set was dated with a coin of Gallienus (Redžić 2013: 97). A more precise dating is also obtained due to the belt-tongue with a ring in the middle discovered with a coin from Nicaea, and dated into the second quarter of the 3rd century (Redžić 2013: 346).

The great frequency of finds of ring-shaped buckles, buttons, strap terminals with a ring in the middle and fittings that are usually part of the belt sets, in the territory of Serbia, perhaps indicates that there was a production centre in this area. This opinion should at least be accepted as

a hypothesis, until it is confirmed with a find of a mould or an unfinished product.

CATALOGUE

1a-i. Ring-shaped buckle, two strap terminals, three buttons with calotte-shaped heads and three buttons with flat-hammered heads made of a copper alloy. The buckle was made of sheet metal and decorated with incisions. The strap terminals are decorated with faceting and they possess a ring in the middle, while their upper ending is perforated to allow it to be put on a leather strap which was then fixed with a nail. On the spot where the ring and the axis meet, there are four bulges. The upper end of one of the three buttons is decorated with radial carvings. The buttons with flat-hammered heads are decorated with carved lines. All of the buttons possess a flat base.

Finding place: *Viminacium*, Više grobalja, 2013, C-12603;

Dimensions: buckle diameter: 6.2 cm; tongue length: 8 cm; buttons with calotte-shaped head, diameter: 2.1-2.5 cm, height: 1.5-2 cm.

Unpublished.

Discovered in skeletal grave G-2272, in the stomach area.

2a-b. Fragmented ring-shaped buckle made of silver sheet, decorated with incisions, as well as a button with a calotte-shaped head and flat-hammered base made of a copper alloy.

Finding place: *Viminacium*, Rit, 2013, C-519;

Dimensions: length of the fragmented buckle: 5.8cm; button: diameter: 2.1cm, height 2.1 cm.

Unpublished.

Discovered in skeletal grave G-10, along with a coin minted in Nicaea, during the second quarter of the 3rd century.

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REZIME

NEPUBLIKOVANI GROBNI PRILOZI POJASNIH GARNITURA SA PRSTENASTIM KOPČAMA SA VIMINACIJUMA

Ključne reči: pojasne garniture, grob, Viminacijum, kopča, dugmad, pojasni jezičak.

Tokom iskopavanja vršenih 2013. godine na viminacijumskim nekropolama „Više grobalja" i „Rit" otkrivena su dva groba inhumiranih pokojnika koji su kao prilog imali pojasne garniture sa prstenastim kopčama. U oba slučaja pored pomenutih kopči u grobovima je nađena dugmad sa ka-

lotastom glavom pomoću kojih se zakopčavala ova vrsta garnitura. Pored toga, u grobu otkrivenom na nekropoli „Više grobalja" otkrivena je i dugmad sa pločastom glavom kao i pojasni jezičci koji imaju ukrasni karakter. Pojasne garniture ovog tipa u stručnoj literaturi se još nazivaju „ringschnallencingulum" i smatraju se predmetima koji su prevashodno korišćeni od strane vojnika. Ovde treba podsetiti da su slične garniture na prostoru Viminacijuma, osim u grobovima muškaraca, nalažene i u grobovima žena i dece.

Na osnovu primeraka iz grobova koji su nađeni zajedno sa novcem, ovaj tip pojasnih garnitura možemo datovati od poslednje trećine II pa do kraja druge trećine III veka. Zbog brojnosti nalaza ovog tipa na tlu Srbije, a naročito u Viminacijumu gde se delovi pomenutih garnitura

relativno često nalaze, treba biti otvoren za mogućnost da se na prostoru naše zemlje nalazila i radionica za njihovu proizvodnju.

1a   1b-c   1d-f

1g–i   2a   2b
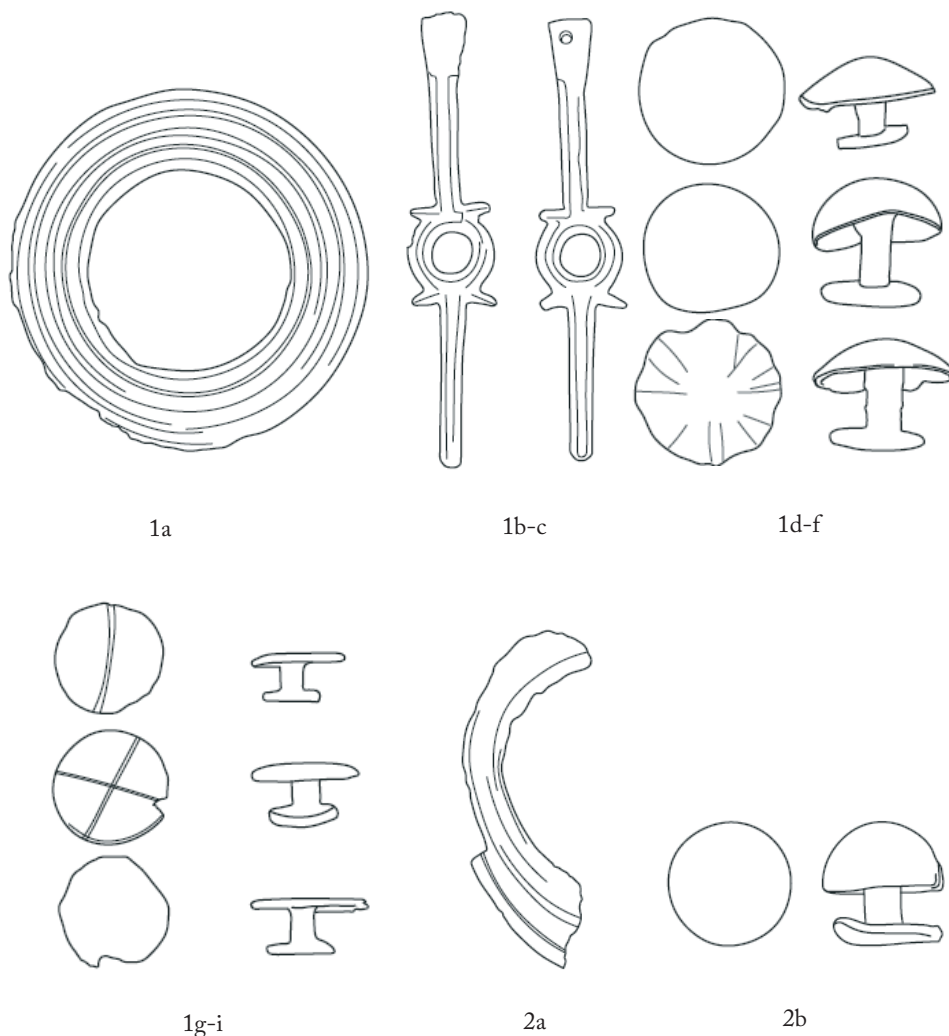
T.I Pojasne garniture iz grobova G-2272, 1a-i; G-10, 2a-b; R 1:1

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THE IMPERIAL STATUE FROM IUSTINIANA PRIMA[1]

ABSTRACT

At the time of the renewal of the Byzantine Empire during the reign of the emperor Justinian I, a new city was built in Dacia Mediterranea as the imperial endowment - Iustiniana Prima. Today it is usually believed that the mentioned city, described by Procopius, can be identified with the archaeological site of Caričin grad.

During the research of the circular forum in the Upper Town, several fragments of the bronze statue were discovered. Based on the analysis of the analogous artistic parallels, it could be concluded that the fragments from Iustiniana Prima were the lower parts of the bronze muscle cuirass of the monumental imperial statue, about 2.2 m high. Its style and the place of its find, as well as the fact that the fragments were discovered on the site which has only the horizons of 6th and 7th century, suggest with some certainty that it was the standing statue of Justinian I. The emperor was displayed on the circular forum of Iustiniana Prima, the center of the newly formed imperial town: according to the analogies, he had the globe with cross as the symbol of the worldly power in one hand, and the cross or more probably spear in another.

Keywords: Byzantine Empire, Justinian I, Iustiniana Prima, imperial statue.

The golden age of the early Byzantine Empire was the period of the rule of Justinian I (527-565). It was marked by the re-conquering of the lost territories, especially the Apennine Peninsula as the heart of the former Roman Empire, as well as with the numerous grand scale building projects. Besides the churches and fortifications, which were either built new or restored, newly built cities mirroring the spirit of the "new epoch" also played an important role in the time of Justinian's rule (Zanini 2003). According to the *Procopius* testimony, one such city emperor built in the land of Dardanians and named it Iustiniana Prima. Namely, Justinian was born in the village of *Taurisium* near the *castelum* of *Bederiana*. His first building project in his fatherland was to enclose the village of his birth with the rectangular fortification with towers on all four angles, calling it *Tetrapirgion*. After that, in its close vicinity, he built a magnificent city (De aedificiis IV 1, 104,20-107,2), which was chosen to be the seat of the Archbishopric (Iust. Nov. XI).

The archaeological site of Caričin grad, situated on the high Plato oriented N-S, modern scholars mostly identify with *Iustiniana Prima*, the eponym city and the endowment of Justinian

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Fig. 1 Ground plan of Iustiniana Prima (after: Bavant and Ivanišević 2003, 13)

I. This early byzantine settlement formed between two small rivers, is situated 28.5 km SW from Leskovac and 7 km W of Lebane, near the main road of the Morava-Vardar valley (Кондић and Поповић 1977, 7).

The research of this site was begun by Vladimir Petković as early as 1912. The size of the city of about 20 ha of the defended area, important architectural remains as well as the abundance of the small finds discovered there,

resulted in the fact that the archaeological investigations on the site are still conducted today. For the last 30 years those campaigns have international character (Кондић and Поповић 1977, 8-13; Bavant and Ivanišević 2003, 14).

Based on up to date researches it was concluded that the city has three large defended areas: the Acropolis, the Upper- and the Lower Town (Fig. 1), while each rampart was aditionally strenghtened by the towers of different shape.

Fig. 2 Fragment of the bronze imperial statue (Documentation of the Archaeological Institute, Belgrade)

Fig. 3 Fragment of the bronze imperial statue (Documentation of the Archaeological Institute, Belgrade)

Besides, the remains of the aqueduct were found, as well as the dam, cistern, porticoed streets, principia, Episcopal palace, thermae, eight churches which significantly differed from each other and numerous profane buildings. Discovered architectural remains match the mentioned, although somewhat scarce description of the city of *Iustiniana Prima* written by *Procopius* (De aedificiis IV 1, 104,20-107,2), as well as the appearance of the cities built *ex novo* in the time of the Justinian`s reign. All the newly founded cities took from the antique heritage all the symbolical as well as real necessities as aqueduct, wide porticoed streets, baths, palaces… Yet, since they all were Christian cities the buildings meant for the amusement of Romans, such as theatres or hippodromes, were permanently abandoned in city planning. As another novelty, when compared with the ancient Roman city, churches appeared, since by that time (i.e. the 6th century) Christianity had the crucial role in the social life of the Empire (Zanini 2003, 198-200).

In the crossing of two main streets of the Upper Town, a circular forum was discovered, which had 22 m in diameter, and with porticoes 3 m wide. It was situated at the top of the slope of the N-S street, which led from the main city gate in the south rampart of the Lower Town. The forum, which was indeed the early byzantine reminiscence to the Roman forum, was paved in stone.

Fig. 4 Bronze monumental imperial statue from Barletta

In its middle stood the stone base of the column or of the statue, fragments of which were found on the site. According to the long lived tradition of Roman imperial cult, the statue of an emperor could found its place on the column as well, which will in the case of *Iustiniana Prima* mean that the statue of the emperor founder (i.e. Justinian) would find its place either directly on the base or on the top of the column, if it originally existed. He was presented as a standing figure in cuirass, which was also Roman iconographic model suggesting that the emperor was the commander of the army and the defender of the Empire (Grabar 1948, 57-59; Кондић and Поповић 1977, 51-54; Bavant and Ivanišević 2003, 22).

The imperial statue in *Iustiniana Prima* unfortunately wasn't preserved, except from several discovered fragments that were cut off from the monumental bronze image, of which only two were published. The first fragment has the dimensions of 58.2 x 18 cm (Fig. 2), while the second has the dimensions of 50.5 x 13.5 cm (Fig. 3). The longer one has the visible remains of two round endings, one of them shaped as a human mask with the beard, while on the right side it has a long drape

which runs the entire length of the fragment. Other drapings, which are narrower, are covered with the bordures with fringes, one of which is in the middle and the other in the lower part of the preserved fragments of the statue. Those fragments belonged to the lower part of the cuirass, since the round endings are in fact agrafe with which pteruges (i.e. the rounded belt strips) were fastened, while the long draping on the left side was the part of the paludamentum, which was originally banded over

Fig. 5 Consular ivory diptych of *Anicius Petronius Probus*

the emperor's left arm. The lower sections of both fragments were the part of tunic (*chlamida*), worn under the cuirass.

According to the everything mentioned, it seems more than obvious that discovered fragments are the lower parts of the muscle cuirass made of bronze, so it was possible to determine that the entire statue without its base was circa 2.2 m high (Grabar 1948, 58, fig. 1; Кондић, Поповић 1977, 187, Cat. No. 1; Bavant and Ivanišević 2003, 60-61, Cat. Nos. 3-4; Баван and Иванишевић 2006, 93-94, Cat. No. 2; Byzanz 2010, 238, Cat. No. 182).

Emperor`s muscle cuirass, which was supposed to be originally integral part of the imperial statue in Iustiniana Prima, imitates the torso. Leather belts (pteruges), which were fastened to the cuirass, were protecting the shoulders, lower part of abdomen as well as the thighs. The cuirass is Hellenistic in origin, but came to use in

Rome quite early, primarily by the infantry and the cavalry, although it was also worn by the navy. During the Hellenistic age pteruges were positioned high on the belt, while in the case of the Roman cuirass they were placed on hips. Besides, there is certain differences in the appearance of the leather belts, which became narrower and longer in the time of the Roman domination. According to some scholars, pteruges were worn predominantly by special units, high officers and

Fig. 6 Ivory diptych from Barberini collection

emperors, so in due time this kind of armor became the symbol of Roman power and *imperium* (Russell Robinson 1975, 147-149).

To this testify also the different Roman coinages, on which the emperor is represented as a horseman, dressed in muscle cuirass with chlamida underneath. The similar representation can be seen on the obverse of the medallion of Justinian I, now in the Bibliothèque Nationale de France in Paris (Age of Spirituality 1979, 45-46, Cat. No. 44).

Chronologically and stylistically, the closest parallel to the find from Iustiniana Prima is almost completely preserved bronze imperial statue which stands today in front of the Church of the Holy Grave in Barletta, Italy. It was part of the war plunder taken after the fall of Constantinople in 1204. The ship on which this valuable cargo

was transported suffered the destruction during its sail. The statue was preserved only by luck, since the sea cast it up on shore in 1309. Mentioned statue is the standing image of an emperor, 3.55 m tall, which together with its base has the height of 5.1 m (Fig. 4). It represents a middle-aged man wearing simple muscle cuirass with pteruges, below which is a tunic. His left leg is slightly spread outward, while in his stretched right arm he holds the cross. The lower part of the paludamentum is switched over his left arm, which is also stretched forward and carries the globe. The emperor wears military boots, and he has a diadem on his head. Based on the technology of its production, as well as on the stylistic characteristics, the statue was supposed to might have represented any emperor from *Valentinian* I (364-375) to *Heraclius* (610-641), although it is most usually assumed that it indeed was *Marcian* (450-457) and that it originally stood on the column erected in Constantinople in the middle of the 5th century (Johnson 1925; Grabar 1936, 16-17; Gerke 1973, 52; Age of spirituality 1979, 27-28, Cat. No. 23; Elsner 1998, 75, 77, Fig. 48).

Beside this example, there are others that testify about the usual way of representing an emperor during the longer period from the 4th to the 6th century. On the very beginning of the mentioned period is the marble statue of the emperor Constantine I (305-337), the remains of which stand today in front of the Palazzo dei Conservatori in Rome. Similar cuirass can be observed on the so called „Group of tetrarchs", originally also from Constantinople, which are situated today in front of the Church of st. Marco in Venice. On the dyptich of Anicius Petronius Probus, roman consul in 406, an image of young emperor Honorius appears (395-423), dressed in the same manner (Fig. 5). The uncertain emperor, Anastasius (491-517) or Justinian I, is portrayed together with some general on the equestrian diptych from the Barberini collection (Fig. 6), which is kept today in Louvre. Both of the portrayed figures are also dressed in the muscle cuirass. Besides, one should mention the throne of Archbishop Maximian from Ravenna, dated to the middle of the 6th century, on which the same cuirass is represented in the scenes from the Story of Joseph (Grabar 1948, 59; Elsner 1998, 84, Fig. 55; Byzanz 2010, 331, Kat. No. 444).

Since on the fragments of the imperial bronze statue from *Iustiniana Prima* the representations of the circular agrafe are preserved, it could be concluded that the cuirass was not the part of the early imperial portrait (1st – 3rd century), when oval agrafe dominated. The most similar are the agrafe from the statue of Marcian from Barletta, as well as those on the Barberini diptych. On the equestrian statue of Justinian I from Constantinople, now lost but known according to the 16th century drawing, same agrafe could be observed. Likewise, the position of the leather belts in the lower part, which are bended in the case of the equestrian statue, suggest that the statue from *Iustiniana Prima* was most certainly standing. Additional data about the chronological determination of the statue can also be obtained by the analysis of the shape of the belts as well as by their position, since the belts are fastened in two rows separate from each other. This way of fastening a belt is not known in early centuries of the Roman Empire, but it can be seen on the Barberini diptych as well as on the Throne of Archbishop Maximian from Ravenna. According to all the analogies mentioned above, the imperial statue from *Iustiniana Prima* can with great certainty be chronologically atributed to the 6th century (Grabar 1948, 59-61; Age of spirituality 1979, 60, Fig. 7; Mango 1992).

Fragmentary state of its preservation enables only the limited possibilities for the determination of its original appearance. Still, A. Grabar proved with arguments more than 60 years ago that it indeed was an imperial statue (Grabar 1948). Based on the fact that it originates from the site where only horizon of the 6th – early 7th century could be found, as well as on the archaeological context, the statue could be atributed to Justinian I. Beside all the mentioned analogies, to this testify also the place where it was found, i.e. next to the town`s main square of circular shape, which was the successor of the ancient roman forum where an imperial statues were placed.

The ruler cult started in Rome from the time of Julius Cesar (100-44 BC), when the almost divine merits were ascribed to one person, characteristic above all for Jupiter as the supreme divinity (Baldwin Smith 1956, 22, 25; Fears 1981, 13, 45; Gradel 2005, 33-35). Erecting imperial statues was just one of the many ways in which imperial cult was demonstrated throughout the Empire. When Christianity became the state religion, the imperial cult disappeared although some prerogatives of the roman imperial titles remain, such as the title of *Pon-*

tifex maximus which was used until *Theodosius* I. Christian emperor owes his imperium only to one God, in whose name he rules and fights the unbelievers (Шене и Флизен 2010, 16-17).

The acceptance of Christianity led to the abandonment of the imperial cult, but in reality the worship of the emperor still continued, although somewhat modified by the dogmatic interpretation of the Constantine`s contemporary and biographer *Eusebius* from *Caesarea*. According to him, the emperor is God`s vicar on Earth. Emperor was no longer the living god but was still preordained and had some godlike attributes. His most important role was to further enlarge the Christian Empire and to protect his Christian subordinates (Evans 1996, 58-62). As such, the emperor was most probably represented on the circular forum of *Iustiniana Prima*, which once dominated the newly founded city as the emperor`s endowment: according to the analogies, he could have globe with cross as the symbol of worldly domination in one hand, and cross or more likely a spear in the other.

The rule of Justinian I was the last successful attempt of renovatio imperii, and the emperor himself is still by some scholars consider as the last truly roman emperor. Unfortunately, as well as almost all of the monumental statues of his predecessor, the Justinian`s statue in *Iustiniana Prima* survived some kind of damnatio memoriae, although possibly not intentionally, since it was cut into pieces which were most probably later re-melted.

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REZIME

CARSKA STATUA IZ PRVE JUSTINIJANE

Ključne reči: Vizantijsko carstvo, Justinijan I, Prva Justinijana, carska statua.

Tokom poslednje velike obnove Rimskog carstva u vreme Justinijana I, na prostoru provincije Sredozemne Dakije novi grad, Prva Justinijana, osnovan je kao carska zadužbina. Danas je uglavnom prihvaćeno da se ovaj grad, poznat iz Prokopijevih opisa, može identifikovati sa naseljem otkrivenim na arheološkom lokalitetu Caričin grad, koji se arheološki istražuje već više od jednog veka. Prilikom iskopavanja kružnog trga u Gornjem gradu, otkriveno je nekoliko fragmenata bronzane statue, koji predstavljaju donje delove muskulatornog oklopa. Pomenuti fragmenti predstavljaju donji deo oklopa, budući da su kružni završeci u njihovom gornjem delu kopče kojima se vezuju pterige, tj. kružni kožni kaiševi, dok dugi nabori sa leve strane predstavljaju delove ogrtača prebačenog preko leve ruke statue. U donjim delovima oba fragmenta predstavljena je tunika (*chlamida*), koja se nosila ispod oklopa.

Na osnovu analize sličnih umetničkih dela, može se zaključiti da su fragmenti iz Prve Justinijane bili deo monumentalne carske stojeće statue, visoke oko 2,2 m. Stilske karakteristike otkrivenih fragmenata, mesto njihovog nalaza, kao i činjenica da potiču sa nalazišta koje ima samo horizont 6 – početka 7. veka, ukazuju sa velikom sigurnošću da je reč o statui Justinijana I. Kult rimskog vladara, koji se između ostalog manifestovao i kroz podizanje carskih statua, započeo je od vremena Julija Cezara. Kada je hrišćanstvo proglašeno za državnu religiju, dogodile su se značajne promene, iako su carevi sve do Teodosija I zadržali neke od važnih titula rimskih careva npr. titulu *pontifex maximus*.

Iako je prihvatanje hrišćanstva rezultiralo ukidanjem carskog kulta, posebne počasti su, premda modifikovane, i dalje ukazivane vladarima. Mada car više nije smatran bogom, bio je božanski predodređen i imao je božanske odlike, iako je njegova nova uloga bila da širi hrišćasko Carstvo i da zaštiti njegove podanike. Kao takav, car je prikazan i na kružnom trgu u Prvoj Justinijani, središtu novoosnovanog carskog grada. Sudeći prema analogijama, imao je globus sa krstom kao simbolom svetske vlasti u jednoj ruci i krst ili verovatnije koplje u drugoj.

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ON THE SPREAD OF REPRESENTATIONS OF "FANTASTIC" ANIMALS ON BRONZE ITEMS (ANCIENT COLCHIS AND EUROPE: RESEARCH PERSPECTIVE)

ABSTRACT

Of the zoomorphic animals (deer, snake, fishes, swastika) engraved on Caucasian bronze items of the Late Bronze-Early Iron Age most numerous and interesting are the representations of the so-called fantastic animals. Of Georgian material alone, 85 bronze axes have been identified with this image. Researchers (V. Miller, A. Miller, P. Uvarova, I. Meshchaninov, B. Kuftin, V. Bardavelidze, Sh. Amiranashvili, V. Ivanov, N. Urushadze, and N. Abakelia) give various interpretations of these representations.

The paper presents representations attested on archaeological artifacts of Europe, analogous to the Caucasian fantastic animals: on fibulae from Boeotia, a fibula from Yugoslavia, on shields and disks from Italy, all datable to the 8th-7th cent. BC.

The emergence of analogous representations in the Caucasus, which suffer definite transformation over space and time, servers as one more proof of contacts between the Caucasus and South Europe.

Keywords: late Bronze-Early Iron Age, Caucasus, Colchian axe, Colchian bronze culture, fantastic animal.

Of the zoomorphic animals (deer, snake, fishes, swastika) engraved on Caucasian, and namely Colchis Culture[1] bronze items of the Late Bronze-Early Iron Age, most numerous and interesting are the representations of the so-called „fantastic" animals (pl. 1/1).

The depictions of "fantastic" animals (map) are represented on bronze axes, daggers, spearheads, mace heads, clasps, fibulae, torques, tweezers, etc. (Pantskhava 1988; Sulava 2000a; idem 2011).

As a result of the recent researches, about 170 items[2] with depictions of fantastic animals were found just in the Georgian materials.

[1] Which covers the area from the east Black Sea coast (West Georgia), including the central part of North Caucasus and is represented within it by local variations, and by infiltration zones on the bordering territories (Also, see - Лордкипанидзе О. 1989. Lordkipanidze O. 1991. Idem. O. 2001. Idem. 2002)

[2] Which is significantly more common on artefacts decorated with animal images, discovered among the north Caucasian materials (Ramishvili 2010; Sulava and Ramishvili 2011)

Map of distribution of bronze axes with images of "fantastic" animals

I group:
1. Tsiteli Shukura; 2. Primorskoye; 3. Tasraqva; 4. Eshera; 5. Amukhva; 6. Zvandripsh; 7.Atchandara;
8. Otkhara; 9. Abgarkhuk; 10. Psirtskha; 11. Svaneti; 12. Etseri; 13. Dghvaba; 14. Ergeta; 15. Mukhurcha;
16. Kutaisi; 17. Khikhadziri; 18. Lukhvano; 19. Oqureshi; 20. Lailashi; 21. Surmushi; 22. Sinatle;
23. Natsargora; 24. Tlia; 25. Samtavro; 26. Narekvavi; 27. Zakaani

II group:
28. Tskhinvali; 29. Tsoisi; 30. Mzetamze; 31. Ojola; 32. Zekari; 33. Meqvena; 34. Tskheta; 35. Khevi;
36. Phushurkauli; 37. Mekhchistsikhe; 38. Akhali Atoni; (4. Eshera; 24. Tlia)

Map of distribution of bronze axes with images of ,,fantastic'' animals

The depictions, as we noted, are performed through the engraving technique (See.: Hančar 1934: 15; Pantskhava 1988: 26, 27; Sulava and Kalandadze 2006: 15-20; Sulava 2011: 186-189).

A number of researchers have studied the depictions of fantastic animals. According to V. Miller, depicted is a dog (Миллер 1876. For reference see also Миллер 1922). R. Vichov argued the zoological explanation of the animal and categorized it as of the Griffin-Sphynx-Kentaur rank (Virchov 1883). P. Uvarova believes that the depiction represents a dragon, a fantastic animal, a tiger, a wolf, a jackal (Уварова 1900: 67, 178). According to I. Meshchaninov, animals whose bodies resemble a snake and have open mouths and paws, posteriors with fish fin, are dragons; however, the dog depictions on Caucasian items are more fantastic, than realistic. As for the dragons and dogs (along with the snake and the fish), he viewed them as belonging to the same water zone and thought that this depiction is a representation of a common semantic-mythological connection between a dog, water and a snake, which is also confirmed by local linguistic materials (Мещанинов 1925: 195, 241, 245-256). B. Kuftin agreed with I. Meshchaninov and N. Marr and

conditionally considered these animals as "snake-wolves" or "dragon-wolves". In his opinion, in the case of this complex –a fantastic dog, snake, and fish - we are dealing with the reflection of the Iber-Megrelian tribal names. Therefore, he considers that these depictions should be identified as a west-Georgian name "Gveri" ("snake-wolf" or "dragon-wolf") (Куфтин 1949: 57). He parallels it with the Cerberus of Greek mythology, which iconographically and from the cultic and mythological point of view, is related to a snake, like the Georgian "Gveri" (considered its "deputy") (Куфтин 1949: 195, 196). B. Kuftin also brings up another parallel from the Greek world in the form of archaeological artifacts (what is particularly interesting for us – N.S.), namely, the boat-like fibula with a plate-like receiver discovered in Boeotia (pl. 1/2).The arch of the fibula is made up of three boats, the receiver resembles a rectangular plate, which is decorated with anengraved composition. The main character on the composition is a predator, eating a hoofed animal. This depiction particularly resembles the Caucasian fantastic animal by its fin-like paws (Perrot and Chipiez 1898: 251-253, pl. 118. Куфтин 1949: 56). According to B. Kuftin, Germans were also

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Pl. 1 Images of „fantastic" animals

familiar with the dog-wolf beast (Garmmr'a), in their ancient epos (Icelandic-Scandinavian *Edda*) (Куфтин 1949: 196, 197). V. Bardavelidze considered the depictions as dogs; however, the dog cult was developed from the totemic wolf, which is more ancient. In his opinion, wolves, snakes and dogs were the zoomorphic aids of astral gods (Бардавелидзе 1957: 47-53, 54). El. Virsaladze related the depiction to the mythical dog of Georgian folklore, "Qursha" (Вирсаладзе 1964). According to Sh. Amiranashvili as well, the depictions represent dogs; he notes that in the Colchian culture they had a central status (Амиранашвили 1963: 42, 43). M. Khidasheli refers to these depictions by the terms – dog, a dog-like animal, and shares the belief that they are connected with the guardian god of animals (Хидашели 1982: 28, 30, 63-64). N. Urushadze views the depictions of the Caucasian fantastic animals on bronze axes and girdles as dogs and wolf-like symbols (Урушадзе 1984: 29-30; idem 1988: 50-51, 81. Иванов 1980: 59-60). According to L. Pantskha-

va, the depiction represents a dog; together with all other depictions (deer, horse, snake, fish), it is viewed as the ancient zoomorphic image of the "great mother of nature" (Pantskhava 1988: 39, 48, 49). According to N. Abakelia, the symbol of a dog, and a wolf associated with it, are revealed in a number of contexts of the Georgian cultural traditions; i.e.: the celestial dog (embodiment of lightning), the water dog (which incorporates the whole complex of beliefs), etc. As N. Abakelia comments, identification of zoomorphic symbols – such as dogs and wolves represents an ordinary phenomena in the common Caucasian (and not only Caucasian) tradition. She brings up examples of both linguistic and mythological associations. In German traditions, two wolves, the holy animals of Odin and Wotan are constantly referred to as dogs (see Abakelia 1997: 56-58). The warriors of the god of war Odin, are identified as "wolves", as "greyhounds"; the beast with a dog's head is known due to the German beliefs (Hundingas) as men-dogs, "dog offsprings" and from Celtic traditions (dog-headed beasts; similarly, a Celtic name of "water dog" with its interior form resembles the Georgian *m-tsav-dzaghli* (see: Abakelia1997: 57; Иванов 1980: 57-64). An analogous creature is represented in the Hittite ritual tradition. N. Abakelia shares the beliefs of N. Marr, that a wolf-dog, as a guard or a watchdog is classified with the representatives of the reptiles' class – dragon, snake and accordingly the whale, i.e. with the inhabitants of the underworld (Abakelia 1997: 58). Therefore according to N. Abakelia, in the Georgian mythic-ritual system the symbol of a dog/wolf is represented through many aspects and, just like a number of other mythological traditions, is unified within one image. As seen from this short review, the dog cult was widely spread in different aspects in Caucasia, as well as in Europe. This can also be seen through the archaeological materials collected by us.[3]

We have already mentioned the similarity with the Boeotian fibula. On the face of it, we come across completely unexpected parallels of

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3 Herewith we would like to note, that the famous Caucasian image thematics – snakes, fish, swastika, meander, Maltese crosses, which are now not subjects of our research, find parallels with the images of the Thessalian fibula receivers (Kilian 1975: Taf. 461312,1325, Taf. 621884; Donder 1994: 16-31, Taf. 26; Sens 2002: 49-93, Taf. 13, 14)

2
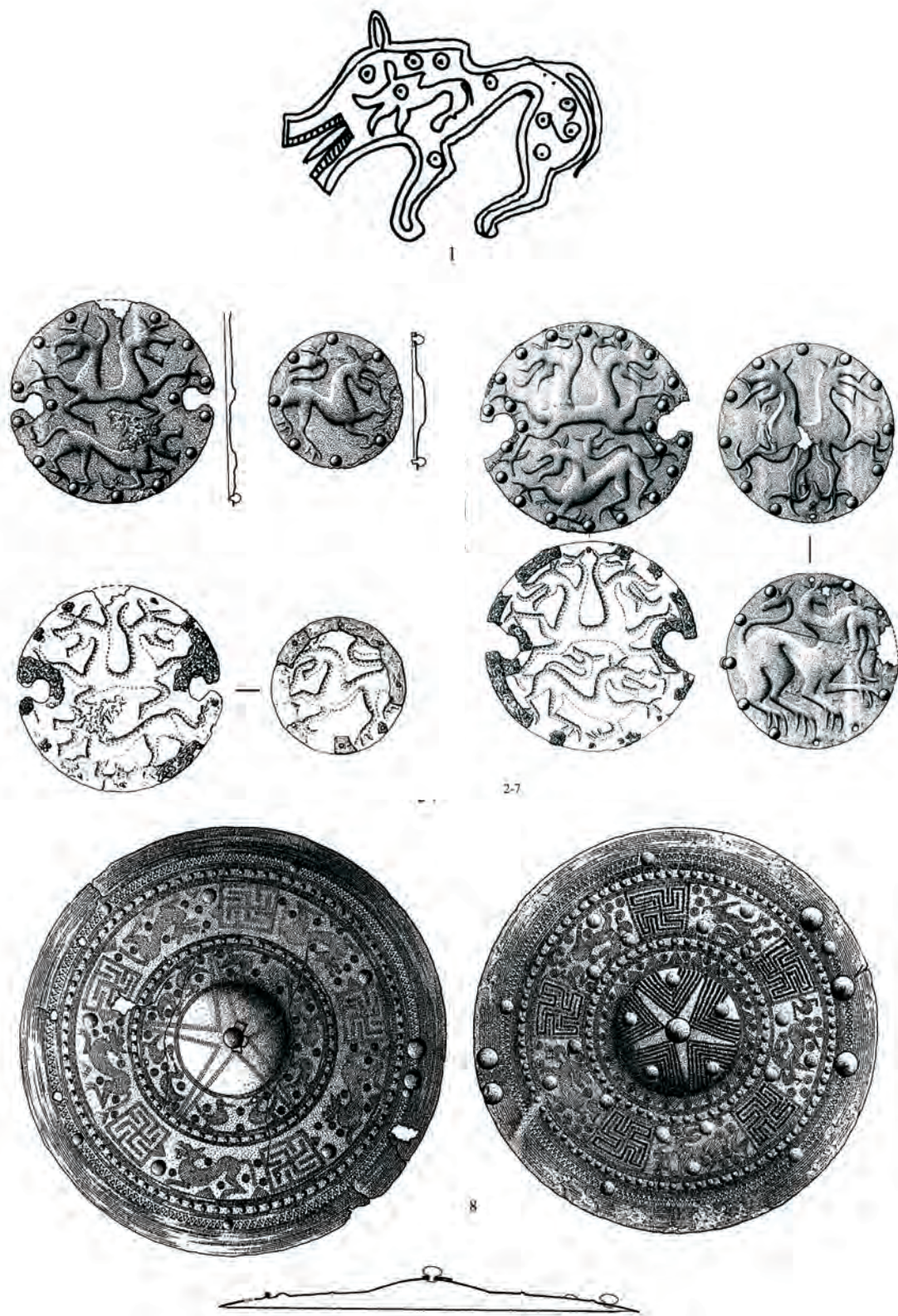
Pl. 2 The fibula from Dalj; bronze shilds/discs from Italy

depictions of Caucasian fantastic animals in Italy. The decorations of the so-called "leech-like" fibulae are found in Bologna (pl. 1/3). The back of these fibulae are decorated with the depictions of analogies of the "Caucasian fantastic animals" facing one another (Montelius 1895: II, pl. VI/50). According to I. Sundwall, this fibula is made of gold and the depiction of the fantastic "dog" is rendered using the technique of granulation (Sundwall 1943: 178, 188, 189, fig. 286, fig. 303). Fibulae of this type are dated to the second half of the 8th century B.C. (Sundwall 1943: 55).

Images of our interest can also be evidenced on other artifacts of Europe. In our opinion, of great significance is the fibula from Yugoslavia (Dalj), which is considered by R. Vasić to be similar to the "Kuban Bestia" (Vasić 1971: 2, pl. II/13) (pl. 2/1).

Bronze shields/discs from Italy are also covered with analogical images (pl. 2/2-7, 8). There are two varieties: the images on one group of the shields/discs cover the whole surface and are represented by one-headed or two-headed creatures; the images on the second group of the shields/discs are located between circular friezes filled with geometric patterns, and the representations of animals interchange with swastikas. The concentration of these items is evidenced in central Italy. A few of them have also been discovered in South and North Italy. Their chronology goes back to the beginning of the 7th century B.C. to the mid-6th century B.C. (Tomedi 2000: 39-42, 72-80, pl. 17-21, 100, 149, 153).

B. Pharmakovski expressed his ideas regarding the first group of shields, saying that they can be found in the Etruscan art, which is greatly dependent on the art of Asia Minor (Фармаковский 1914: 29, pl. XIX/3). S. Boriskovskaya, who studied the discs decorated with the images of "four-legged fantastic creature" of the Hermitage collection, also notes that the researchers studying these discs, characterized them as Orientalized (Борисковская 1973: 5-15).

A bronze shield covered with analogical depictions is known from grave 49 of the necropolis of Paradis (Azerbaijan) (pl. 3). Here, as on the Italian shields, there is an image of five animals on the circular friezes. Instead of swastikas, they are divided by four vertical ribbons. According to the authors the necropolis is dated back to the 11th-7th

centuries B.C.[4] and belongs to the Ganja-Qarabakh culture (Nagel, Strommenger 1985: 10). So far as I know, no analogy of the Paradis shield can be found in the Caucasus.

I believe that the following materials confirm once again the contacts between Caucasus and southern Europe[5]; of course the artifacts or various details of the artifacts proving this, have been the subject of transformation throughout time and space. In spite of this, however, it is possible to follow these contacts (or impulses)[6].

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4 Burial no. 49 of the Paradis necropolis can be dated more precisely. The inventory of the burial, besides of the mentioned bronze shield, consists of the following bronze and iron items: bronze– horse-bit, which is analogous of one from the Mingechauri burial 1 (Abramishvili 1997: pl. I/123); so-called Transcaucasian axe, which is analogical to the axe from Samtavro (burial no. 591) (Абрамишвили 1957: pl. I/165); spearhead with a tall razor and a long, socketedshaft (Abramishvili 1997: pl. I/101), however it has a longer spearhead bushing; the girdle, which represents an analogy of the one discovered in burial 61 of the Gantiadi necropolis (in the same burial, a one-piece arch-fibula has been discovered as well) (Кахиани et al. 1985: pl. XXX); a tube-like item, on which "fantastic animal" of Caucasian type is soldered; a tip with two rings; a macehead, which is analogical to the one from burial 276 of the Samtavro necropolis (Абрамишвили 1957: 132-134; Sulava 2000: pl. II/3); bimetallic - a spear-head, with a bronze hilt and iron mouth. Analogical spears are thought to be of Urartian production by B. Piotrovskii, while R. Abramishvili argues their local production (Пиотровский 1955: 42. Пиотровский1959: 177; Абрамишвили 1961: 370, 371, pl. XI2, XIII123, XIV, XVI); iron – spearheads, spherical beads of various size made of cornelian, and pottery (Nagel, Strommenger 1985: 77-79, tab. 23-26). In our opinion, the complex must be dated by the first half of the 8th and 7th centuries B.C. (see also: Abramishvili 1997: pl. I). The given date is hereby supported by the discovery of the so-called eastern Caucasian axe and the two-piece arch-like fibula in burial 112 at the Paradis necropolis (Nagel, Strommenger 1985: 118, tab. 4; on two-piece arch-fibulae see: Sulava 2001)

5 Based on the Colchis (and Caucasus) fibulas, besides the contacts with the Egeos world, distinguished were contacts north Italy-Balcan materials (disc-like augmentations, luxuriously engraved thick arcs, arcs with lobelike bottoms, with hangers and etc.). If we glance over the other materials of the Colchian culture as well, we will find out, that these contacts can be identified based on other artefacts as well. We mean – the ceramics with zoomorphic handles, spectacle-like hooks, spiral-ended bracelets and torques, bronze vases, the engraving method and etc. (Sulava 2011: 210, 211). The identification of materials reflecting these contacts and their chronological synchronous alignment opens up interesting perspectives for further research and cooperation

6 S. Reinhold, in his work – "Late Bronze and Early Iron Age in Caucasus", states that, it is Caucasus from where the cultural impulses spread from to the west, which
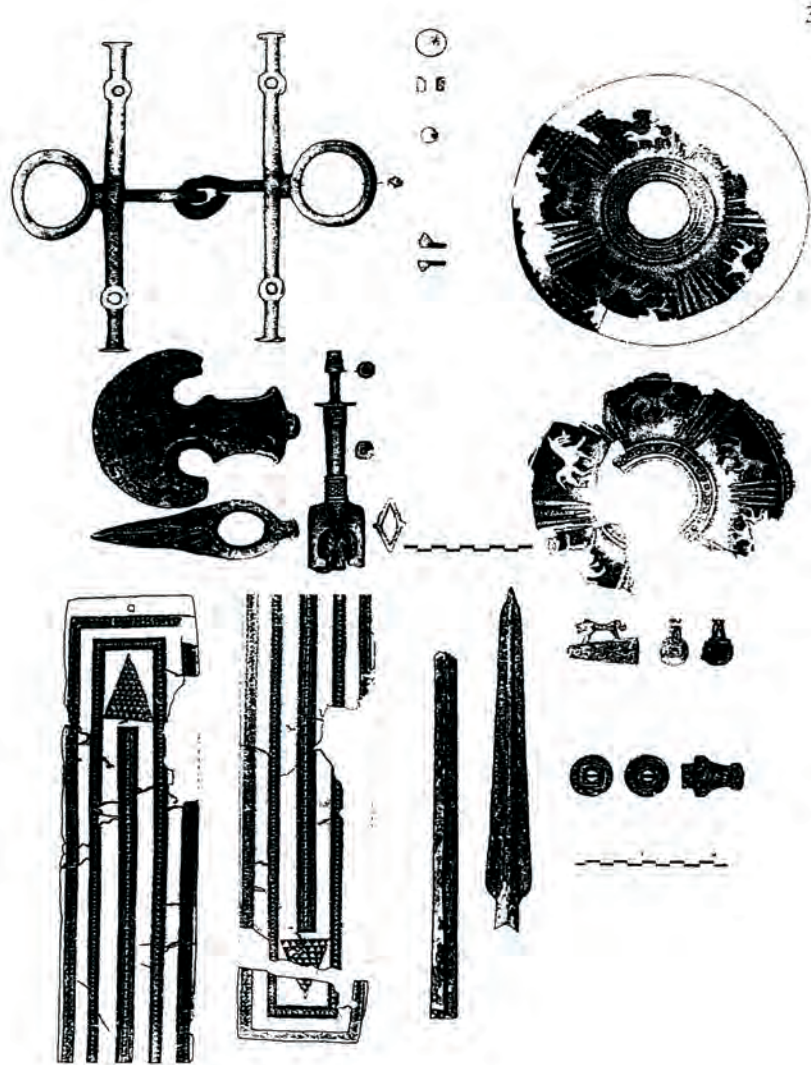
Pl. 3 Bronze shild from necropolis of Pardis

One of the documentary proofs of these contacts is the appearance of the imported fibulae on the coastal area of the Black Sea (Abkhazeti). This fact seems to be important from the following point of view: the spread of the images discussed by us could be related to the introduction of these particular artifacts (fibulae). The boat-like fibulae represent the earliest imports found on the territory of Colchis, dated to the end of the 8th century and the beginning of the 7th century B.C. (Sulava 2003; idem 2006: 159-161, 185, pl. 57/688, 689. Idem 2011: 157-166, pl. 57/691-698). They are characterized by rectangular plate-like receivers, plain or decorated with engravings. Here we must also recall engraved images on the shaft of the boat-like Boeotian fibula which has been identified as a parallel by B. Kuftin. It may be that imported fibulae of this very type (with plate-like engraved receivers) introduced into Colchis the decoration of bronze items with engraved patterns, as well as subjects. However, the engraving on bronze works seems to be known in Europe since the 8th century B.C. (Maryon 1949: 115, 117. Also see: - Sulava and Kalandadze 2008).

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are now viewed as originators of forms in the European Hallstatt Culture development (Reinhold 2007: 2-5, 333). Before we make such conclusions, we are confronted by the problems of chronology; in particular, how realistically can the chronological synchrony between Europe and Caucasus be determined today. Only after ascertaining this problem, can we discuss in what directions did the cultural impulses spread

E. Sapouna-Sakelarakis, one of the researchers of Greek fibulae, calls animal design of our interest "a running dog" décor; he notes, that together with broken lines, slanting notches, linked corners and hook-like spirals, belong to the Geometric Age (900-700 y. B.C.) (Sapouna-Sakelarakis 1978: 7).

The existence of bronze "treasures" characteristic of some regions of Europe (Atlantic, north, central-European, Adriatic-Carpathian) (Hänsel B. 1997) and some of Caucasian regions (the region of Colchian culture), is explained by the sacral-religious moment (Lordkipanidze 2001: 182, see also cited references). O. Lordkipanidze noted, that "bronze "treasures" and religious rites reflected in them are specific only to Colchis on the entire territory of Caucasus"; "the "treasures" including bronze items are spread on the very territory and in those very borders, which is known as "Colchis" from the 7th century B.C. at first in the Urartian cuneiform inscriptions, and later in Greek literary sources (it is enough to mention: Herodotus, II, 103-105, IV, 37-38: Pseudo-Scylax, 81; Strabo, XI, 1,5; XI, 1, 14-17 (See - Lordkipanidze 2001: 187)). As a result we have grounds to assume, that the so-called "treasures" of the Colchian bronze culture (and accordingly the related sacral rites) are carriers of an ethnic character" (Lordkipanidze 2001: 186-187). It is possible to support this opinion by the observations performed as part of our research: a large number of the bronze artifacts (Colchian axes, clasps) found in "treasures" characteristic of the Colchian culture are decorated with representations of the so-called "fantastic" animal, outlining the territory populated by people sharing a similar religious beliefs. If we add to this the burial grounds containing items with representations of "fantastic" animals, which basically cover the same territory, the area and the borders of infiltration of people bearing the Colchis bronze culture seem to be more convincing.

ABBREVIATION DEFINITIONS:

SSMM / Saqartvelos sachelmtsifo muzeumis Moambe / ssmm – saqarTvelos saxelmwifo muzeumis moambe (Georgian National Museum Publication)

ЗКВАМР – Записки Коллегии Востоковедов при Азиатском музее Рассийской Академии Наук

ИРАИМК – Известия Российской Академии истории материальной культуры

МАК – Материалы Археологии Кавказа

МАР ИАК – Материалы Археологии России Известия Археологической Коммисии

ПАИ – Полевые Археологические Исследования

СА – Советская Археология

AJA – American Journal of Archaeology

PBF – Prähistorische Bronzefunde

UPA – Universitätsforschungen zur prähistorischen Archäologie

WPZ –Wiener Prähistorische Zeitschrift

ABBREVIATIONS:

Abkhazeti – Journal of Academy of Sciences of Autonomous Republic of Abkhaseti. Tbilisi

ACADEMIA – Journal of Human Sciences (Association of Modern Scientific Iinvestigation). Tbilisi

BOREAS – Münstersche Beiträge zur Archäologie. Münster

Dziebani – The Journal of the Centre for Archaeological Studies of the Georgian Academy of Sciences. Tbilisi

IBERIA-COLCHIS – Researches on the Archaeology and History of Georgia in the Classical and Early Medieval Period. Tbilisi

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REZIME

RASPROSTRANJENOST PREDSTAVE FANTASTIČNIH ŽIVOTINJA NA BRONZANIM PREDMETIMA (ANTIČKA KOLHIDA I EVROPA: PERSPEKTIVA ISTRAŽIVANJA)

Ključne reči: kasno bronzano i rano gvozdeno doba, Kavkaz, kolhidska sekira, kolhidska bronzana kultura, fantastične životinje.

Među zoomorfnim predstavama na bronzanim predmetima sa Kavkaza iz kasnog bronzanog i ranog gvozdenog doba, najbrojnije i najinteresantnije su predstave tzv. fantastičnih životinja. U radu su predstavljeni predmeti koji potiču sa različitih lokaliteta u Evropi, a koji svojim izgledom podsećaju na primerke sa Kavkaza. Da pomenemo predstave sa fibula iz Beotije, Jugoslavije, na štitu iz Italije, datovane u period od VIII do VII veka pre nove ere. Pojava sličnih predstava fantastičnih životinja sa lokaliteta na Kavkazu, koje su pretrpele izvesne transformacije tokom vremena u novim geografskim uslovima, predstavlja još jedan dokaz o kontaktu između Kavkaza i južne Evrope.

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FOR THE TYPOLOGY OF ENGRAVED DEPICTIONS OF "FANTASTIC" ANIMALS ON COLCHIAN AXES

ABSTRACT

One of the most important elements of decoration of Colchian-Kobanian bronze is a depiction of fantastic animal or dog. The article refers of the engraved depictions of dogs on the Colchian axes found in Georgia. The depictions are divided into two groups: The first group contains examples that are implemented in the naturalistic - linear manner. The examples of second group are very stylized and schematic. The ornamented axes bear together both depictions – dogs and geometric figures. Dogs are represented in profile, with their jaws open and ears and tail upward. Notwithstanding of some variations they compose one artistical group with their stylistical features.

The difference of depictions of dogs in groups 1 and 2 was caused by the alternation of artistic manner during the time. It was changed from natural to schematic; from realistic to geometric; from decorative to ornamental. The depictions with concrete shape were replaced by syncretical and polymorphic figures and the definition of dog was transformed to the depiction of Fantastic animal.

Keywords: Colchian axes, Colchian-Kobanian bronze, fantastic animal.

Among the archaeological cultures discovered in the Caucasus, the Colchis-Koban circle monuments always attracted particular attention. There are a number of scientific works created around the issues of their artistic decoration (Kuftin B. 1949; Koridze D. 1965; Amiranashvili Sh. 1970; Mikeladze T. 1974; Lortkipanidze Ot. 2001; Pantskhava L. 1988).

The existence of analog images on European monuments urged us to study and document the images of "Fantastic" animals engraved on Georgian and Caucasian bronze items in general (Sulava N. 2010; Ramishvili K. 2010, 2011; Sulava N. and Ramishvili K. 2011), which in our opinion opens up perspectives for further research (in terms of early contacts). However in the given work, we shall only discuss the graphical images of "fantastic" animals and wolf-dogs presented on Colchis axes found on the territory of Georgia, from typological and stylistically-compositional points of view.

A number of considerations have been made about the origin of "fantastic" animals in scientific literature. P. Uvarova distinguishes a dragon or a "fantastic" animal, a wolf or a tiger among the animals represented on Colchis axes (Uvarova P. 1900: 67); I. Meshchaninov believes that the "fantastic" animals engraved on the Koban axes are wolf-dogs, which represent the Iberian totem (Meshchaninov I. 1925: 250); According to Sh. Amiranashvili, this animal is a wolf or a dog and represents the Colchis totem (Amiranashvili Sh. 1950: 42-43); A. Miller believed that the "fantastic" animal portrayed on the axes is definitely a dog, a wolf-dog or a wild dog (Miller A. 1922: 316-318); El. Virsaladze related

Pl. I- First group:

1. Khikhadziri, hoard, 8th-7th cc BC (Kakhidze A. and Mamuladze Sh. 1993: 27- 34, pl. V); 2. Tlia, grave 52, 8 th-7 th cc.BC (Pantskava L. 1988: 76, pl. XVIII, 3; Tekhov B.1980: 14, 20, pl. 46, fig. 6); 3. Eshera, grave 4, Late Bronze Age (Kuftin B. 1949:192, pic.37); 4. Khikhadziri, hoard, 8th-7th cc BC (Kakhidze A. and Mamuladze Sh. 1993: 28- 34, pl. VII); 5. Oni, 8th-6th cc BC (Unterwegs zum goldenen Vlies 1995: 108, pl. 93); 6. Tsiteli Shukura, grave 94, 8th-6 th cc BC (Trapsh M. 1969: 144, pl. XV, 2); 7. Nikortsminda, hoard, 8 th-7 th cc.BC (Pantskava L. 1988: 69; Koridze D. 1965: 36, pic.29, fig. 2); 8. Surmushi, hoard, 8 th-7 th cc.BC (Pantskava L. 1988: 69; Koridze D. 1965: 35, pic.28); 9. Dgvaba, grave 2, 7th-6th cc.BC (Mikeladze T. 1995: 14-18; Mikeladze T., Migdisova N., Papuashvili R., and Chubinishvili N. 1995: pl. 54); 10. Zakaani, 8 th-7 th cc.BC (Ramishvili K. 2010: 84, pl. I, 10); 11. Samtavro, grave 121, 8 th-7 th cc.BC (Abramishvili R. 1957: 132; Abramishvili R. 1961: pl. XIV, 1); 12. Natsargora, grave 319, 8 th-7 th cc.BC (Ramishvili A. 2003: 43, pl. II, 963); 13. Anukhva, 8 th-7 th cc.BC (Domanski Y. 1984: 11, pic.3); 14. Tlia, grave 282, 8 th-7 th cc.BC, (Pantskava L. 1988: 70-71; Tekhov 1981: 6, pl. 82, fig. 1); 15. Tlia, grave 414, 8 th c.BC, (Tekhov B. 2002: 43, 185, pl. 87, pic. 1); 16. Narekvavi, grave 53, 7th-6 th cc BC (Apakidze A., Nikolaishvili V., Kipiani G. Sikharulidze A., Giunashvili G., Gavasheli E., Glonti N. and Kapanadze M. 2005: 32, pl. XV, 597); 17. Svaneti, Late Bronze Age (Chartolani Sh. 1977: 50, pl. XXIII-3); 18. Tlia, grave 308, 7th-6 th cc BC (Pantskava L. 1988: 64; Tekhov B. 1981: 6, 22, pl. 87, fig. 1); 19. Kutaisi, 8 th c. BC (Pantskava L. 1988: 71, pl. XIII, 1); 20. Tlia, grave 50, 8 th-7 th cc. BC (Pantskava L. 1988: 80; Tekhov B. 1980: 14, 20, pl. 45, pic. II, fig. 4); 21. Lukhvano, hoard, 8 th-7 th cc. BC (Pantskava L. 1988: 64; Domanski Y. 1984: pic. 2); 22. Etseri, Late Bronze Age (Chartolani Sh. 1977: 51, pl. XXV, 1); 23. Tlia, grave 101, 7 th-6 th cc. BC (Pantskava L. 1988: 64; Tekhov B. 1980: 26-27, pl. 66, fig.1); 24. Mukhurcha, 8 th-7 th cc. BC (Apakidze J. 1991: 73, 116, pl. CXIV, 2).

these animals to the mythical dog-pet ("kursha") well known in Georgian folklore (Virsaladze E. 1964: 72, 97); As for V. Bardavelidze, he considered the majority of "fantastic" animals portrayed on Colchis axes as dogs (Bardavelidze V. 1957: 29-30; 47-53); L. Pantskhava also describes such images as dogs (Pantskhava L. 1988; 27, 48). As we see, the majority of researchers considered the animals engraved on Colchis axes to be dogs. We also share their consideration and distinguish this animal to be a dog; however, we believe that later, for a number of reasons, it took on the appearance of a "fantastic" animal.

The axes with the images of dogs discovered in Georgia mainly come from burial complexes, treasure, and some are accidental acquisitions. All of this material can be divided into two groups, according to the manner of depicting images. Out of them, we unified 44 samples into the 1st group, and 41 into the 2nd. (85 pieces in total, which represents 80% of all analog items discovered in Caucasus).

In the 1st group we placed the graphical images of dogs or their heads, which are always presented in profile. Through modeling a pliable continuous line on a flat surface, a more or less realistic figure is received. Apparently, first the body contour was outlined, and then afterwards it was decorated with different faces (Kakhidze A. and Mamuladze Sh. 1993: 27-34). The dog figures in the 1st group are proportional, they have a relatively static, calm pose and the works are executed in a natural-linear manner (pl. I, fig: 1-23).

We have divided the 1st group images into two sub-groups according to the manner of depicting, out of which the 1st subgroup of group 1 unites the figures of dogs, which have moderately open gullets, pricked up ears, a relatively flexed body and a longish, raised tail at the end. A dog's image comes rarely without a tail, e.g.: from the Surmushi treasure (pl. I, fig. 8), from the Samtavro grave 121 (pl. I, fig. 11), with a triangle-shaped paws turned backward, e.g. Dgvaba, grave 2 (pl. I, fig. 9), from the Natsargora, grave 138 (pl. I, fig. 12), which sometimes resemble fish fin, e.g. Esheri pitcher, grave 4 (pl. I, fig. 3). The animal's eyes are indicated by a small dot e.g. on the accidentally discovered axe from Zakaani (pl. I, fig. 10), or are not indicated at all e.g. in Khikhadziri treasure (pl. I, fig. 1). Dog images are mostly decorated by lines composed of dots (pl. I, fig: 1, 3, 10), e.g. from the Sinatle treasure (pl. I, fig. 7), or by fish finlike ornaments, e.g. Tlia, grave 52 (pl. I, fig. 2), and sometimes – with circles, e.g. Khikhadziri treasure (pl. I, fig. 4), Oni (pl. I, fig. 5). Figures rarely come undecorated, e.g. from Surmushi treasure (pl. I, fig. 8). Together with the image of a dog, displayed images on axe include fish (pl. I, fig: 2, 3, 6), snake (pl. I, fig. 4), bird (pl. I, fig. 8) and deer (pl. I, fig. 19), as well as a graphic image of a human displayed on an axe discovered in Tlia burial ground grave 234 (Tekhov B. 1980: 14, 40, pl. 130, Fig. 2), the majority of axes are joined with a girdle decorated with different geometrical faces, e.g. Khikhadziri treasure (Kakhidze A. and Mamuladze Sh. 1993; 28, 34, pl. VI); Otkhara (Voronov Y. 1969: 19, pl. XXXV, 5); Achandara (Lukin L. 1941: 54-55, Fig. 5; Voronov Y. and Gunba M. 1978: 260, Fig. 3, 2; Trapsh M. 1970: 188, pl. X, 2); Zvandripshi (Trapsh M. 1970: 188, pl. X,3); Abgarkhuki (Voronov Y. and Voznuk A. 1975: 272-273, Fig. 4]; Lailashi treasure (Domanski Y. 1984: Fig. 15); Tlia, grave 63 (Tekhov B. 1981: 9, 10, 12, 13, pl. 59, fig. 1, pl. 66, fig.1).

The dog images in the 1st subgroup of group I are situated on the side surface of the axe (pl. I, fig: 1-12; 15-17), the poll (pl. I, fig: 2, 5, 19, 20, 21), axe-head, e.g. Tlia, grave 101 (Pl. I, fig. 23) and on the sides of the hole on the end-knob (Pl. I, fig. 2). Some axe cheeks display a dog, or a continuous line of joined dog heads over the girdle, e.g. Tsiteli Shukura, grave 94 (Pl. I, fig. 6). Figures of only dogs are displayed on the cheek, the poll and on the both sides of the end-knob hole of an axe discovered in Oni. The body of the same axe, up from the girdle are decorated with a line of joined dog heads (pl. I, fig. 5).

The images of dogs displayed on the poll (pl. I, fig. 21) and the cheek are more static (Pl. I, fig: 2, 5, 19-21), however more flexed figures are displayed by the end-knob hole, which must be stipulated by the rounded shape of the surface behind the image (Pl. I, fig. 19). The image of a dog with two legs on the poll can be provoked by the limited are for decoration, e.g. Okhureshi treasure([Koridze D. 1965: 34, pl. XLIV). A prevailing axe from the Tlia burial ground, grave 50 (p. I, fig. 20), displays a dog with four legs on the poll, however the image covers quite a large surface of the poll, where additional geometrical ornaments are not marked. We also have axes, where two-legged dogs are displayed on
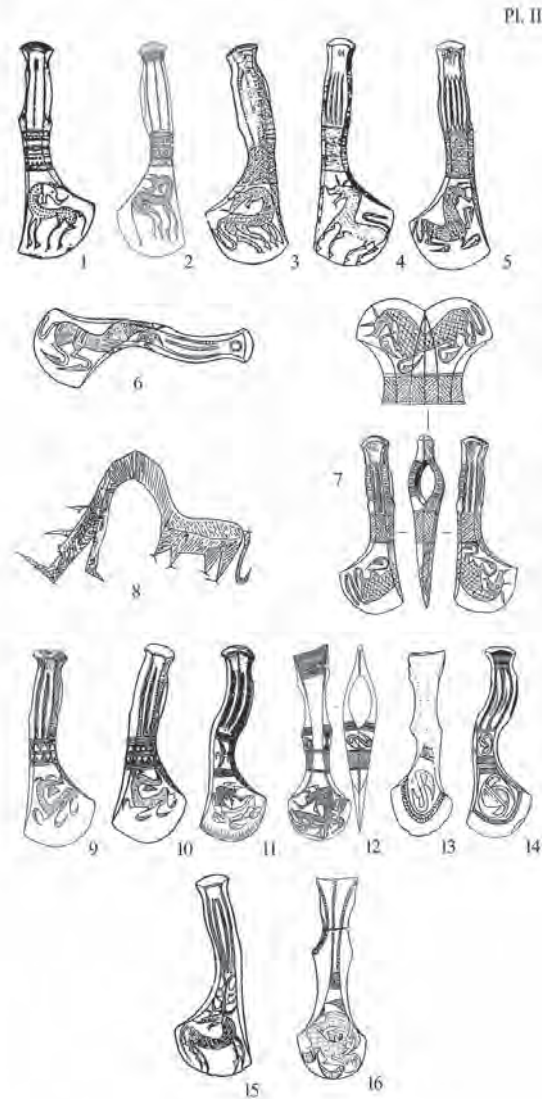
Pl. II – Second group:

1. Mzetamze, 7th-6th cc. BC (Nasidze G. 1990: 2, pl. IV,1); 2. Tskhinvali, hoard, 7 th-6 th cc BC (Pantskava L. 1988: 67; Japaridze Ot. 1950: pic.2c); 3. Tlia, grave 432, 7 th c. BC (Tekhov B. 2002: 50, pl. 104, fig. 1); 4. Tlia, grave 287, 7 th-6 th cc. BC (Pantskava L. 1988: 79; Tekhov B. 1980: 14, 46, pl. 117, fig. 1); 5. Tlia, grave 252, 7 th c. BC (Pantskava L. 1988: 69; Tekhov B. 1981: 14-15, pl. 72, fig. 1); 6. Tlia, grave 161, 7 th c. BC (Pantskava L. 1988: 71; Tekhov B. 1981: 38-39, pl. 111, fig. 1); 7. Tlia, grave 165, 8 th-7 th cc. BC (Pantskava L. 1988: 79; Tekhov B. 1980: 32-33, pl. 84, fig. 1); 8. Mzetamze, grave 4, 8 th-7 th cc BC (Georgien 2001: 347); 9. Tlia, grave 316, 7 th-6 th cc. BC (Tekhov B. 1985: 5, 51, pl. 200, fig. 1); 10. Tlia, grave 127, 7 th-6 th cc. BC (Pantskava L. 1988: 79; Tekhov B. 1981: 35, pl. 105, fig. 1); 11. Tlia, grave 374, 7 th c. BC (Tekhov B. 2002: 186-187, pl. 50, fig. 1); 12. Eshera, 7 th-6 th cc. BC (Voronov Y. and Gunba M. 1978: 163-264, pic. 6, fig. 2); 13. Mekhchistsikhe, hoard, 8th-6th cc. BC (Pantskava L. 1988: 70; Koridze 1965: 37-38, pic. 30, fig. 5); 14. Tskhinvali, hoard, 7 th-6 th cc BC (Pantskava L 1988: 67; Japaridze Ot. 1950: pic.2a); 15. Tsoisi, grave, 8th-6th cc. BC (Pantskava L. 1988: 58, pl. XIX, 3); 16. Khevi, grave, 7th c. BC (Pantskava L. 1988: 70; Koridze 1965, pl. XXXVI).

the cheeks, e.g. Tlia burial ground, grave 414 (pl. 1, fig. 15), however the area for the image is rather reduced due to the geometrical ornamentation.

The 1st group's 1st subgroup unites the dog figures situated on a triangular area framed with ornaments, displayed on the side cheeks of type IV axes acquired from the Tlia burial ground, graves 160 (Tekhov B. 1980: 32, pl. 83, Fig. 1) and 234 (Tekhov B. 1980: 103, Fig. 2). The indicated images are somewhat stylized, however the natural-linear character of the artwork is still preserved. Engraved in the same manner are the two images of facing dogs, which have thin legs and are displayed standing on the decorative triangle arc with heads downward on the cheeks of an axe from Svaneti (pl. I, fig. 17). On the cheek of an axe discovered in the grave 53 in Narekvavi, fifteen dog figures aligned in six lines are displayed on a triangular surface decorated with a twisted spirals, engraved in a naturalistic manner (pl. I, fig. 16).

Images of dogs on certain axes are particularly stylized; however, they preserve the naturalistic characteristics at the same time. We have allocates such images to the 2nd subgroup of group I, e.g. the end-knob and the cheek of an axe from Anukhva are decorated with an image of three dogs, out of which two are facing the poll, and the one displayed on the cheek is facing downward. This axe does not have a girdle (Pl. I, fig. 13). The dog images similarly facing downward displayed on the cheeks of axes from Eshera (Shamba G. 1984: 51, pic.15, fig. 2), Tasrakva (Voronov Y. 1969: 22-23, pl. XXXV, fig. 1) and Primorskoe (Kuftin B. 1949: 139, Fig. 24) are even more stylized. The have an elongated torso and disproportionally large heads. These axes do not have girdles either. Both axes belong to type I.

We have also included into the 2nd subgroup of group I the type IV axes discovered on the Tlia burial ground, on which dog images are displayed in length. Their bodies are decorated with lines (Tekhov B. 2002: 185, pl. 15, fig. 1), twisted spirals (Tekhov B. 1981: 13, pl. 67, fig. 1) and voluminous circles (Pl. I, fig. 14). Some parts of these figures are stylized. The elongated torso is moderately curved, the animal's snout thickened, and the arced paws are fish finlike (Pl. I, fig. 14). The given axes do not have girdles either, however the poll is covered with fish, frog, snake and faces with circles beams.

The image of the dog is always well suited to the form of an axe, what can be well distin-guished on every section of its decorations. In this sense, remarkable is the axe from Eceri, which portrays aligned dog heads along the narrow line of axe's body (Pl. I, fig. 22) and the axe from the Tlia, grave 308, the decorated arc of which portrays a line of joined dog heads facing downward, matching the contour of the cutting edge (pl. I, fig. 18). Similar images can be found on axes from Tlia grave 263 (Tekhov B. 1981: 16-17, pl. 74, fig.1) and Erega 4, grave 2 (Mikeladze T. 1995: pl. 8, fig. 6). The heads of animals in profile are represented with mouths open and ears pricked up and the work is performed naturalistically, however the rhythmical repetition of the arced head-necks is so aggravated, that the aspiration towards ornamental work can be distinguished. According to these characteristics we have unified the items in the 2nd subgroup of group I. Sometimes, the joined dog heads are substituted by geometrical ornaments with similar form and content, e.g. axe from Mukhurcha (pl. I, fig. 24).

The images allocated into group I are generally dated VIII-VII CC. B.C., some of them (pl. I, fig: 6, 9, 16, 18, 23) – VII-VI CC. B.C. and are displayed on type I, II, IV and V axes (view the literature along with the description of plates).

The II group (pl. II, fig: 1-16) unifies dog images, which similar to the group I samples, are performed graphically, in profile, with pricked up ears and a tail lifted at the end, however this time with widely opened mouths, a thickened snout, pointed jaws and limbs. The majority of them have their heads twisted backwards; however the breast-neck and torso are curved inward. A disproportional composure and the deformation of separate body sections or the whole figure is characteristics for these images. The geometricizing and the scheming of the image is present. This process began somewhat later than the images of group I and continued simultaneously with it, however in the final stage it gained superiority, even though by the end of the Colchis graphic art, the naturalistically performed works continued to exist.

A part of these rather stylized images become similar to the images of group I, sometimes due to their pose, or the modeling of different body parts. They more or less preserve the fair proportional and figurative character. We have unified such images of dogs into the 1st subgroup of group II.
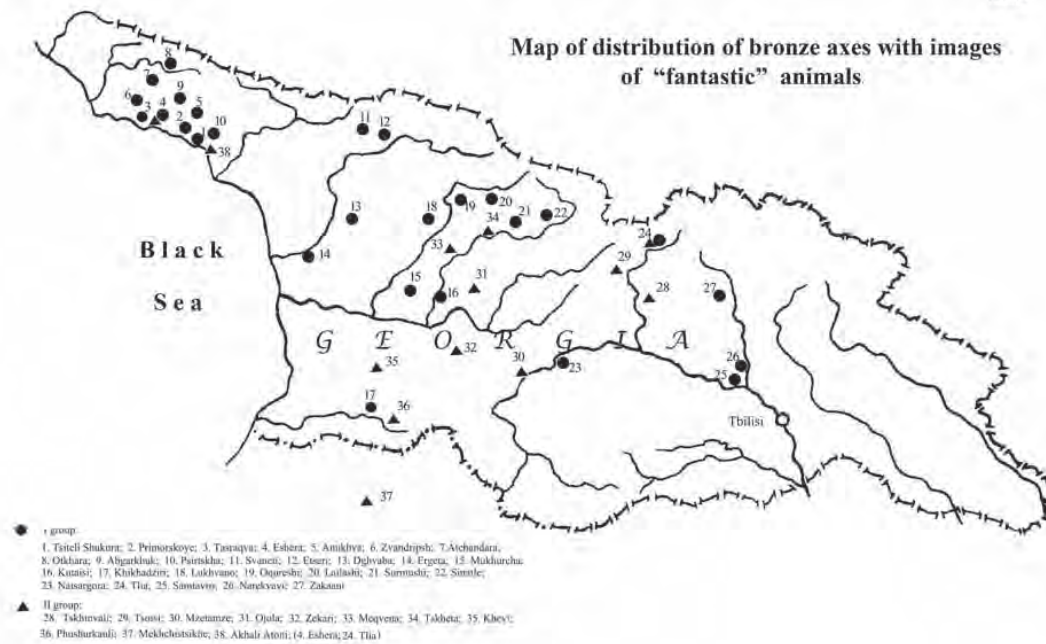
Pl. III – Map of distribution of bronze axes with images of "fantastic" animals.

We have unified the rather stylized images of dogs with widely opened mouths, a simplified pointed snout and ears, engraved on axes from the Tlia burial ground graves 161, 165, 287, 252 according to their general characteristics; however all of them are presented with their heads facing forward. The images of dogs displayed on items from graves 161, 165 (pl. II, fig: 6, 7) have a moderately curved torso and a head, which is proportionate to the body. However the heavily concaved body of the rather stylized dog figure, from grave 252 (pl. II, fig. 5), connects directly with the disproportionally large head, through a curved neck, which gives the composition a shape of S. The arced and turned paws of all three dogs end with pointed claws. The dog image of the grave 287 is rather proportional (pl. II, fig. 4), legs end with triangle-shaped paws, which makes them similar to the Mzetamze and Tlia, grave 432 images (pl. II, fig: 1, 3), and with its tail shape and the net-like decoration of the body, resembling dog images of the Tlia burial ground graves 165 (pl. II, fig. 7) and 432 (pl. II,fig. 3). All axes are of type II, and the ones from grave 161 are of type IV (pl. II, fig. 6).

cal image of a fish (Tekhov B. 1980: 14, 44, pl. 114, fig. 1). The axes are of type II.

We have allocated to the 1st subgroup of group II, the engraved "dog" figure (pl. II, fig. 8) on the type I axe, which is similar to the images mentioned above due to its mouth cut, horn-like pointed aggravations on the lips, and the tail lifted at the back. The rectangular torso of the animal and short triangular legs are displayed on one side of the axe, and the long arched neck and a gigantic head – on the other side. The composition is completely geometricized and is made up of a rectangle, a triangle and an arch, however the image has not turned into a geometrical ornament, since the principle of submitting a particle to the whole is still present, therefore, the figurativeness of the image is preserved.

Other images in the 1st subgroup of group II are displayed in: Ojola treasure (Koridze D. 1965: 38, Fig. 31), Tskheta (Koridze 1965: pic. 62, fig. 2), Tlia, grave 271 (Tekhov B. 1981: 17-18, pl. 77, fig. 1], Zekari [Ivashenko M. 1941: 7-8, Fig. 3 b).

Full stylization of dog images can be seen on Colchis axes, which come from different graves

of the Tlia burial ground. We have allocated these types of images in the 2nd subgroup of group II, e.g. images from the Tlia graves 316, 127 (pl. II, fig: 9, 10). The complete destruction of proportions is characteristic to such images, as well as the scheming and geometricizing of the forms. A short torso is of the form of an arc and with a long arched neck connects to a head turned backward, which also has arched and pointed ears. A thickened snout ends with a bill pointed upward, however the lower jaw is trapeze-shaped. The limbs are thin lines, which end with smaller arcs. The tail is also displayed in the form of a short line, raised at the end. All images are dotted. The axes are of type II. Similar images can be found on axes from Tlia graves 49, 130 (Tekhov B. 1981: 30, 31, 35, 36, pl. 97, fig 1, pl. 106, fig. 1) and graves 121, 129 (Tekhov B. 1985: 17, 18, 20, pl. 128, fig. 1; pl. 131, fig. 1).

The stylization of dog images reaches its culmination in the figures displayed on Colchis axes, which are almost completely arched and leave the impression of infinitely turning circles at the first glance (pl. II, fig: 11, 12, 16). We have allocated them into the 3rd subgroup of group II. The maximal geometricizing and ornamentation of the form is evident: e.g. the images on the axes from Pushrukauli (Kakhidze A. and Mamuladze Sh. 1993: 37-38, pl. IX) and Eshera (pl. II, fig. 12) burial ground coming from Khevi treasure (pl. II, fig. 12) have no characteristics of a dog left, and look more like geometrical ornaments. All axes are of type I, only one axe coming from the Tskinvali treasure (Japaridze Ot. 1950: 101-106, Fig. 2 b) is of type II and one more axe from the Tlia burial ground, grave 374 (pl. II, 11) is of type IV. Similar images are displayed on axes from Tlia grave 51 (Tekhov B. 1981: 7-8, pl. 53, fig. 2); grave 69 (Tekhov B. 1985: 5, 10, pl. 109, fig. 1); graves 362/1, 425, 462 (Tekhov B. 2002: 22, 192-193, 47, 61, pl. 32, fig. 1; pl. 100, fig. 1; pl. 127, fig. 6); from Akhali Atoni (Lukin A. 1941: 43, pl. VII, fig. 5).

We have allocated the geometrical-symbolic sign of a dog or a "fantastic" animal into the 4th subgroup of group II, which is twisted in the shape of eight, has two joined, pointed paws, which depict the conditionally marked animal, e.g. the image from Mekhchistsike treasure (pl. II, fig. 13). By reducing the whole composition to a single detail, the received symbolic image of an animal at the same time represents a geometrical ornamentation. We come across such geometrical-symbolic ornaments on the girdle of an axe (Tekhov B. 2002; 48-49, 187, pl. 102, fig. 1) or under the hole of the end-knob (pl. II, fig. 12). Similar images are displayed on axes in Tlia, graves 297 (Tekhov B. 1981: 48-49, pl.133, fig. 1), 76 (Pantskhava L. 1988: 67, pl. XV, fig. 2) and 417 (Tekhov B. 2002; 44, pl. 90, fig. 1). This symbolic sign can be only displayed on the cheek of the axe, e.g. Tlia grave 452 (Tekhov B. 2002; 57, pl. 123, fig. 1) or the cheek and the axe handle at the same time, e.g. there is such an axe from the Tskinvali treasure (pl. II, fig. 14). Two samples of similar axes come from Tlia, the cheeks of which are undecorated, however the mentioned symbolic sign is displayed on the handle, grave 391 (Tekhov B. 2002: 34, pl. 65, fig. 1) or situated under the hole on the end-knob, grave 345 (Tekhov B. 2002: 14, pl. 12, fig. 1). We come across symbolic signs on type I, II and IV axes.

Most dog images included in group II are dated VII-VI CC. B.C. and half of them are displayed on type I, II and IV axes and dated VIII-VII CC. B.C.

One part of the images displayed on Colchis axes is particularly remarkable. Extremely significant is the Tsoisi treasure axe (pl. II, fig. 15), on the cheek of which we come across branched out horns, however if observe closely, we'll find out that without horns, the animal is practically a dog (Pantskhava L. 1988: 43), it has a curved body typical of a dog, a head turned backward, a widely open mouth and pricked up triangular ears, bent forward, with which a deer is never portrayed. In the place of the second ear, deer horns are placed. Even more interesting is the fact that the animal has a long, slightly arched and straight-ended tail, typical of a horse, so atypical of a dog and a deer. In our opinion, in this case we are dealing with a synthesis of an image; where a unification of all three animals is represent (a dog, a deer, a horse).

On a certain development stage of the society, holy animals with similar functions like a dog, a deer and a horse are unified in one object. The image of the dog displayed on the axe from the Tsoisi treasure, as a creature connected to all three parts of cosmos, combines the characteristics of a horse and a deer, also connected to all three parts of cosmos, as a result we receive a syncretic animal object, which with its form, as well as its content already represents a "fantas-

tic"animal. However, this tendency which moved from particular objects to syncretic does not end here. For example an extremely stylized and geometricized animal is displayed on the axe from the Khevi treasure. The object is a combination of almost all animals - birds and fish connected to the beliefs and imagination of the people (pl. II, fig. 16). The animal displayed on the cheek of the axe has a widely open mouth and pricked up triangular ears, fish-like fin and bird-like claws. The torso is decorated with a rhombus pattern net; however the one single hoofed foot is typical of horse. The same figure is transmitted through the unity of geometrical figures (arc, triangle, rectangle, circle), which makes up an abstract image of a polymorphic creature, which more looks like a geometrical ornament, rather than an animal. Apparently, the unified depicting of all three parts of cosmos animals, which implied the combination of characteristic signs of each one of them into a single figure, resulted in turning the image into a hybrid or "fantastic" animal, and heavy stylization and maximal geometricizing of the form turned out to be the most practical and expressive way to achieve this.

The main characteristics of Colchis axes decoration style of the wide mastery of iron and the late bronze-iron age, is the combined graphical display of animals (in this case a dog and a "fantasic" animal) and geometrical images. Dog images are always given in profile, with mouths open, ears pricked up and the end of the tail twisted upward. Geometrical images engraved in the same graphical style serve as the background for majority of these images, which adds decorative character to the image.

Regardless of the diversity and variety of the dogs and "fantastic" dogs unified in groups I and II, in this case we deal with a unified style of artistic thinking. Such representations with common stylistic signs make up one big and complete artistic group and never cross the boundaries of this single style.

The differences between the dog images in group I and II were caused not by the development and change of the style, but the work manner throughout time, which shifted from the naturalistic approach to the schematic stylization, from realistic images to abstract, surreal figures, from flexed forms to complete geometricizing, and

from decorative - to ornamental character. Images portraying particular forms and content turned into syncretic and polymorphic figures, as a result of which, once a dog image acquired the image of a "fantastic" animal.

Such is the typology development of the "fantastic" animal in Georgia.

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REZIME

TIPOLOGIJA UGRAVIRANIH PREDSTAVA "FANTASTIČNIH" ŽIVOTINJA NA KOLHIDSKIM SEKIRAMA

Ključne reči: kolhidske sekire, kolhidsko-kobanska bronza, fantastična životinja.

Jedan od važnih elemenata u dekoraciji kolhidske bronze je prikaz psa ili fantastičnih životinja. Ugravirane predstave psa na kolhidskim sekirama pronađenim u Gruziji mogu se podeliti u dve grupe. Prvu grupu čine primerci koji su rađeni više naturalistički, linearnim načinom. Druga grupa nalaza je rađena vrlo stilizovano i šematski. Ukrašene sekire sadrže najčešće predstave psa i geometrijske motive. Psi su predstavljeni u profilu, sa otvorenim čeljustima i podignutim ušima i repom. Uprkos izvesnim varijacijama sve ove predstave formiraju stilsku grupu sa specifičnim karakteristikama.

Promene u načinu prikazivanja psa dovele su tokom vremena do formiranja novog stila koji je u prikazivanju išao od naturalističkog ka šematizaciji, od realističkog ka geometrijskom, od dekorativnog ka ornamentalnom. Prikazi konkretnih oblika su zamenjeni polimorfnim figurama, a predstava psa je transformisana u fantastičnu životinju.

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ARCHAEOLOGICAL RESEARCHES AND ARCHAEOLOGICAL EXHIBITIONS IMPLEMENTED BY THE NATIONAL MUSEUM KRUŠEVAC BETWEEN 2009 AND 2012

ABSTRACT

Within 2009-2012 Kruševac National Museum has organized research on five sites and organized eight archeological exhibitions (by authors and guests). Initiative activities for commencement of construction works on the reconstruction of he central building of Kruševac National Museum in Lazar's Town during 2010 included protective archeological researches of the close Museum building surrounding. During the research the layers dating from neolith to late Middle age were found. Not even this time, the researchers of Lazar's Town were able to note layers belonging to the ancient period. Multi discipline research of Mojsinje-Poslon Mountains involved systematic research on three localities-Ukosa and Kućiste in Grad Stalać, Municipality of Ćićevac (2009, 2010 and 2011) and Branik in Dedina near Kruševac (2010 and 2011). On the site of Ukosa the remains of Early Byzantium highland fortress from the 6th century were found together with the layers dating from prehistoric and antique period and horizons from the 10th and 11th century AD. The Existence of the Neolithic settlement was proved on the Branik locality. Researches on these three sites are to continue in 2012. Archeological research on the locality Bedem in the village of Maskare, Municipality of Varvarin, three campaigns took place within 2009-2011. The remains of Early Byzantium lowland fortress from the 6th century were brought to the light wherefrom the foundation of the monumental basilica remains were defined. Prehistoric layers have been determined on the researched site. The researches realized within the project supported by the Ministry of Culture will be continued in 2012.

In the period from 2009 to 2012, the National Museum Kruševac implemented archaeological researches on five localities and organized eight archaeological exhibitions (by authors and hosted). The archaeological researches were implemented under the projects supported by the Ministry of Culture of the Republic of Serbia.

The archaeological researches were performed on the localities of Lazar's town in Kruševac, Ukosa and Kućiste in Grad Stalać, Bedem in Maskare and Branik in Dedina.

The campaign of the archaeological researches on Lazar's town was implemented in 2010, as part of the preparatory work for the implementation of the project of reconstruction and renovation of the main building of the National Museum Kruševac. These reasons have caused the excavation to be directed to the location in the immediate vicinity of the Museum

building. The researches were performed within the project supported by the Ministry of Culture.

Before the large campaign of the archaeological researches of Lazar's town in Kruševac, which was conducted during the seventh decade of the 20th century, the only known elements of the former Serbian capital were the Lazarica church and the remains of the Donjon tower (Keep), with the traces of town wall (Ковачевић 1980: 13 – 28). An architect Aleksandar Deroko had tried to reconstruct the appearance of the medieval fortress, but due to the scarcity of data, he only managed to take an attempt of the Donjon tower (Keep) reconstruction (Дероко 1950: 122).

The archaeological researches have provided an overview of the capital city of the Serbian prince, the definition of the town wall direction and the ascertainment of the existence of forty buildings within it. A movable archeological material provided an insight into everyday life of Prince Lazar's courtiers, through records of ceramics, jewelry, glass, craft tools, tools and weapons.

Fig. 1 Part of the hoard of the Roman coins from Ukosa (photo: Dušan Rašković)

The excavations showed that the locality had been populated for the first time in the Neolithic period. That the continuity of populating was rarely interrupted is confirmed with the records from the Bronze and the Iron Age, remains from the Antique and the Early Byzantine period, whereas there are strong indications of the existence of the medieval settlement, older than the large construction project by Prince Lazar.

Fig. 2 Ukosa – record of a pitcher (photo: Dušan Rašković)

Fig. 3 Ukosa – part of the town wall (photo: Dušan Rašković)

The Prince Lazar's capital city was built on slightly elevated river terrace, about two kilometres distant from the West Morava and one kilometre from the Rasina. Along the town wall there was a Kožetin stream running, allowing the water supply in case of siege.

It catches one's eye that the city was not built on strategically dominant and protected place, so that it is obvious that the military-strategical reasons were not the prevalent one on the location choice, which is a novice for the Serbian medieval towns, for whose locations hardly reachable places were usually chosen.

It becomes clear that the place characterized by some other conveniences was chosen as the location for the new capital. An overview of the road

Fig. 4 Kućiste – skeletal grave of a female individual
(photo: Dušan Rašković)

Fig. 5 Ukosa – discovery of skeletal grave
(photo: Dušan Rašković)

Fig. 6 Basilica in Maskare (photo: Marin Bugar)

network and positions of the other medieval towns and church centres in the late 14th century show that this place was a significant intersection of medieval roads (Бошковић 1980: 9, fig. 1).

Everything indicates that the capital of Moravian Serbia was meant to be economical and cultural centre, built on a place that was busy, but at the same time slightly drawn inside and additionally protected, by defensive walls of the medieval Stalać, from the Constantinople Road, being an important, but still endangered communication.

There were the two construction phases of building Lazar's town determined. First, the Small town was fortified with the walls made of pebbles, protected with the ditch and the Donjon tower (Keep). Then, with the town walls made of crushed stone, an entire plateau was protected and the fortification was formed, oriented towards northwest – southeast, the approximate dimensions being 300 x 200 metres

Thus, a space which can be divided into two units was determined. The Small and the Big town. The Small town, meant to be the last line of defense of the entire fortification, was located in the northeastern, the lowest part of the complex and covered the space of not more than 1600 m^2 (Миладиновић 2006: 2 - 3).

The town walls of the Big town had shallow foundations (to 25 cm deep) and an average width of about two metres. Those walls were fortified with the towers, built on a mutual distance of 35 - 50 metres. In front of two towers were found the remains of the outer protective walls, having the same direction as the towers, with which they were not joint.

It can be assumed that these are the town's double walls remains, recorded in the description of Kruševac from the 15th century by the French travel writer Bertrandon de la Broquiere. The travel writer, speaking of Kruševac, states: „And that borough is very small and very well fortified with the double wall, which is torn down at its top where the crenels are, and there was another very small town, which is now ruined"(Broquiere (Брокијер) 1950: 127).

In the centre of the Big town was built the Church of St Stephen – the Lazarica Church, an endowment of Prince Lazar. Although not of big dimensions, Lazarica is significant as a church building in which all the elements of the Moravian architecture are united. Not far from the Lazarica Church, on the highest point of the plateau, are the remains of a group of the profane buildings, among which are distinguishing the objects identified in literature as the palace and the horse stable.

The southern and the eastern part of the medieval fortification have remained largely unexplored, due to the exploration being unable because of the existence of contemporary buildings. Probes opened on this part of the town have shown the existence of the town wall on a presumed route and a part of the defensive tower (Ковачевић 1980: 34).

The buildings built within the fortification were not organically joint with town walls, but stood alone in this space, which is another indicator of the new time which, in spite of the constant positions to relate it to the famous epoch of the Nemanjić dynasty, presents the first act of the last drama of the Serbian Middle Ages, known as Moravian Serbia.

The campaign of the archaeological researches on Lazar's town was implemented in 2010, as part of the preparatory work for the

Fig. 7 Lazar's town – part of the horse skeleton (photo: Ljubiša Vasiljević)

implementation of the project of reconstruction and renovation of the main building of the National Museum Kruševac. These reasons have caused the excavation to be directed to the location in the immediate vicinity of the Museum building. The researches were performed within the project supported by the Ministry of Culture. The research coordinator was Ljubiša Vasiljević, while the expert team consisted of Sanja Rutić, Dušan Rašković, Nataša Miladinović and Milan Trifunović.

The continuity of populating in the prehistoric period, from the Starčevo culture, was confirmed during the research through the records from the Copper, the Bronze and the Iron Age. Not any remains or records from the Antique or the Early Byzantine period were found on the explored place. The existence of smaller buildings from the 14th century, as well as of the layers timely placed into the 15th and the 16th century was confirmed.

The attention is drawn by the unusual records of the three horse skeletons, carefully laid on the exact distance of five metres between each other. A movable archeological material, discovered in the vicinity of the skeletons, is dated in the 15th and the 16th century. The most characteristi-

cal are the records of the stone cannonballs and the large pieces of metal castings. Records of the larger pieces of metal could present the remains of the activities related to the cannon casting, which is the typical procedure for the time period in question. This record is surely in relation to a certain historical event related to the area of Kruševac (Васиљевић, Рутић 2013: 68 – 69).

The researches on Lazar's town have been continued in 2012 and are still ongoing.

As a part of the multidisciplinary research on Mojsinje and Poslon mountains by the National Museum Kruševac during archeological campaigns between 2009 and 2012, researches have been directed to the localities of Ukosa and Kućiste in Grad Stalać, in the municipality of Ćićevac. The localities are situated in the southern part of Grad Stalać, immediately above the local road Grad Stalać – Stevanac, that means above the left bank of the South Morava. The research coordinator was Dušan Raškovic, while the expert team consisted of Sanja Rutić, Ljubiša Vasiljević, Nataša Miladinović and Milan Trifunović.

Ukosa is a multilayer locality which had been populated for the first time in the period of the Early Iron Age and was being used until the

Fig. 8 Lazar's town – semicircular construction made of stone (photo: Sanja Rutić)

Roman conquest of the area, at the beginning of the New Era. In the 4th century, the strategic benefits of Ukosa were re-used, what is evidenced with the records of the Roman bronze coins. The wave of renovation of fortifications in the Balkans, during the reign of Justinian (525 – 565), did not bypass even Ukosa, what is evidenced with the discovered remains of the town wall and the movable archaeological material dating from the Early Byzantine period, when the fortification had had the most significant role.

One of the most significant records from the localities which were known before the beginning of the systematic archaeological researches, is the Langobardian „S" fibula, a unique record on the territory of Serbia. The fibula suggests the

Fig. 9 Locality Branik in Dedina (photo: Ljubiša Vasiljević)

Fig. 10 Exhibition detail „Neolithic settlement at Stragare" (photo: Ljubiša Vasiljević)

possibility that the fortification crew consisted of Langobards in the 6th century.

Through the archaeological researches, the discovered were the parts of the town walls, the preserved height of 1.10 m. The wall's width was not ascertained. The town wall had been built using the larger pieces of the rough stone, joint with mortar. The wall line follows the configuration of the hilly terrain. The length of the fortification is almost 300 m, while the width dimensions vary between 80 and 100 m. An area of the fortification is a natural cascade divided into four plateaus (Рашковић 2002: 51).

In the middle part of the fortification the four caves were discovered, dug under the rock surface. The caves had primarily had the function of the food storage. Numerous records of amphorae in the very caves and their immediate surrounding are the evidence that this place had been a space for storing the food. It is certain that, at some point, this space had lost this purpose and, as it is usually the case, it began to be used as a place for the disposal of unnecessary things, which enabled for the numerous objects to wait until they are reached by the archaeologist's spatula.

The most attractive record from the campaign in 2011 is the hoard of coins. There were 115 coins found, mostly in small denominations, dated in the second half of the 4th century. There was also found a large number of coins dated in the 6th century.

One of the so-called trap holes is particularly characteristical for the material found in it. Ceramics from this hole indicates the continuation of life in the fortification after the 8th century and indicates the presence of Slavs in the fortification. During the period from the 9th to the 11th century, the Balkans were the battlefield for Serbia, Bulgaria and Byzantium, and the fortifications on the river Morava had to regain their significance. The discoveries made during the researches performed in 2012 could also be in relation with these records. Ceramics and the metal records discovered on that occasion are determined to belong to the period of 9th-10th century and can be related to the period of Bulgarian domination over this area (Рашковић 2011: 7 - 8).

An anthropological analysis of the skeletons found on Kućiste showed that the decomposed remains of a female individual about 25 years old had been found in the grave. The relative height of this individual was 163 - 170 cm. With a high certainty,

it could be claimed that this person had suffered from bone tuberculosis in her life, but whether this disease was the direct cause of death can not be confirmed with certainty (Цомба 2011: 281 – 283).

The archaeological locality Bedem extends at the periphery part of the village Maskare, on about 15 kilometres northern from Kruševac and opposite of the medieval town Stalać. It is situated a few hundred metres from where the West Morava meanders in the great arc and near to the confluence of the West Morava and the South Morava. The large early Byzantine fortification from the 6th century was discovered on this place. The dimensions of the fortification are 130 x 130 metres.

The locality Bedem in the village Maskare was explored during the four campaigns conducted from 2009 to 2012. It is an Early Byzantine fortification which had controlled the place where the two rivers, the South Morava and the West Morava, meet and together form the Great Morava. Fortifications of this type had controlled roads that were leading down the river valleys. The Turkish Moravian river fleet was based on this place in the 15th and the 16th century.

It is for these reasons that one of the most significant fortifications of the medieval Serbia had been built in Grad Stalać, which lies exactly opposite the Bedem, on the opposite bank of the West Morava. It should be emphasized here, that near to the Grad Stalać there is a locality Ukosa, contemporaneous with Bedem, with which it had probably formed the control system. With the locality Ukosa we have already met in this article. The locality Bedem had drawn attention of the explorers even in the late 19th century.

The first to write about Bedem was S. Braljinac, who noted that „The ruins are lying on a plateau above the Morava and the sides are forming a square, whose every side is about 100 m. The thickness of the surrounding walls is more than one metre. Except the walls forming the said square, there are some more squares inside, and some of them are with the rounded corners. Beside this there are some driven channels which seem to lead to the deepness. The bricks are mixed, the small and the big ones. The small ones are common, like ours today, and the big ones are 35 long, 29 wide, and 4 cm thick. Of

the things, they told me that a few years before, there had been found a piece of one iron tripod (sadžak) and a piece of sabre, and of the money, one gold coin 10 years before and one bronze coin, which, they said, had been sent to Belgrade" (Браљинац 1890: 57).

The locality has also been visited by M. Riznić, one of the Serbian archaeology pioneers. Riznić states that the dimensions of the fortification are 156 x 132 m, and that the fortification was built of stone and bricks, with twelve projecting towers of 18 m of the distance between each other, the walls thickness of 1.25 m. Dimensions of the bricks, which were recorded by Riznić, are identical to the dimensions specified in Braljinac's writings (Ризнић 1891: 71 - 91).

In his anthropogeographical study on Temnić, issued in 1905, S. Mijatović states the following about the fortification in Maskare: „The town was excavated 15 years ago. Today it is highly ruined, and later the same was scattered through the village for the houses raising" (Мијатовић 1905: 344)

Before the beginning of the systematic archaeological researches, the archaeologists of the museum of Kruševac were repeatedly conducting the field survey, where they found tegulae, bricks and fragments of ceramics. The particularly characteristical are the records of the bricks with the decorations shaped as smaller crosses. There were the tales of the locals recorded that the skeleton graves had been found in the eastern part of the fortification. According to D. Rašković and N. Đokić, these graves originate from the Middle Ages (Рашковић, Ђокић 1997: 137).

The National Museum Kruševac, with shorter interruptions, has been conducting the systematic archaeological researches of the locality Bedem since year 2001. Starting from 2010, the researches were conducted within the project supported by the Ministry of Culture, in cooperation with the Institute of Archeology in Belgrade. During the period covered with this work, the archaeological researches of the locality Bedem were coordinated by Vujadin Ivanišević on behalf of the Archaeological Institute, and Marin Bugar on behalf of the National Museum Kruševac. Members of the expert team were Nataša Miladinović and Gordana Čađenović.

The first results of the archaeological excavations show that this is a multi-layer locality. Besides the Byzantine material, there was also found a material form the prehistoric period from the Eneolithic (Baden cultural group), Middle Bronze Age (Vatin cultural group), the Early Iron Age – Iron Age I (Brnjica cultural group) and the Late Iron Age (Чађеновић 2011: 40).

It was determined that the real dimensions of the Early Byzantine fortification are 130 x 130 metres. The locality belongs to the rare type of the Early Byzantine fortifications built in the lowland, because in those troubled times the most often chosen locations were on naturally protected elevations. Relatively shallow cultural layer indicates that it was not for long in function. Absence of traces of fire, as well as the small number of movable archaeological records, indicate that the fortification had been left at some moment not preceded by the military conflict in the immediate surrounding.

Within the fortification, the particularly outstanding is the record of the triple-naved basilica whose dimensions, length and width, exceed 23 metres, making it one of the most monumental on the territory of the entire Serbia. (Бугар 2012: 5 – 6).

Of the movable archaeological records from the Early Byzantine period, the significant are the records of ceramics, arrowheads, tools, knives, wedges and money (the half folles of Justin II).

That this space has also served as a temporary refuge in the following centuries evidences a record of the residential building, area of about 25 square metres, within which there was a pearlike furnace with brick paving. The residential building is dated in the 10th century. (Бугар 2012: 5 – 6).

A prehistoric locality Branik in Dedina was registered in 1997. The surface records has already indicated the possibility that on this place had been a kind of „workshop" for manufacturing of the stone tools in the Neolithic period (Рашковић 2000: 15). It is situated 3 kilometres northeastern from Kruševac and 3.5 kilometres southeastern from the mouth of the Rasina into the West Morava.

The locality is situated on the gentle slope descending down the Mojsinje mountains towards the alluvial plains of the Rasina and the West Morava. Archaeological researches of the localities were performed in 2011 within the implementation of the Project of multidisciplinary researches of Mojsinje – Poslon complex. The researches have shown that the locality had been populated in the Neolithic period, which means the period of Starčevo culture. The researches were coordinated by Milan Trifunović and Gordana Čađenović.

The finding site is specific for its location and the surface area. Its dimensions are considerably less than those of the similar localities and are about 50 x 50 metres. It is located far from any greater watercourses and wellsprings, without natural protection, which did not make ideal conditions for Neolithic settlement forming.

The discovered movable archeological material also differs from other contemporaneous finding sites by the representation of the records. The most common are the records of flint tools and tools made of polished stone. On the very surface of the terrain, grouped on relatively small area, there is a high concentration of the flint material, presented not only in the finished products (blades, microliths, small knives, scrapers...), but also in the intermediate products, refuse, as well as in the flint cores on which there are traces of the partial exploitation. The very frequent are also the records of the supporting tools used for making flint tools. These are the polished chisels, tongue-as-blade axes and mauls – striker with the circular section. The very significant characteristic for defining the finding site purpose in the Neolithic period is the very weak presence of ceramics records. The ceramics found belongs to the Starčevo culture. (Чађеновић, Трифуновић 2012: 5).

The presence of a small number of ceramics fragments is a confirmation of the hypothesis that the locality Branik is not an example of a classical Neolithic settlement, but that the role of this place was primarily that of a workshop, which means that it was a centre intended for the manufacturing of flint and stone tools.

In the exhibition space of the Small showroom of the House of the Simic family the follow-

ing exhibitions were opened: „Neolithic settlement at Stragari" (from the Museum collection of the National University Trstenik) (author: Ljubiša Vasiljević, expert assistant: Sanja Rutić), „Antique Horreum Margi" – in cooperation with the Museum Horreum Margi – Ravno from Ćuprija (authors: Ljubiša Vasiljević, Danica Milošević Jović, expert assistant: Sanja Rutić) „The Cult of Mithras in the confluence zone of three Moravas" (authors: Dušan Rašković, Ljubiša Vasiljević), „Zindan – Roman settlement Praesidium Pompei" – in cooperation with the Heritage Museum Aleksinac (authors: Dušan Rasković and Aleksandar Nikezić) and „Jerina's town near Trstenik" – in cooperation with the Institute for Protection of Cultural Monuments Kraljevo and the Association of citizens Jerina's town (realization of the exhibition: Marija Marić, Ljubiša Vasiljević, Sanja Rutić and Vojkan Milovanović).

Within exhibitions „Brothers Music" (author: Ljubiša Vasiljević) and „Battle of Kosovo" (author: Sanja Rutić) organized as a part of Vidovdan celebrations, the archaeological material was also displayed, as an illustration of the epoch presented in the exhibition.

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REZIME

ARHEOLOŠKA ISTRAŽIVANJA I ARHEOLOŠKE IZLOŽBE REALIZOVANE OD STRANE NARODNOG MUZEJA KRUŠEVAC U PERIODU OD 2009-2012. GODINE

Ključne reči: Arheološka istraživanja, arheološke izložbe, Narodni muzej Kruševac, Ukosa i Kućište – Grad Stalać, Lazarev grad – Kruševac, Bedem, Branik.

U periodu od 2009-2012. godine Narodni muzej Kruševac realizovao je arheološka istraživanja pet lokaliteta i priredio osam autorskih arheoloških izložbi. Arheološka istraživanja izvedena su u okviru projekata podržanih od strane Ministarstva kulture Republike Srbije. Pripremni radovi pred realizaciju projekta rekonstrukcije i adaptacije centralne zgrade Narodnog muzeja Kruševac u Lazarevom gradu, tokom 2010. godine, uključivala su i arheološka istraživanja neposrednog okruženja zgrade. Iskopavanja su pokazala postojanje kulturnih slojeva od starijeg neolita do poznog srednjeg veka. Nisu pronađeni slojevi iz antičkog perioda. U okviru Projekta multidisciplinarnih istraživanja Mojsinjsko – poslonskog kompleksa, arheološki su istražena tri lokaliteta – Ukosa i Kućište u Grad Stalaću, Opština Ćićevac (2009, 2010 i 2011 godine) i Branik u Dedini, Grad Kruševac (2010 i 2011. godine). Na lokalitetu Ukosa su, pored nalaza vezanih za značajno ranovizantijskog utvrđenja iz VI veka, otkriveni tragovi naseljavanja iz starijeg gvozdenog doba i latena, antički nalazi i horizonti iz X – XI veka nove ere. Neolitsko naselje starčevačke kulture iskopavano je na lokalitetu Branik. Arheološka istraživanja lokaliteta Bedem u Maskaru, Opština Varvarin, na svetlo dana iznela su ostatke nizijskog utvrđenja iz VI veka sa ranohrišćanskom bazilikom, kao i slojeve iz eneolita, bronzanog doba, starijeg gvozdenog doba i latena.

Tokom pomenutog vremenskog okvira, Narodni muzej Kruševac priredio je osam autorskih arheoloških izložbi, organizovao gostovanje izložbe iz fondova Muzeja Grada Beograda, dok

su, u okviru istorijske izložbe „Kosovska bitka“, izlagani i arheološki nalazi kao ilustracija i sve-dočanstvo opisane epohe.

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VIMINACIUM – EXPERIENCES WITH HUMAN OSTEOLOGICAL MATERIAL*

ABSTRACT

When the Viminacium research is regarded from the aspect of biophysical anthropology, we consider that four different phases can be identified. The first one possesses an introductory character and includes the period from 1882 until the 1970's. The second phase is featured not only with huge archaeological, but also anthropological investigations, revealing over several thousand skeletons in the period from 1978 until the end of the 20th century. The third phase is of a preparatory-transitional character. It can be said that it lasted a bit longer than the first decade of the 21st century. Apart from great innovations, another one thousand skeletons were also revealed. The fourth phase includes huge and complex investigations which started in 2013 and are still in progress.

KEYWORDS: Viminacium, necropolis, osteological material.

INTRODUCTION

It is a well-known fact that during the last half century, the biggest and longest excavations in the Balkans have been taking place in *Viminacium*. This is not only related to the Roman period. The time of research and the amount of osteological material certainly brought with it certain experiences with the educating of staff, depositing sensitive osteological material, as well as presenting and publishing expert and scientific results.

Since this paper is dealing with biophysical anthropology, we will write about the period from 1882 until 2013. This is a period of more than one century, so it would be necessary to, at least, report on the anthropological experiences in a separate paper, which didn't only occur during the early phase of research (in the classical sense of this science). During the entire research of *Viminacium*, human skeletons were treated professionally, but there were certain problems which should be described. There will be an attempt to overview and explain all of this in this paper, in order to gain a better documentation of the research and also the importance of *Viminacium*[1].

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1 Anthropological analyse of the material from cemeteries not included in this paper is in process and they will be published in a separate publication.
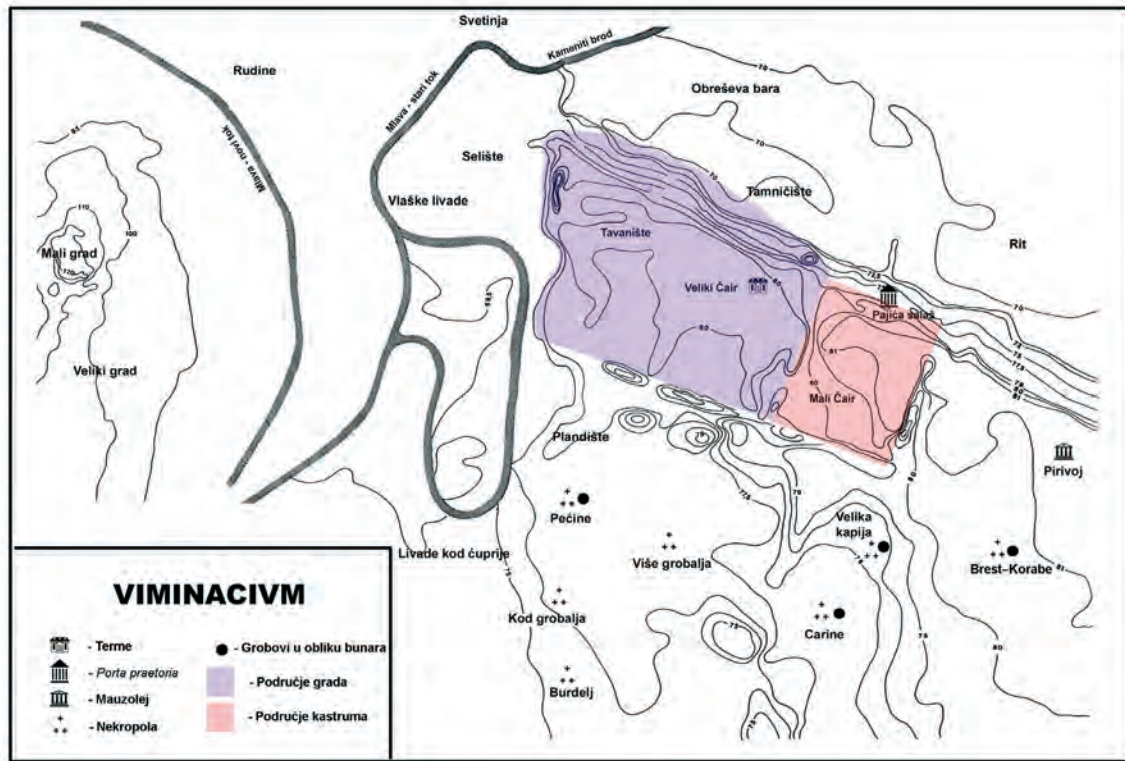
Fig. 1 Excavated necropolis of Viminacium.

RESEARCH PHASES

THE FIRST PHASE

The oldest written data about the *Viminacium* cemeteries dates back to 1882. Back then, M. Valtrović published that to the south of the "settlement" there is a big cemetery which reaches the right Mlava bank. He performed sondage excavations on a smaller scale in the part of the cemetery with skeletal burials (Valtrović 1884: 3-14). He concluded that "plunderers" from the village of Kostol had already excavated a huge number of graves. Many skeletons were destroyed and they found different kinds of jewellery. He concluded that it was mostly the inhabitants of Kostolac who excavated the graves and that they would continue doing so until they are forbidden to do it.

M. Valtrović reports that he "excavated 27 graves". In each of 23 of them, he found one or two skeletons of adults, while in four of them there were infant skeletons. With two exceptions, the rest of them were already excavated by plunderers. It is considered that the graves were already devastated, since there were visible marks of them above the ground, and it was known that Roman graves were sources of many valuables (Valtrović 1884: 10).

In 1902 and 1903, M. Vasić excavated *Viminacium*. He published his results in 1903 and 1904. In his first report to the Serbian Royal Academy of Sciences, he does not mention graves, nor skeletons (Vasić, 1903: 3-14). However, in his next report about the excavation in 1903 (Vasić, 1904: 249-259), there is information that he investigated around seventy graves. He concluded that none was older than the 2nd century AD, as well as that all the rest of them were "plundered". There is no other data about skeletons from these graves (Vasić, 1904: 248).

It is clear that this early research phase of *Viminacium* can, in its anthropological sense, also be called the introductory phase. The research-archaeologists mention cemeteries and name them according to their position (south of the settlement, east of the settlement etc.). Apart from that, only inhumations are mentioned.

If we would like to add something to this phase of anthropological research of *Viminacium*,

then it would be the fact that, in three research campaigns, around one hundred skeletons were excavated, but were subsequently lost, not only in literature, but also literally (while archaeological finds were transported to Belgrade).

THE SECOND PHASE

The second research phase of *Viminacium* began during the 1970's, with huge excavations of cemeteries when the thermo power-plant Drmno was expanded. According to the Law for Protecting Cultural Monuments, the thermo power-plant also financed the excavation. From the archaeological point of view, the locations which were excavated were named according to the actual cadastre, since they were basically agricultural fields. After that, since it was clear that the chronological span was broader than one millennium, graves were given specific marks (next to the current number). More specifically, Roman inhumation graves were marked G, while cremations were marked G1. Graves from the period of the Great Migration were marked as G2. Chronologically younger graves were marked as G4. It should be underlined that during the anthropological investigation, the same marks were used, clearly understandable from the methodological point of view.

By looking at the archaeological, as well as anthropological documentation, we see that the excavations of *Viminacium* cemeteries began in 1978 at the site called Pećine (according to the cadastre) and continued until 1990. In that period, the first grave was discovered, as well as the skeleton 11. In May 1978, the necessary anthropological analysis was performed.

During the same year, an archaeological excavation was also performed at the Više Grobalja necropolis. During the first campaign, 53 inhumations were excavated (G) and 59 cremations (G1). During the first campaign at the site Pećine, 151 skeletal graves and 35 cremations were investigated.

In the following thirteen years, until 1990, archaeological excavations continued only at the Pećine necropolis. This is how we found data in the field diary that during this period (1978-1990), until November 1990, 5626 inhumation graves (G) and 1154 cremations (G1) were discovered at the Pećine site. The diary ends on page 3835.

Here we should mention that, on the site Pećine, there were also some "previous" excavations in 1973. However, in the available documentation there was no data about the skeletons that were excavated at that time.

Archaeological and anthropological excavations of *Viminacium* were not only conducted in the cemeteries of Pećine and Više Grobalja, since the area of *Viminacium* was inhabited before and also after the Roman times. In this context, the bi-ritual necropolis should be mentioned, which was ascribed to the Celts. It was excavated in 1981 and 1982 at the site Pećine, simultaneously with the ancient Roman cemetery (in the same area). During this excavation, 26 skeletal graves and 17 cremations were discovered.

As an extremely important skeletal series from the territory of Serbia, it was published from several perspectives, the latest one from the year 2011. (Mikić, 2011: 255-260).

The Više Grobalja necropolis (named after the cadastre of the Kostolac municipality) also belongs to the South *Viminacium* cemeteries. As already mentioned, the archaeological excavations of this cemetery began in 1978 and they have continued, with some interruptions, until recently.

At the Više Grobalja site, the archaeological excavation began on the 20th of May 1978 and continued until the 10th of October 1985. The first inhumation was discovered on the 25th of May and the first cremation on the 30th of May, 1978. This is highlighted because by 1985, at this *Viminacium* site, 2208 inhumation graves (marked G) and 1773 cremations (marked G1) were excavated. With voluminous and precise field documentation, the field diary ends on page 2287.

In 1987, further excavations on a smaller scale were conducted. The number of skeletal graves reached 2213 and the number of cremations reached 1776. The field diary ends on page 2291.

In December 2008 further excavations were conducted, but on a small scale. No graves were discovered.

In 2009, at the Više Grobalja site, there was an excavation from April to August. The number of skeletal graves reaches 2233. The number of cremated graves reached 1793.

During this last campaign of archaeological research at the site Više Grobalja, graves G2-2217 and G2-2227 (marked as early Middle Ages), which are certainly connected with the earlier research of the Gepid and the period of

the Great Migration should be mentioned.

Apart from the mentioned cemeteries, the Celtic one at the site Pećine and the two Roman cemeteries, Pećine and Više Grobalja, during the second research phase in *Viminacium*, there were only chronologically younger cemeteries (or parts of cemeteries) that were examined and partially published. Chronologically, they include two cemeteries from the period of the Great Migration at the Više Grobalja site and the medieval series Kod groblja (earlier Pećine, churches A and B) (Mikić, 2008: 45-55). An even younger necropolis, Nad Lugom, and the two Roman ones (Pećine and Više Grobalja) were partially published in 1984 (Mikić, I., Korać N., 2012: 185-199).

On the other hand, there is still anthropologically examined, but unpublished, material left in *Viminacium*. It chronologically belongs to the period from the Roman times to the Middle Ages. These are as following, mostly smaller and very specific skeletal series: Rudine, Svetinja, Velika Kapija and Burdelj.

Five skeletons, coming from four graves at the site Rudine, were anthropologically examined. They were excavated in 1978 in one single sondage, which could be regarded as a test sondage. The anthropological documentation reveals that there were of both genders and included infants. The preservation of these skeletons is very poor. Only one skull (from grave number 4) could be reconstructed in order to undergo further anthropological analysis. On adult skeletons there were certain paleo-pathological changes on bones, as well as on teeth.

During the same year, 1988, five graves with seven skeletons were excavated on the site Svetinja. Two graves contained two skeletons each, while the rest were individual graves. There were skeletons of both genders, as well as several infants, who died at an early age. There were paleo-pathological changes in jaws and teeth, as well as on postcranial skeletons. The preservation is poor and, according to the documentation, only paleo-demographic and paleo-pathological diagnoses were made.

Velika kapija can already be considered to be a smaller anthropological series. It includes 19 skeletons from seventeen graves. The preservation degree varies very much, so there are skeletal remains which could not even be lifted from the ground, but also those which offered cranial and post-cranial anthropological measurements. Some of the skulls could be photographed in standardised anthropological projections.

Apart from the mentioned anthropological measurements, there are also both genders in this series, as well as infant skeletons. Apart from that, their health is reflected in numerous paleo-pathological diagnoses.

In an anthropological sense, site "Njive kod Mlave" drew the attention of the investigators after a skull was discovered with a very specific deformity on the back of the head (due to carrying heavy weights on the head). According to the archaeological documentation, along with this skeleton, "a typical German fibula" was discovered, dating it into the period of the 5th and 6th centuries. It was not investigated whether this was a single grave or part of a necropolis.

This isolated, and certainly hugely anthropologically important find from the "Njive kod Mlave", is very well preserved. All of the primary anthropolgical measures were obtained. Since it is unpublished, it will be referred to in other publications about *Viminacium*.

The site at Burdelj was also excavated in 1978. In archaeological literature, it is known as the cemetery of the Eastern Goths (Zotović 1981: 95-115) but the anthropological material from this cemetery is not fully investigated yet. Skeletons from number 44 to number 66 remained preserved, but only nine were suitable for detailed study (due to the poor state of preservation).

Anthropologically investigated skeletons showed that there were both genders, as well as infants. There was also certain paleo-pathology. There can be almost nothing said about paleo-demography, since the skeletons from this necropolis were not fully investigated. It is certainly because they possess a very poor state of preservation, especially the infant skeletons.

More data was obtained about these cemeteries from their documentation, since they were not published.

If we wish to consider them, regarding the volume of archaeological research and the subsequent anthropological analyses at *Viminacium*, then the situation is as follows:

The Celtic necropolis (at the site Pećine) with graves marked G3 (inhumations) and G3-1 (cremations) is chronologically the oldest one. Then there are two Roman cemeter-

ies, Pećine and Više Grobalja, globally speaking. During the first research phase at Pećine, 5626 inhumation graves (G) were excavated and 1154 cremations (G1). At the Više grobalja necropolis, there were 2233 inhumations and 1793 cremations. The number of anthropologically investigated skeletons is certainly much bigger, since graves with several individuals are quite usual at *Viminacium* (Mikić 1993: 197-198).

Smaller cemeteries, like Rudine, Svetinja and Velika Kapija, revealed only skeletal graves. Their total number does not exceed several dozens and they were completely and independently numbered.

The older and the younger Gepid cemeteries, whose graves, i.e. skeletons, were marked as G2, are numerically integrated into the ancient Roman cemetery of Više Grobalja. There were 94 totally anthropologically examined skeletons.

Medieval graves around churches A and B were marked as G4, but numerically, they are integrated into the graves of the ancient Roman Pećine. Still, the medieval necropolis Nad lugom includes 112 graves. They are not marked as G4, but just with numbers from 1 to 112, since they were situated further away from the other *Viminacium* cemeteries.

Briefly said, until 1990, the following anthropological material from *Viminacium* was investigated: the Celtic necopolis of Pećine and, later, the Roman cemeteries Pećine and Više Grobalja, whose territories overlap, forming the so-called southern *Viminacium* cemeteries. Then there are also the aforementioned smaller skeletal groups. In total, there are over 14000 graves.

The investigated skeletal remains from the period of the Great Migration come from four sites: the older and the younger cemeteries at Više Grobalja, the Burdelj necropolis and the Lanci necropolis. The total number of anthropologically investigated skeletons from these sites is slightly over 100. Later medieval skeletons come from the graves marked as G4, and their number is slightly bigger from the previous group – around 150. These are the Nad Lugom necropolis and the necropolis near the Roman memoriae at the Pećine cemetery.

Nevertheless, not all of the skeletons could be deposited after they have been studied. Due to the large number of skeletons, which grew bigger each year, the depositing problem occurred very soon. The anthropological field laboratory was set up in the primary school in Kostolac, but this was soon lost. This is why it was decided to re-bury the skeletons and to only keep voluminous anthropological documentation about them. This measure was accepted with much difficulty, but there were simply no capacities which would enable the depositing of such voluminous anthropological material, including about ten thousand skeletons, especially regarding the degree of development of physical anthropology in our country.

On the other hand, Ž. Mikić and M. Korać, managed to form a huge collection of the best preserved Roman skulls (with the approval of the former conductor of archaeological excavation at *Viminacium* - Lj. Zotović). These skulls are now exhibited in the Anthropological laboratory inside the Domus, representing a very important collection of *Viminacium*. Further, all of the 34 artificially deformed Gepid skulls are in Munich at this time (Anthropological state collection of Bavaria) and will be returned to *Viminacium* after very complex analyses, which are now being performed.

The second phase of anthropological investigation at *Viminacium* ended in the year 2000. The experience of not being capable of keeping such a large quantity of human osteological material was not positive. It is fortunate that it was successively studied and documented, including photographs in standardised projections, with all the necessary anthropological measures and paleo-pathological diagnoses, already partially published. One of the mentioned preserved skull series, the collection from the Pećine necropolis, was recently published (Korać, M., Mikić, Ž., in print), so it is easy to overview a great variety of populations which dwelt in *Viminacium* in Roman times. The same should be done with the Više Grobalja necropolis.

THE THIRD PHASE

The third phase can also, chronologically, be precisely determined. It begins in 2000 and ends in 2013. The director of the *Viminacium* project was M. Korać. It is actually an innovation phase in all the fields of investigation. Methodologically speaking, new technologies are introduced into archaeological research,

which is new in our country. The Domus Scientarium was under construction (at the part of the site on which no finds were expected, near the mausoleum). The ways of collecting documentation was modernised, there is international co-operation, with different foreign experts coming to work in *Viminacium*, etc.

Anthropologically, since the Domus was practically finished, a modern anthropological laboratory was established, with all of the necessary instruments, with the possibility of depositing and keeping human osteological material.

As far as the archaeological excavation is concerned, as well as the anthropological material, it was excavated at four locations: Pirivoj, Amfiteatar, Nad Klepečkom and is still continuing on the site Više Grobalja. In other words, apart from the already investigated southern *Viminacium* cemeteries, in this excavation phase, research has spread also to the eastern part (Pirivoj). By the end of 2013, anthropological investigation from the sites Amfiteatar, Pirivoj, Nad Klepečkom and those excavated during the last years at the already known site of Više Grobalja had finished. This revealed another 1000 skeletons, increasing the number of human osteological remains from *Viminacium*. It transpires that the study of the anthropological material was performed with success and simultaneously with the excavation. This is how the anthropology of *Viminacium* made a step forward in comparison with other research disciplines. It should also be mentioned that it was all done within the framework of the current project.

THE FOURTH PHASE

The fourth phase of anthropological research will be the least considered one in this paper. It begins in 2014 and it will probably last for several years. It is related to the most recent analyses and their publication. New skeletal finds which are discovered in the meantime will also be added here. After the results of examining the human osteological material gained so far, a complex bio-archaeological reconstruction of *Viminacium* can be expected in this phase, in which anthropology will make its contribution. This will be done with multidisciplinary research.

INSTEAD OF CONCLUSION

The experience so far with human osteological material is not very satisfactory. Insufficient development of bio-physical anthropology in our country was certainly also reflected in the situation at *Viminacium*. In the first place it is the lack of balance between the anthropological material and the employment of adequate staff to explore it, especially in the early investigation phases. As a result of this, there are insufficient publications about the anthropological material and incomplete depositing of anthropological finds. Still, after 2000, the situation changed in a positive direction. Primary anthropological studies of all of the skeletons were recently updated. In accordance with the research phases named above, which partially match with the phases of archaeological excavations, we can overview the anthropological situation. Human osteological material was excavated and anthropologically examined from twelve sites, containing fifteen cemeteries (see appendix). The oldest necropolis on Pećine was ascribed to the Celts. After that there were graves with skeletons from the Roman period: Pećine, Više Grobalja, Velika kapija, Rudine, Svetinja, Pirivoj, Nad Klepečkom and, most likely, the Amphitheatre. Traces of the Great Migration were discovered at the sites Više Grobalja, Burdelj and Lanci. Cemeteries from the later medieval periods were examined at the sites Kod Groblja (according to the earlier archaeological documentation, Pećine and Nad Lugom). According to the anthropological finds, we can conclude that the continuity of life in the area of *Viminacium* goes from the last centuries of the Old Era until late Middle Ages, which is almost two millennia.

In the next, fourth research phase, we will try to conduct detailed and modern isotopic laboratory analyses, which should help with the bio-archaeological reconstruction of *Viminacium*. There is also a problem to be solved regarding the naming of the cemeteries. Can they be named according to the cadastre or according to directions (east, south)? For the Roman period it is necessary to divide the cemeteries of *Viminacium* from those connected to other areas such as farms, settlements and other sites. The demands of further anthropological research in *Viminacium* will certainly take that direction, with further innovations and in interdisciplinary fields.

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REZIME

VIMINACIUM - ISKUSTVA SA HUMANIM OSTEOLOŠKIM MATERIJALOM

Ključne reči: Viminacijum, nekropole, osteološki materijal.

Kada su u pitanju istraživanja koja obuhvata bio-fizička antropologija na Viminacijumu, mogu se izdvojiti ukupno 4 faze. Početak istraživanja na Viminacijumu se vezuje za 1882. godinu. Tada počinje i prva faza istraživanja dok poslednja faza istraživanja počinje 2014. godine. To je vremenski raspon koji obuhvata period više od jednog veka. S obzirom da su arheološka iskopavanja na Viminacijumu najveća na Balkanu u poslednjih nekoliko decenija, dobijeni su značajni antropološki rezultati i stečeno je veliko iskustvo. Prema humanom osteološkom materijalu se ophodilo profesionalno, ali su se tokom vremena javili i određeni problemi koji su navedeni u radu.

Situacija sa humanim osteološkim materijalom u prvim fazama istraživanja nije bila zadovoljavajuća, međutim od 2000. godine drastično se poboljšala.

Na Viminacijumu je do sada istraženo 15 nekropola (12 lokacija). Prema arheološkim kriterijumima, obuhvataju vremenski raspon od blizu 2 milenijuma tako da možemo konstatovati kontinuitet života na Viminacijumu.

Za poslednju fazu istraživanja na Viminacijumu se vezuju analize drevne DNK i izotopske analize stroncijuma koje će nam poslužiti da proširimo bioarheološku sliku ovog lokaliteta.

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VIMINACIUM: ROMAN AGRICULTURE ON SERBIAN SOIL?

ABSTRACT

If our aim is to provide visitors of the Archeological park Viminacium an aura of Roman way of life, it would be certainly in our interest to revive a piece of Roman agriculture as well. This isn't possible if the park area is covered with crop that came to Serbia at the end of 16th cent. AD – maize. Archaeobotanical research can help us determine ancient crops which were sawn on the fertile fields of this Roman town and military camp.

Keywords: Viminacium, Archaeological park, tourism, archaeobotany, local farmers, ancient plant economy.

When visitors of Viminacium pass the welcome gate of the Archaeological park next to Kostolac Power plant, they will be confronted with vast maize fields for almost 2 km until they finally reach parking area in front of the "Mausoleum" (Fig. 1). This isn't surprising if we know that maize was sawn on the half of the spring sowing area in Serbia in 2012, on almost 1.3 million of hectare, which represents one quarter of all arable land in the country.

First records of maize in Serbia go back to 1576 (Zirojević 2006). It was introduced to Balkans and south Central Europe via "Turkey" and North Africa. In central Europe it was known as "*türkischer Weizen*" (Germ.), or "*grano turco*" (Ital.). At the beginning it was grown in gardens. In an Ottoman letter from 17th century it was mentioned that the maize was cultivated at Kosmaj Mountain near Belgrade, which is 60 km south-west from Viminacium. Already in 1718, in Belgrade's surrounding one third of the plough land was cultivated by maize. But, all this has nothing to do with Viminacium, nor Roman plant husbandry. If our aim is to provide visitors of the park an aura of Roman way of life, it would be certainly in our interest to revive a piece of Roman agriculture as well. Is it possible?

Until recently, very little was known about the agriculture of the antique period in Serbia. At the beginning of the 21st century two archaeologists have recognized the problem regarding the lack of botanical data for that period. They tried to reconstruct Roman plant husbandry in the Bal-

Fig. 1 Photos of the Archaeological park Viminacium taken by the visitors posted on one of the internet forums

kans according to archaeobotanical records from Europe north of Alps (Tapavički-Ilić & Arsenijević 2006). As Virgil in 29 BC in his *The Georgics* wrote: "*Not that all soils can all things bear alike*" and as crops are regionally adapted to climate such comparison is inappropriate. Generally, the Alps are dividing Europe into two contrasting climatic zones, in wet north and dry south.

The first archaeobotanical paper on Roman plant husbandry in Serbia appeared in 2008 about Gamzigrad near Zaječar – Felix Romuliana (Medović 2008). Archaeobotanical papers which goal is not only to study Roman plant economy on Serbian soil, but also the barbarian plant economy on the left bank of the Danube River, appear on the annual basis ever since (Dimitrijević & Medović 2009, Medović 2009, Medović 2010, Medović 2011, Medović 2012).

PLANT REMAINS FROM ROMAN PERIOD IN SERBIA – THE RIGHT BANK OF THE DANUBE RIVER

The main crop of the late Roman period at Gamzigrad (second half of the 3rd – second half of the 5th cent. AD) is bread wheat (*Triticum aestivum* s.l.), while broomcorn millet (*Panicum miliaceum*), loose six-row barley (*Hordeum vulgare* subsp. *vulgare*) and rye (*Secale cereale*) were also cultivated (Medović 2008). Three pulses could be identified in that period: lentil (*Lens culinaris*), broad bean (*Vicia faba*) and common vetch (*Vicia sativa*). Cultivated fruits are represented with only two grape pipes (*Vitis vinifera* subsp. *vinifera*). Wild-fruit gathering was of great importance at Felix Romuliana.

A massive find of barley (1st/2nd cent. AD) at Gomolava archaeological complex allows us insight into difference between Late Celtic and Roman agriculture (Medović 2010). The change between grain cultivation methods seems to be confirmed – intensive production on small plots has been changed by the extensive agricultural industry of large estates.

At Hissar near Leskovac one botanical sample from Roman period (Medović 2012) has yielded plant remains of broomcorn millet and common walnut (*Juglans regia*).

Most promising archaeobotanical material from Roman times has been recovered and partially analyzed during Archaeological excavations (2002-2004) at Petrovaradin fortress (*Cusum*) in Novi Sad (Medović unpublished). The results will fulfill our knowledge about Roman agricultural practice at the frontier of the empire on the middle Danube. Three major cereals in Roman *Cusum* were bread wheat, barley and broomcorn millet.

PLANT REMAINS FROM ROMAN PERIOD IN SERBIA – THE LEFT BANK OF THE DANUBE RIVER

Two sites on the left bank of the Danube River from the Roman imperial era were archaeobotanicaly investigated: Čurug – "Stari vinogradi" (Medović 2009) and Starčevo – Grad (Medović 2011). This allows us to compare "barbarian" and Roman plant economies on the opposite sides of Danube only partially. So far, only three "barbarian" samples were archaeobotanicaly analyzed.
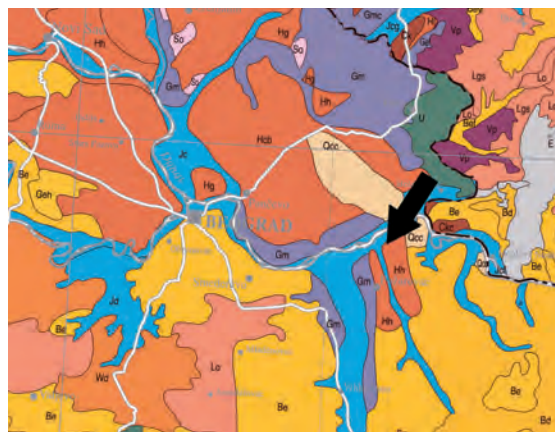
Fig. 2 Soil map of Viminacium area with its location (Anon. 2005). Legend: *Hh*HaplicPhaeozem, *Hcb*CalcaricPhaeozem, *Hg*GleyicPhaeozem, *Be*Eutric Cambisol, *Bd* Dystric Cambisol, *Jc* Calcaric Fluvisol.

Beside the mass find of the "unripe" spelt wheat grains (*Triticum spelta*), grain-storage of Limigants at Čurug – "Stari vinogradi" contained also charred items of einkorn wheat (*T. monococcum*), while emmer wheat (*T. dicoccon*), loose six-row barley, rye, bread wheat, broomcorn millet and foxtail millet (*Setaria italica*) were weedy admixtures. The find also contains 199 charred spikelet forks of mosquitograss (*Dasypyrum villosum*). More light on the condition of the spelt wheat crop provide the finds of black-bindweed (*Fallopia convolvulus*) and field bindweed (*Convolvulus arvensis*). Both weeds are known for "choking" cultivated plants in which they grow. This results in reduced crop yields.

A fair number of carbonized einkorn grains

Fig. 3 Areas in Europe where Phaeozems are the dominant soil type (Anon. 2005). Legend: *Arrow* Location of Viminacium.

found in a Sarmatian pit at the Archaeological site Starčevo – Grad suggest that the "barbarians" were more orientated toward yield security rather than yield maximization. Einkorn wheat is more robust than its more domesticated descendants in that it can better scavenge nutrients in resource-limited conditions. As in Čurug, black-bindweed is most common weed at that period in Starčevo, which is situated only 40 km west of Viminacium.

ARCHAEOBOTANICAL RESEARCH AT VIMINACIUM

Ancient city and military camp Viminacium was situated in a very good location, in the fertile plains of Stig (Fig. 2): Pliny the Younger noticed in *Epistulae* about the city: "*Wherever you look, you see orchards, tilled fields, forests. People are all over the fields, working diligently*". Viminacium was surrounded with the most fertile soil in Upper Moesia – Phaeozem. According to this, plant husbandry of the capital of the province is comparable with the agriculture in Pannonia (Fig. 3). In fact, the fertile plains of Stig, although situated on the right bank of the Danube River, can be considered to be a part of Pannonian plain. Phaeozem is highly productive soil type and is mainly used for cereal crop production (Anon. 2005). This dark soil with humus-rich surface horizon is found in wet steppe regions. In Serbian literature one can still find the term Chernozem soil instead of Phaeozem. But, a

Charred plant items		
Cereals		
Hordeum vulgare vulgare	16	Loose six-row Barley
Secale cereale	5	Rye
Triticum aestivum s. l.	4	Bread Wheat
Avena	2	Oats
Cerealia indeterminata	10	Unidentified Cereals
Millets		
Panicum miliaceum	6	Broomcorn Millet
Pulses		
Lens culinaris	5	Lentil
Ignota	1	Unidentified Pulses
Fruits		
Fragaria vesca	3	Woodland Strawberry
Corylus avellana	1	Hazel
cf. *Ficus carica*, fruit	1	probably Common fig, fruit
Ignota	2	Unidentified fruits
Weeds/Ruderals		
Agrostemma githago	17	Corncockle
A. githago, capsule fragments	1	Corncockle, capsule fragments
Galium spurium	15	Stickywilly
Teucrium chamaedrys, fruit	1	Wall germander, fruit
Vicia-type	11	Vetch-type
Galium aparine	7	Goosegrass
Chenopodium album	5	Fat Hen
Fallopia convolvulus	5	Black-bindweed
Trifolium-type	5	Clover-type
Schoenoplectus lacustris	4	Common Club-rush
Echinochloa crus-galli	2	Barnyardgrass
Plantago lanceolata	2	Ribwort Plantain
Rumex crispus-type	2	Curled Dock-type
Silene-type, capsule	2	Campion-type, capsule
Asperula arvensis	1	Blue woodruff
Bromus	1	Brome
Bromus arvensis	1	Field Brome
Bromus secalinus	1	Rye Brome
Bromus sterilis-type	1	Barren Brome-type
Galium palustre	1	Common marsh bedstraw
Glaucium/Chelidonium	1	Horned Poppy/Chelidonium
Hyoscyamus niger	1	Henbane
Lolium, small-seeded	1	Ryegrass, small-seeded
Prunella vulgaris	1	Self-Heal
Setaria viridis	1	Green Bristlegrass
Solanum nigrum	1	Black Nightshade
Plant families		
Poaceae	7	True Grasses family
Apiaceae	1	Parsley family
Asteraceae	1	Sunflower family
Brassicaceae	1	Cabbage family
Lamiaceae	1	Mint family
Sum	**173**	
Uncharred (mineralized) plant items		
Sambucus ebulus	5	Danewort
Sambucus	1	Elderberry
Lithospermum arvense	1	Field Gromwell
Sum	**7**	
Other finds		
Fish scales, uncharred	2	Fish scales, uncharred

Table 1 List of carbonized and mineralized plant macro-remains from the archaeological excavations at Viminacium / Amphitheater in 2011.

study performed by Sekulić et al. (2010) reveals that 39% of plough land in Vojvodina has a humus content of only 1 to 3% and that 60% of arable land humus content is 3 to 5%. Real Chernozem soil (e.g. in Ukraine) characterizes humus content between 7 and 15%.

Viminacium fulfill all environment requirements to have flourishing plant economy. But, two years ago, we didn't know much about it. During excavations at Viminacium in 2011 eighteen earth samples were taken from the Amphitheater for the archaeobotanical analyses. The main objective was to find out which timber was used for its construction. The side effect of these analyses was a

rich cereal and weed assemblage (Table 1). The results include five cereals (loose six-row barley, rye, bread wheat, oats and broomcorn millet), and one cultivated pulse crop, lentil. Three fruit species were identified: woodland strawberries (*Fragaria vesca*), hazel (*Corylus avellana*) and common fig (*Ficus carica*). The list of weeds includes 25 plant names.

Is it possible to involve local farmers in the tourism policy of the Archaeological park and persuade them to exclude maize from the crop-rotation? What plants could they use instead? All the archaeological sites mentioned above have one plant in common – broomcorn millet. This plant has been cultivated in the region since Neolithic period and Starčevo culture (Medović 2011). The plant reminds one on a short maize plant. Its hollow stems reach an average height of one meter. The plant has

Fig. 4 Broomcorn millet (Hallier 1881).

wide leaves and large, open panicle inflorescence (Fig. 4). Its small seeds even taste like maize – common name for *Panicum miliaceum* in Serbia is "sitna proja". Its cultivation range approximates the cultivation range of maize. Both plants have the same photosynthetic pathway (C4-plants) which differs from other cere-

als. The water requirement of broomcorn millet is probably the lowest of any major cereal. This characteristic and the fact that it will mature in 70 to 90 days from planting make it very interesting for farmers who had experienced severe draughts in the last few years.

Even though it's not possible to remove Kostolac Power plant from the landscape, we can still improve the visual effect of the Archaeological park by providing the authentic indigenous Roman plant production environment. After all, everyone remembers the brilliant scene of Maximus' hand over the barley field in the Ridley Scott's blockbuster Gladiator from the year 2000.

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REZIME

VIMINACIUM: RIMSKA POLJOPRIVREDA NA SRPSKOM TLU?

Ključne reči: Viminacium, arheološki park, turizam, arheobotanika, lokalni ratari, antička zemljoradnja.

Na osnovu rezultata arheobotaničkih analiza dobijenih tokom arheoloških istraživanja na Viminaciumu i ostalim lokalitetima koja su vršena nakon 2000. godine moguće je navesti sve značajnije žitarice koje su bile uzgajane u rimskom periodu na tlu Srbije. Sve ove biljke se i danas mogu videti na našim oranicama, sem jedne – običan proso. Ovaj drevni usev je za svega nekoliko vekova potisnut sa oranica od strane kukuruza. Obe biljke imaju puno sličnosti, počevši od izgleda, preko termina setve, istog procesa fotosinteze, pa čak sve do ukusa. Da li je moguće da ovdašnje ratare uključimo u turističku politiku arheološkog parka i ubedimo ih da iz plodoreda izbace kukuruz i uvrste obični proso? Na ruku nam ide činjenica da je zajedno sa promenom klime poslednjih decenija došlo do pojave sve učestalijih, dugotrajnih suša. Veoma niska potreba za vodom ovog useva kao i činjenica da proso sazreva za svega tri meseca od setve čine ovu biljku veoma interesantnom za poljoprivrednike. Ovo može da bude dobitna kombinacija, kako za posetioce arheološkog parka tako i za same ratare.

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DANUBE LIMES AS A UNESCO WORLD HERITAGE SITE

ABSTRACT

The Roman frontier or limes was a continuous line of fortifications connected by a system of roads and river ports defending the empire. Large rivers like the Rhine and the Danube were used as primary barriers against barbarian attacks. The frontier spread over three continents and consisted of thousands of sites that belonged to many different types and categories: cities and other settlements, legionary and auxiliary forts, watchtowers and cemeteries etc.

"Frontiers of the Roman Empire" is a complex, phased and trans-national UNESCO world cultural heritage project. Limes in general meet three cultural criteria for the World Heritage List. Parts of limes were already ascribed to the list. Several other countries have all started their nomination processes. The Limes in Serbia is a natural extension of this project, especially recommended by UNESCO authorities. The advantage of inscribing the limes in Serbia to the World Heritage List is that all the major argumentation has already been proved and attested. Being inscribed to the UNESCO World Heritage List means that the site must be physically protected, presented and has an organised management system. Where major sites are concerned, the presentation and protection of the Danube limes in Serbia is actually a part of the already ongoing project Itinerarium Romanum Serbiae, recognised by the EU and professional authorities.

Keywords: Roman Limes, Roman Empire, Danube, UNESCO, World Heritage List, Serbia, frontier

INTRODUCTION*

The Roman frontier, or *Limes,* was a continuous line of fortifications connected by a system of roads and river ports which defended the empire. Troop commanders used natural obstacles to improve their defensive positions. Large rivers like the Rhine and the Danube were used as primary barriers against barbarian attacks with an organised military infrastructure along the Empire's borders. The frontier spread over three continents and consisted of thousands of sites that belonged to many different types and categories: cities and other settlements, legionary and auxiliary forts, watchtowers and cemeteries etc. The continuous presence of troops, who were highly paid, brought merchants and craftsmen to the frontier. Soon large urban centres emerged and rivers become one of the most important trade routes. The frontiers become highly developed regions and, with

Fig. 1 *Singidunum* – Roman fort wall incorporated into the later fortification

the army being the bearer of Romanisation, the Limes transformed into a unique zone that, today, really can be seen as the outstanding legacy of Roman civilisation.

The ultimate goal of the entire project is to inscribe all Roman limes sections to the UNESCO World Heritage List. Finally, the Roman limes can be considered as the largest archaeological complex in the world.

ROMAN LIMES AS THE UNESCO WORLD HERITAGE SITE

"Frontiers of the Roman Empire"[1] is a complex, phased and trans-national UNESCO world cultural heritage project. Parts of *limes* in the United Kingdom and Germany have already been inscribed to the list. Hadrian's Wall (United Kingdom) was the first part of the frontier inscribed in 1987. In 2005, the Upper German-Raetian Limes followed as along with the Antonine Wall in Scotland, in 2008 (Breeze 2009). Justification of the limes as a linear site of outstanding universal value was already accepted with the first nomination.

All other nominations are now considered as the extension and every project ads its own unique features to the already existing ones. Danube is the next step in completing the nomination of the Limes in Europe (Jilek 2009).

The project enhances the long-term preservation for future generations through the development of a harmonised, transnational, "joint action plan" for all Danube countries in respect of protection, conservation, management and presentation of Limes monuments and sites. It helps to create a link between individual regions and sites and to create local and regional identities. It promotes further cultural and civil society cooperation and contributes to economic and tourism development.

The Danube Limes, as a future World Heritage Site shared by all Danube countries, is listed in the Danube Area Strategy (EUSDR) as a flagship project under the action: To promote cultural exchange and exchange in arts. The new SEE project application is a follow-up of the former CE project "Danube Limes – UNESCO World Heritage" 2008-2011. It capitalises on its results, based mainly on the experiences during the successful preparation of the UNESCO nomination documents on the Danube Limes heritage

1 http://whc.unesco.org/en/list/430/

Fig. 2 *Singidunum* – Roman fort gate preserved in the Belgrade library Roman hall

in Hungary and Slovakia[2].

Austria (Jilek et al 2011), Hungary, Slovakia and Croatia have all started their nomination processes. Hungary and Slovakia have already prepared full nomination documentation and it now only depends on the governmental structure as to when the procedure will be finished. Serbia, on the other hand, is just taking the first steps towards the tentative list and nomination.

According to the UNESCO nomination regulations, all nominated sites must be of "outstanding universal value" and meet at least one of the criteria. Since 2005, there has been one set of ten criteria for nominating sites to the World Heritage List: 6 cultural criteria and 4 natural criteria.[3]

The Roman limes meets three out of the six cultural criteria that are evaluated for every World Heritage Site. These criteria are 2, 3 and 4.

(ii)   to exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts,

town-planning or landscape design;

(iii) to bear a unique or at least exceptional testimony to a cultural tradition or to a civilisation which is living or which has disappeared;

(iv) to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history;

Research of Limes is one of the most thorough archaeological activities among experts from all countries of the world. The results of this research are often presented at the Limes Congress – a regular congress held every three years.

PREPARATION FOR THE NOMINATION OF THE SERBIAN LIMES SECTION

Being inscribed to the UNESCO World Heritage List means that the site must be physically protected, presented and has an organised management system. Since this is not the actual situation in the field, work must be undertaken in

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2 http://www.danube-limes.eu; Lesak et al, 2013

3 http://whc.unesco.org/en/criteria/

Fig. 3 *Viminacium* – Amphitheatre, aerial view during excavations

order to prepare it for nomination. An effective management system depends individually on the type, characteristics and needs of the site and its cultural context. Government, regional and local authorities must all be involved in presenting archaeological remains. Popularisation and education related to Roman heritage is essential since it will help raise awareness of its importance among the local population and help with the preservation of archaeological remains.

Where major sites are concerned, the presentation and protection of the Danube limes in Serbia is actually a part of the already ongoing project Itinerarium Romanum Serbiae, recognised by the EU and professional authorities.

The Tentative List is the first step in the nomination of all sites. It is only a preliminary list, an inventory of those properties which each State Party intends to consider for nomination. This list is flexible, can be modified prior to nomination and is not binding. When the nomination is accepted and the property becomes part of the World Heritage List, states are obliged to respect all conditions prescribed by UNESCO.

There are 11 properties submitted by Serbia on the Tentative List for both cultural and natural heritage:

- Djerdap National Park (2002)

- The Deliblato Sands Special Natural Reserve (2002)
- Mt. Šara National Park (2002)
- The Tara National Park with the Drina River Canyon (2002)
- The Djavolja Varoš (Devil's Town) Natural Landmark (2002)
- Fortified Manasija Monastery (2010)
- Negotinske Pivnice (2010)
- Smederevo Fortress (2010)
- Caričin Grad – *Iustiniana Prima*, archaeological site (2010)
- Historical place of Bač and its Surroundings (2010)
- Stećak's – Medieval Tombstones (2011)

At the moment, the Republic of Serbia has 4 World Heritage sites[4], of which 3 are mediaeval monasteries with other archaeological elements (fortified city etc.). Only one site is archaeological and belongs to the antiquity – Gamzigrad (*Felix Romuliana*).

World Heritage list – sites in the Republic of Serbia

- Cultural-Historical Region of Stari Ras and Sopoćani Monastery (1979)
- Studenica monastery (1986)

4 http://whc.unesco.org/en/statesparties/rs

- Medieval Monuments in Kosovo (2004, 2006) Dečani Monastery, Patriarchate of Peć, Gračanica
- Monastery, Our Lady of Ljeviš (2006)
- Gamzigrad – Felix Romuliana (2007)

The Institute for the Protection of Cultural Monuments of the Republic of Serbia is the competent institution to prepare a nomination of cultural heritage. The government has a Permanent Delegation to UNESCO in Paris and the Commission of the Republic of Serbia for UNESCO that is part of the Ministry of Foreign Affairs of the Republic of Serbia.

The Serbian nomination of the Danube limes will not be an individual nomination which is most common where UNESCO is concerned. This will be an extension of the existing transnational and serial property "Frontiers of the Roman Empire" as discussed in previous chapters.

Experts from all institutions in Serbia are now organised in a work group that began its activities in autumn 2013. A preliminary register of the archaeological sites has been formed and preparation of the tentative list is in progress. The Archaeological Institute and the Institute for the Protection of the Cultural Heritage of the Republic of Serbia are the leading institutions in the workgroup.

DANUBE LIMES BRAND[5]

Danube Limes Brand is the project co-funded by the European Union and one of the best examples of multinational cooperation of experts from countries along The Danube. Nine partners from seven countries gathered to prepare the base

for the nomination – an extension of the project "Frontiers of the Roman Empire".

The DANUBE LIMES BRAND Project fosters the sustainable utilisation of the cultural Danube Limes heritage (archaeological sites, monuments and landscape) under the UNESCO World Heritage designation. The DANUBE LIMES BRAND project concentrates on:

1. Preparation of additional Danube Limes UNESCO heritage nominations in the Lower Danube area (Croatia, Serbia, Romania, Bulgaria);

2. Development of general branding for the future joint exploitation of the economic and tourism potential of the Danube Limes heritage with the input of best practice models from all participating countries;

3. Investigation of the regional potential for the exploitation of the Limes heritage on a national/regional level and the preparation of national/regional presentation concept studies in all partner countries;

4. Implementation of some measures of the presentation concept as pilot actions on a local/regional/national level to function as role models for the exploitation of a common perspective Danube Limes World Heritage Site.

It is important to make basic preparations for the nomination of all sites (documentation, conservation, presentation and visualisation). Media attention and tourist promotion are also important to achieve.

An important focus is also the exchange of knowledge and experience through the tight coordination of experts from all partners. All partners are listed in table 1 below.

Within the project, each partner has a different role and different goals, since every country follows its own legislation related to the process

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5 http://danubelimesbrand.org/

Project Partners	Associated Partners
Lead partner Institute for History, University of Vienna Vienna, Austria http://www.univie.ac.at/Geschichtsforschung	Danube Working Community St. Pölten, Austria http://www.arge.donau.at
Department for Building and Environment, Centre for Architectural Heritage and Infrastructure, Danube University Krems Krems, Austria http://www.donau-uni.ac.at/en/department/ bauenumwelt/zentrum/baukulturelles_erbe/ index.php	Eco-Museum Research Institute Tulcea Tulcea, Romania http://www.icemtl.ro
Municipal Monument Preservation Institute in Bratislava Bratislava, Slovakia http://muop.bratislava.sk	Federal Ministry for Education, Arts and Culture Vienna, Austria http://www.bmukk.gv.at
Institute of Tourism, Regional Development and Foreign Languages, Károly Róbert College Gyöngyös, Hungary http://www.karolyrobert.hu	National Tourism Organization of Serbia Belgrade, Serbia http://www.serbia.travel
Province of Rimini Rimini, Italy http://www.provincia.rimini.it	PUSR – The Monuments Board of the Slovak Republic Bratislava, Slovakia http://www.pamiatky.sk
National Institute for Heritage Bucharest, Romania http://www.monumenteistorice.ro	
Institute of Archaeology and Museum, Bulgarian Academy of Sciences Sofia, Bulgaria http://www.naim.bg/	
Archaeological Institute, Serbian Academy of Sciences Belgrade, Serbia http://www.ai.ac.rs	
Museum of Slavonia Osijek Osijek, Croatia http://arheoloskimuzejosijek.hr/	

Table 1 - Participants in the project Danube Limes Brand.

Fig. 4 *Viminacium* – Eastern cemetery and mausoleum

and is in a different phase of nomination. Among the goals of Serbia are the preparation of the tentative list, the preparation of an example of the nomination file (Viminacium is the site that has been chosen), to improve the presentation of the sites where it is possible and to prepare a web site and a booklet for our section of the limes.

ROMAN LIMES IN SERBIA
AN OVERVIEW

Limes in Serbia is a natural extension of this project, especially recommended by the UNESCO authorities. An advantage for inscribing the limes in Serbia to the World Heritage List is that all the major argumentation has already been justified and attested. This would be the main obstacle for nomination. The basic undertakings of Serbian archaeologists now are to finish the recording of all the sites, prepare technical documentation and make a detailed assessment of the situation in the field. The selection of the sites that will be inscribed to the list is of no less importance, since not all of them can be included. The relationship with the local population to the site is one of the
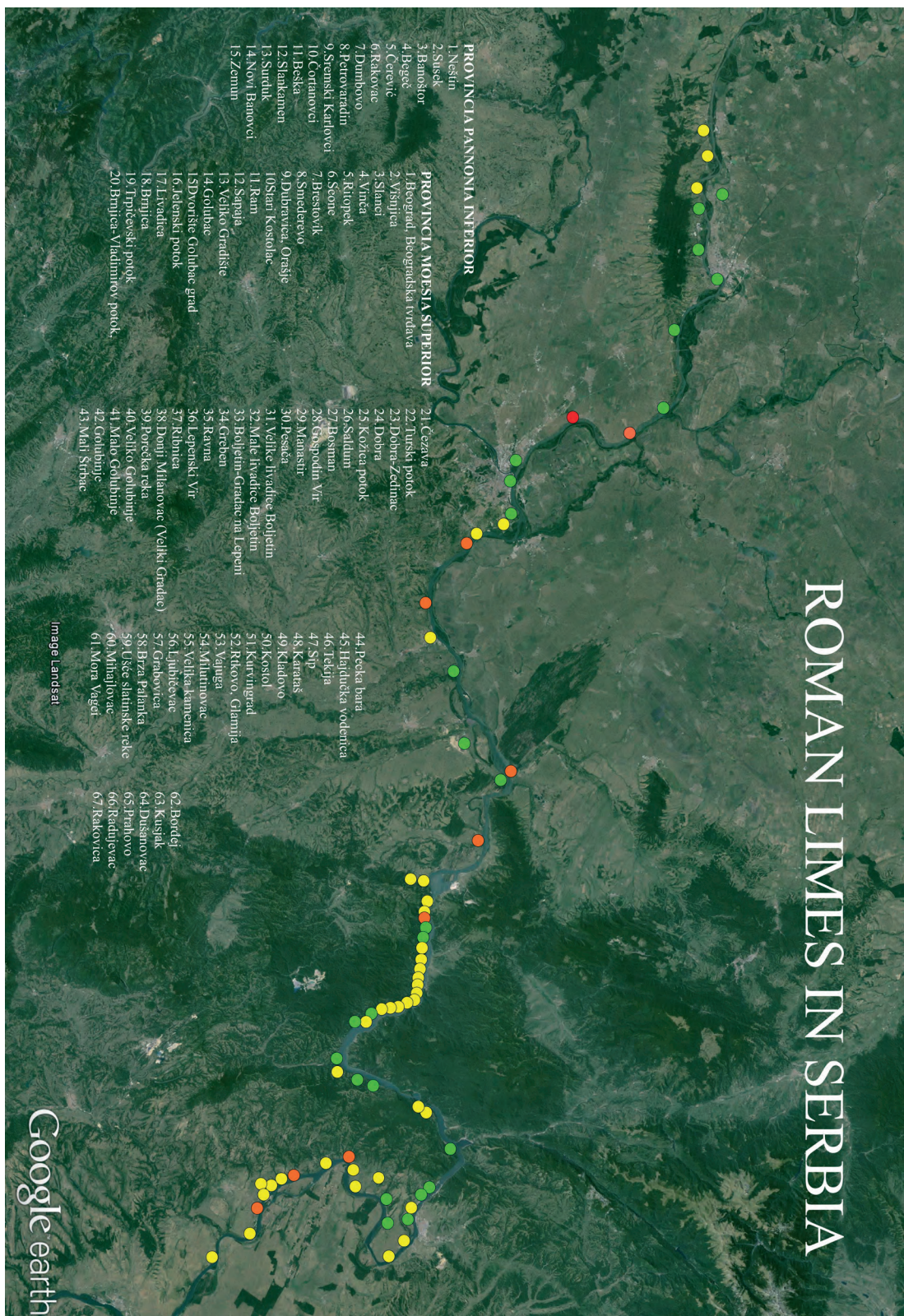
most important issues.

Unfortunately, no previous steps towards the nomination of the limes have been taken. The advantage of our long term archaeological research is that many sites are excavated, identified and, at least partially, published. This is an excellent springboard, since at least the tentative list can be prepared without major research.

European countries that are along the river Danube have different lengths of frontiers, but generally, as it was proven during meetings and study visits, all are faced with similar problems.

Comparative lengths of the river Danube in the countries included in the process of nomination:

Austria – 357 km
Slovakia – 72 km
Hungary – 417 km
Croatia – 137 km
Serbia – 587 km
Bulgaria – 471 km
Romania – 1075 km

As seen from the overview, Serbia has a significant part of Danube length (587 km). Where the Roman frontier is concerned, the length of the Serbian limes section is actually 450 km. Serbia

ROMAN LIMES IN SERBIA

PROVINCIA PANNONIA INFERIOR
1.Neštin
2.Susek
3.Banoštor
4.Begeč
5.Čerević
6.Rakovac
7.Dumbovo
8.Petrovaradin
9.Sremski Karlovci
10.Čortanovci
11.Beška
12.Slankamen
13.Surduk
14.Novi Banovci
15.Zemun

PROVINCIA MOESIA SUPERIOR
1.Beograd, Beogradska tvrđava
2.Višnjica
3.Slanci
4.Vinča
5.Ritopek
6.Seone
7.Brestovik
8.Smederevo
9.Dubravica, Orašje
10.Stari Kostolac
11.Ram
12.Sapaja
13.Veliko Gradište
14.Golubac
15.Dvorište Golubac grad
16.Jelenski potok
17.Livadica
18.Brnjica
19.Trpičevski potok
20.Brnjica-Vladimirov potok,

21.Čezava
22.Turski potok
23.Dobra-Zeđinac
24.Dobra
25.Kožica potok
26.Saldum
27.Bosman
28.Gospođin Vir
29.Manastir
30.Pesača
31.Velike livadice Boljetin
32.Male livadice Boljetin
33.Boljetin-Gradac na Lepeni
34.Greben
35.Ravna
36.Lepenski Vir
37.Ribnica
38.Donji Milanovac (Veliki Gradac)
39.Porečka reka
40.Veliko Golubinje
41.Malo Golubinje
42.Golubinje
43.Mali Srbac

44.Pećka bara
45.Hajdučka vodenica
46.Tekija
47.Sip
48.Karataš
49.Kladovo
50.Kostol
51.Kurvingrad
52.Rtkovo, Glamija
53.Vajuga
54.Milutinovac
55.Velika kamenica
56.Ljubičevac
57.Grabovica
58.Brza Palanka
59.Ušće slatinske reke
60.Mihajlovac
61.Mora Vagei

62.Bordej
63.Kusjak
64.Dušanovac
65.Prahovo
66.Radujevac
67.Rakovica

Map 1 Serbian section of the limes. Satellite image with marked location of the sites.

Image Landsat

Google earth

Fig. 5 *Viminacium – Porta praetoria* of the legionary fort

and Croatia share 137 km, where Serbia holds the left bank that is, in fact, part of Barbaricum. Along the rest of the length that Serbia holds, either both or only the right river bank was part of the Empire. This means that almost 100-120 sites of different character can be expected in this zone. At least 80 sites are so far documented and partially published (map 1). Unfortunately, half of this number has not completed the procedure of legal protection. Only a few sites have physical protection, video surveillance or a guard service.

Archaeological research on the sites of the Serbian Limes Section has lasted for more than 130 years. However, unfortunately, not all parts of the limes are equally explored and published.

Geographically, the limes in Serbia can be divided into 4 sections:

Section 1: Lower Pannonian section from Neštin (border with Croatia) to *Taurunum*.

Section 2: Upper Moesian part from *Singidunum* to *Cuppae*.

Section 3: Iron Gate gorge (Djerdap I)

Section 4: Part of the limes from *Pontes* to Radujevac/Rakovica (Djerdap II)

This division more or less corresponds to the regional institutional jurisdictions discussed in the next chapter.

The Lower Pannonian section (section 1) was explored during the mid XXth century, but almost no excavations were undertaken in the past several decades. Section 2 was explored only at the strong points and major cities like *Singidunum*, *Margum* and *Viminacium*. The space between is either not known or not adequately explored. The best known limes section is the area of the Iron Gates and downstream towards the Bulgarian border (Sections 3 and 4). During protective excavations in the 1960's and 1970's (Projects Djerdap I and Djerdap II) systematic excavations of numerous sites were undertaken. Unfortunately, many sites in this section were submerged under water when the level of The Danube rose after the building of the dams for the hydroelectric power plants Djerdap I and Djerdap II.

The first inspection of existing documentation confirmed that our section of the limes will meet all the criteria published in the UNESCO Guidelines 2005. Furthermore, there are at least three sites along the Limes that could meet the first criteria – to represent a masterpiece of human creative genius. These sites are:

The Roman road through the Iron Gates with imperial tablet (better known as Trajan's tablet). Parts of roman road are now almost com-

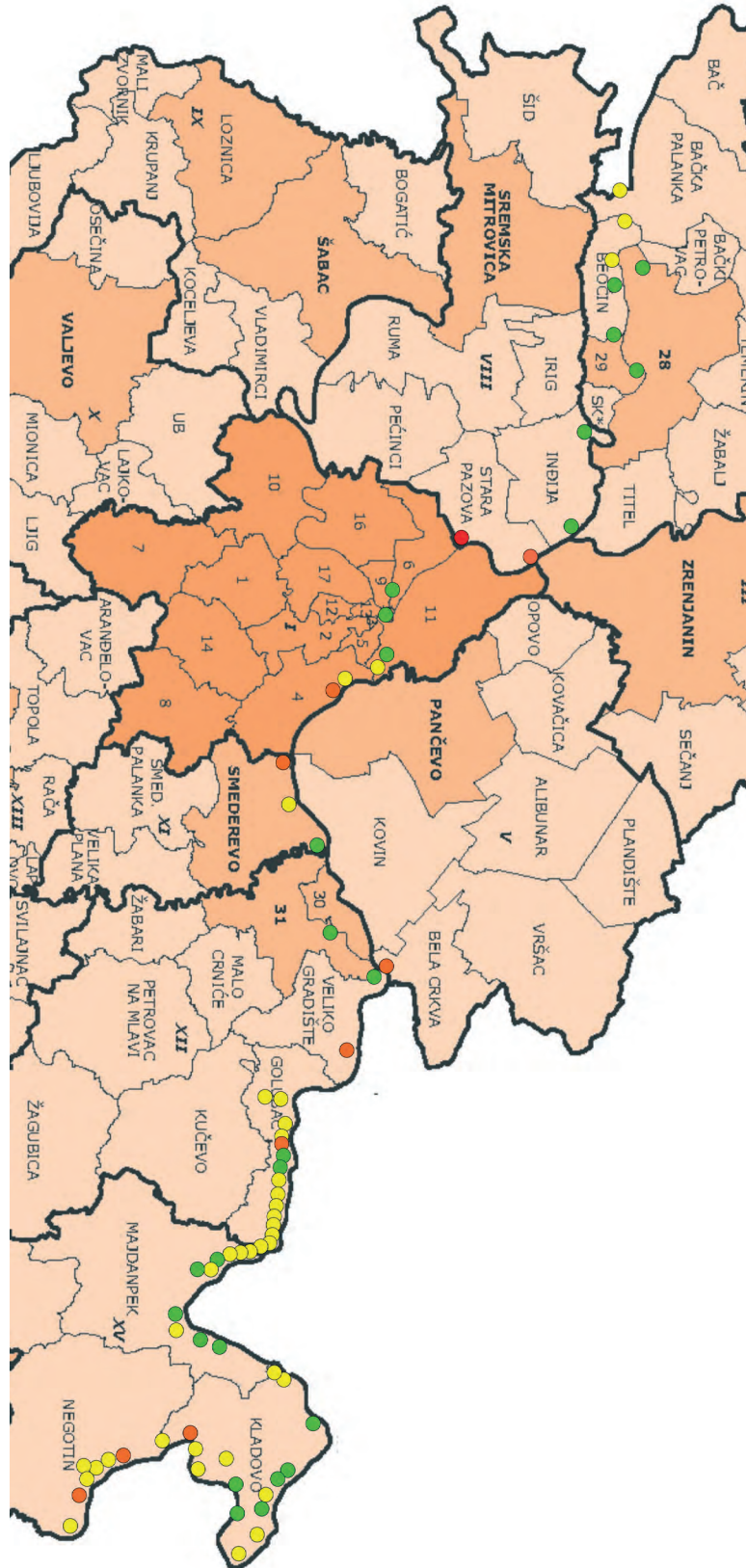Map 2 Serbian section of the limes. Distribution of sites in municipalities along Danube

Fig. 6 *Viminacium* – City Thermae

pletely submerged under the waters of The Danube. Only the section under Trajan's tablet was relocated to a higher location and is still visible.

Trajan's canal at Sip with the Diana fort. Unfortunately, the canal is now completely destroyed and there are no elements for nomination. On the other hand, Diana is among the best preserved, excavated and presented sites on our section of limes.

Trajan's bridge over The Danube between *Pontes* (right bank - Kostol, Serbia) and *Drobeta* (left bank – Drobeta – Turnu Severin, Romania), with the fortification of *Pontes* (*Transdrobeta*). Remains along the bank are visible, conserved and presented. The fort protecting access to the bridge was also excavated, conserved and partially presented. Pillars that were in the middle of the river are also partially preserved.

It is now clear that many of the sites are endangered or have been almost completely destroyed since preliminary research was done in previous decades. The best examples of many problems faced along The Danube are *Burgenae* (Novi Banovci) and *Lederata* (Ram). Burgenae is completely over built by a weekend settlement and it will be almost impossible to nominate this fort for the UNESCO World Heritage List. Roman *Lederata*, on the hill above modern Ram, is out of sight of the local population and is systematically looted. The trenches of looters who destroyed the Roman remains are visible, even from the satellite.

The situation at the sites differs enormously. Some sites, like Singidunum are under modern settlements. Elements of a Roman legionary fort (Fig. 1-2) are under Kalemegdan Park and the Belgrade fort. A Roman city is under the modern city centre. The possibility for the presentation of antique architecture is fairly limited, but almost all the infrastructure still exists. On the other hand, Viminacium city and the legionary fort (Fig. 3-6) are away from modern settlements. Nothing is visible above the surface, but the buildings are well preserved. There are unlimited possibilities for the presentation, reconstruction and visualisation, but all the infrastructure will have to be built from zero. In the eastern section, sites are either under modern settlements or very close to them. Sites like Diana (Fig. 7-10) and Pontes (Fig. 11-14) are well preserved and have excellent possibilities for presentation. Partial infrastructure exists, but a lot of investment is needed to put everything

Pannonia Inferior (Lower Pannonia)			
NOVI SAD Municipalities Bačka Palanka Beočin Novi Sad Petrovaradin	SREMSKA MITROVICA Municipalities Šid Sremska Mitrovica Irig Inđija Stara Pazova		
Moesia Superior (Upper Moesia)			
BELGRADE Municipalities Zemun Novi Beograd Stari grad Palilula Grocka	SMEDEREVO Municipalities Smederevo	POŽAREVAC Municipalities Kostolac Požarevac Veliko Gradište Golubac	BOR Municipalities Majdanpek Kladovo Negotin

Table 2 – Overview of the local authorities in the area of the Roman frontier on The Danube

into service for tourism. There is one especially interesting idea to use hologram technology for the visualisation of the Roman Bridge without interfering with the navigation of modern ships.

INSTITUTIONS INVOLVED IN THE PROCESS OF THE NOMINATION

Inscribing the site to the UNESCO World Heritage List is a project of the highest national importance. A problem that usually appears during the process of nomination is the number of institutions involved in the preparation of documentation, and their mutual coordination.

National level institutions:
• Archaeological Institute of Belgrade
• Institute for the Protection of Cultural Heritage of the Republic of Serbia
• National Museum of Belgrade

Regional institutes for the protection of cultural monuments:
• Provincial Institute for the Protection of Cultural Monuments, Novi Sad
• Institute for the Protection of Cultural Monu-

ments of the city Novi Sad
• Regional Institute for the Preservation of Cultural Monuments, Sremska Mitrovica
• The Cultural Heritage Protection Institute of the City of Belgrade
• Regional Institute for the Preservation of Cultural Monuments, Smederevo
• Regional Institute for the Preservation of Cultural Monuments, Niš

Regional Museums:
• Museum of Vojvodina, Novi Sad
• Museum of Srem, Sremska Mitrovica
• City Museum of Belgrade
• Regional Museum of Smederevo
• Regional Museum of Požarevac
• Archaeological Museum of the Iron Gates, Kladovo
• Regional Museum of Negotin

Among the stakeholders in the Danube area, it is necessary to include The Electric Power Industry of Serbia in all major activities. It has facilities in the vicinity of some of the crucial archaeological sites. The Accumulative Lake Djerdap directly influenced the Serbian limes section because the rising water level resulted in dozens

Fig. 7 Diana (*Statio Cataractarum Dianae*) – South Gate

of sites being submerged.

The Electric Power Industry of Serbia can, and often does, influence local and regional development and financing and can help with site management. Here, we should specially distinguish the thermoelectric power plants "Kostolac A" and "Kostolac B", the open pit coal mine "Drmno" and the hydroelectric power plants "Djerdap I" and "Djerdap II".

Cooperation with the municipalities along The Danube is also of crucial importance to the nomination. The maintenance, protection, management and utilisation of all sites depends a lot on local authorities. Therefore, it is also imperative to have good communication with the local population and to achieve their awareness of the importance that these sites have on the level of the entire humanity. The number of municipalities is large (Table 2) and they must all take part in the nomination of properties.

GOALS OF THE NATIONAL NOMINATION PREPARATION

- Preparation of the Serbian Limes Section UNESCO Tentative list
- Preparation of the nomination files for the sites of the Serbian Limes Section
- Scientific and documentation database for the sites
- Detailed archaeological map of the Serbian Limes Section
- Publication of all the material that is related to the Serbian Limes Section

ARCHAEOLOGICAL DATABASE AND DETAILED ARCHAEOLOGICAL MAP OF SITES

Research that started more than hundred years ago produced an enormous quantity of results and information. A lot of these results have been published, but far more was never processed or analysed. The documentation was scattered among many institutions and was never completed. Many sites that have been excavated and even partially published were never processed among top institutions and, therefore, do not have the appropriate level of legal and, especially, physical protection.

One of the bases for a future nomination would be the formation of a comprehensive database of all roman archaeological sites along the limes.

A preliminary database is filled with data that is already published and available to the re-

Fig. 8 Diana (*Statio Cataractarum Dianae*) – West Gate

searchers. The next step would be the implementation of data that is not published from the local documentations of national and regional institutions.

Naturally, it is also very important to survey all the sites, acquire precise coordinates and document the state of the heritage. The problem is that many sites have not been visited by experts in decades. The coordinates of many sites do not exist, due to different documenting methods. One of the problems is the lack of precise coordinates for sites that are submerged in the Iron Gates. During salvage excavations in the 1960's, coordinates were not regularly acquired and now these sites are not visible any more. One of the solutions to this problem is to acquire these coordinates from the old geo-referenced aerial images from the time of the excavations (1960-1970).

This database will be also a fundamental tool for the planning of conservation and presentation activities. It is also going to help with the utilisation of regional and local tourist and economic potentials.

CONCLUSION

The benefits of becoming a world heritage site are enormous. The development of tourism and the regional economy that normally follows this achievement greatly improves the quality of life of the local populations and brings international prestige. The obligations of the national and local government are now greatly enlarged. Financial expenses, as well as income, rise due to larger tourist traffic. However, all the efforts are futile unless the local population accepts the duty of the protection and management of the property. People living in the vicinity are the first line of defence, and without their cooperation central government has little chance to succeed in managing the site. Being a world heritage site also has limitations that sometimes discourage people from supporting the nomination. These limitations are primarily focused on the prevention of building activities and continuous maintenance.

Since there is a 450 km line to be presented and managed, it is suggested to organise regional centres for better control of the UNESCO properties. So far, the idea is to organize 4 centres as regional hubs. The centre for the Srem area

Fig. 9 Diana (*Statio Cataractarum Dianae*) – East Gate

could be Novi Sad. Belgrade and Viminacium could manage the central zone. Kladovo would be the eastern centre, controlling Iron Gates and the area downstream to Bulgaria. There is also a suggestion to appoint one central institution that would be the coordinator for the entire area of the Limes. This tends to be a problem because none of the existing centres has sufficient financial or human resources for this task. In ideal conditions, Government would found a new and specialised institution. However, this is unlikely in present financial and political environment.

Being part of the World Heritage List is the ultimate recognition of international value. The responsibility of maintaining this status is probably an even harder task than the nomination itself. Whatever the outcome of all of our efforts, the preservation of the Roman heritage for future generations remains the true legacy of this project.

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REZIME

DUNAVSKI LIMES KAO JEDAN OD LOKALITETA NA UNESCO-VOJ LISTI SVETSKE KULTURNE BAŠTINE

Rimska vojna granica ili limes je neprekidna linija utvrđenja spojenih sistemom rečnih i kopnenih puteva sa osnovnim ciljem da se odbrani unutrašnjost Carstva od upada varvarskih plemena. Velike reke kao što su Dunav i Rajna iskorišćene su kao primarne barijere protiv ovih napada. Granica se prostire preko tri kontinenta i sastoji se od niza od više hiljada lokaliteta koji pripadaju različitim kategorijama počev od naselja, legijskih logora, manjih i većih utvrđenja za pomoćne jedinice, kula os-

matračnica i brojnih naselja i nekropola koja su se formirala u njihovoj blizini.

„Granice rimske imperije" su kompleksno i međunarodno kulturno dobro pod zaštitom UNESCO-a. To je jedan od najvećih projekata zaštite u okvirima svetske arheologije. Limes ispunjava tri od šest kriterijuma za nominaciju kulturnih dobara na listu svetske baštine. To su kriterijumi 2, 3 i 4. Delovi limesa koji se nalaze u Velikoj Britaniji i Nemačkoj već su upisani na listu svetske kulturne baštine 1987, 2005. i 2008. godine. Austrija, Slovačka, Mađarska i Hrvatska uveliko su započele nominacijske procedure. Njihovi delovi limesa već se nalaze i na UNESCO-vim preliminarnim listama (UNESCO Tentative list).

Limes u Srbiji je prirodan nastavak ovog projekta koji je i preporučen od strane UNESCO-a. Prednost za upis srpskog dela limesa na listu svetske kulturne baštine je upravo ta da je glavna argumentacija već napisana, priložena i prihvaćena. Osnovni zadatak arheologa u Srbiji je da se završi dokumentovanje lokaliteta, pripremi tehnička dokumentacija i izradi detaljna procena situacije na terenu. Izbor lokaliteta koji će biti upisani na listu kulturne baštine nije od manje važnosti, kao

Fig. 11 *Pontes* / Trajan Bridge – Relief on Trajan's Column in Rome

Fig. 12 *Pontes* / Trajan Bridge – Architectural remains on the right bank of the Danube

ni odnos lokalnog stanovništva prema onome što poseduju u svojoj neposrednoj blizini.

Upis na listu podrazumeva da su lokaliteti fizički zaštićeni, prezentovani i da imaju organizovano upravljanje. Upravo kada je u pitanju upravljanje, važan je odnos lokalne vlasti i stanovništva prema sopstvenom kulturnom nasleđu. Bez obzira na državne institucije ljudi koji žive u neposrednoj blizini lokaliteta čine njegovu prvu liniju zaštite. Pošto situacija nije u potpunosti onakva kakva je propisana normama UNESCO-a, potrebno je uložiti puno energije u njeno stvaranje. Efikasan sistem up-

ravljanja u potpunosti zavisi od pojedinačnih slučajeva, vrste lokaliteta, njegovih karakteristika, potrebe i opšteg kulturnog konteksta. Državne institucije, regionalna i lokalna uprava moraju biti uključeni u pripremu za nominaciju i prezentaciju arheoloških ostataka. Popularizacija i edukacija u vezi sa ovim segmentima rimskog nasleđa su neizostavni delovi rada sa stanovništvom kako bi se podigla svest o njegovoj važnosti, o prednostima zaštite ovakvih objekata i ključa njegovog očuvanja. Dosta lokaliteta je ili u velikoj meri kroz istoriju potpuno devastirano ili za stanovništvo predstavljaju samo izvor besplatnog

Fig. 13 *Pontes* / Trajan Bridge – Remains of the bridge and fort in the background

Fig. 14 *Pontes* – Fort, West gate

građevinskog materijala. Toj populaciji potrebno je posvetiti posebnu pažnju i odgovarajućim pristupom ih dovesti do saznanja zašto je upravo ta "ruševina" deo kulturne baštine sveta.

Kada su najveći lokaliteti u pitanju, prezentacija i zaštita dunavskog limesa u Srbiji je deo već postojećeg projekta *Itinerarium Romanum Serbiae* (Putevima rimskih imperatora) koji je priznat od stručnjaka Srbije i Evropske Unije.

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DYNAMIZATION OF ARCHEOLOGICAL HERITAGE IN SPAIN. PERSPECTIVES FROM OUR EXPERIENCES IN ATAPUERCA (BURGOS) AND ARQUEOPINTO (MADRID) IN OTHER WORDS .... TO TOUCH IS A MUST

ABSTRACT

Our presentation will explore, from the author's experiences, how heritage dynamization can promote knowledge and the need to understand cultural, educational and archaeological resources, as an element of social cohesion. The goal of Paleorama is to engage people of all ages in the daily life of our ancestors and to increase their understanding of their skills, resources and strategies.

As a company involved in the democratization of culture and the search for new means for exploration of knowledge, we develop and manage open-air museums where we perform the human evolution journey, with complete scientific rigor, from the earliest African ancestors up to the main keys of European and Spanish culture, supplemented by a great variety of dramatized workshops for a complete understanding of techniques and processes used in antiquity.

1. - ABOUT US: PALEORAMA S.L.

We are a company formed by professionals of archeology and education, with extensive experience in the archaeological, experimental archeology, education, pedagogy, scanning and digital environments field. So that, this background defines us as an absolutely solvent and professional group with dilated experience, pioneers in Spain since 1993.

2. - WHAT DO WE PURSUE (MISSION, VISION, VALUES)

We believe in cultural heritage as a factor of social cohesion. We want to bring archaeological heritage to the general public in a simple, understandable, friendly, but without losing the scientific rigor. Our job is not only educational, it is also formative and cultural.

All this from two perspectives: business and scientific field. That is, teaching with rigor, accessible and from a business perspective to look for an economically sustainable management.

There cannot be culture managing without an enterprise culture. We believe in private management of public spaces through a clear communication plan for the society and under the supervision of the administration. It imposes a professional and responsible management fully integrated into the vicissitudes of business and multidisciplinary character.

Fig. 1 Primitivos (Primitives): the seed of our approximation to audience

This management should tend at zero cost by the administrations. That takes training, professionalism, passion, emotion, imagination and creativity. To achieve these goals, the team, people are the key to success. Without the human element, the lens is merely a document of intentions, and that is not going to be able to provide the mission, values and vision in a passionate way.

Money is only a complement necessary, but secondary. If the goal is social, cultural and educational, economic sense cannot be the main target. It exists as a fundamental premise, but not to be understood as the main objective of the mission of education and training.

That is why there is no direct relationship between investment, infrastructure and management success. Human capital and educational awareness of heritage values should be the main thing.

3. - OUR ORIGINS PRIMITIVES (PRIMITIVOS):

Primitivos was a pioneering idea that emerged in Spain in 1993 from the hands of Paleorama when no one hardly were doing heritage revitalization activities based on personal experience. The courses were held in a wild natural setting where the participant, in an interesting, participatory and dynamic, came directly in contact with original raw materials used in the past, flint, wood, bone, vegetable fiber, ocher, and metamorphic rocks and a long list of items, usually ordinary, that they would convert by themselves into prehistoric tools, fuel or food, using processes and techniques reconstructed from archaeological and ethnographic record. Thus constituted, the first prehistoric leisure activity conducted in Spain, a program of revitalization of the prehistoric environment as the main resource that was conducted between 1993 and 2002.

The primitives courses, that at no time intended to train specialists in prehistory or experimental archeology, generated in the participants interest in its past, new attitudes of preservation and respect for the natural and archaeological heritage and stimulated the desire to know more about ourselves. These and not others, were the targets of Primitives. In the training, the participant had the opportunity to become the protagonist taking home, a genuine and a real experience of survival and ancient techniques.

The typology of the groups was varied, graduates in architecture, archeology, biology, computer science, students and amateurs of prehistory. The recurrence rate for the courses (which repeat-

Fig. 2 Planning, analysis and study of maintenance for further success

ed), was over 40%, and the seats are covered with a year in advance. The groups were limited to a maximum of 25-30 people (Fig. 1).

ATAPUERCA AND ARQUEOPINTO OPEN AIR MUSEUMS

Over the time, professional and enterprise development led to the creation from zero, of two open air archaeological parks.

They are open air archaeological parks whose objective is the dynamization of the archaeological heritage, in which Spain has plenty of examples from the earliest Paleolithic to modern times.

The revitalization project we developed at both Atapuerca (Burgos) and Arqueopinto (Madrid), required several years to generate sustain-

Fig. 3 Archaeological Reconstructions and reenactment

able or self-funded management programs.

These work projects arises from:

• A hard and deep analysis of the environment, needs and possibilities that could provide this type of activity (potential communications, villages nearby, accessibility, etc.).

• Study and forecast maintenance costs. This section is a main key in managing spaces because poor planning will mean an increase in the economic needs of the project, sometimes unaffordable, causing the deterioration of educational quality proposal.

• Recognition of the quality of educational provision. What seems important is not the quantity, but also quality, and secondly, that the recognition of the importance of an archaeological site, for example, immediately does not turns its environment in capacity business.

• Therefore, it is necessary to make a clear quality educational offering in response to the needs of the environment, both by typology of offering, as well as responsiveness and adaptation to the context.

Both Atapuerca and Arqueopinto Open Air Museums, have taken years of analysis and in-depth knowledge to carry out this system and evaluation of system self-sustainable and quality management.

In both interpretive centers have clear preference, imagination (originality), innovation (singularity), and training (rigor and professionalism), as keys to coordinate the supply. Their quality depends, not only on investment in infrastructure, the available budget, the prestige of the place with which you are associated to, or national and international recognition, but their ability to teach values to provide an emotional experience to the visitor (which contributes something meaningful in his life), its ability to meet the public needs and establish new perceptions and attitudes towards something or promote actions in favor of something.

These would be the **keywords** that define our archaeological parks:

Open air Parks.

Archaeology.

Reconstructions with rigor.

Play and experiment **is a must.**

Wide Educational offering: Guided visits and workshops adapted to the needs of each group (age, group category, special needs, etc..), School groups and families, adult training, etc.

Social values in both, content and accessibility to that content as a initiative of access for people with different disabilities.

•Bringing Prehistory and the Atapuerca site

Fig. 4 Wide Educational offer

Fig. 5 Archaeological Reproductions

to deaf people (facilitate the access of a collective communication barriers into cultural resources from the province). We made a bid to facilitate the training of people with this kind of sensorial disabilities, facing their labor insertion.

• Enhance integration between deaf and hearing through workshops and activities related to archaeological and historical heritage. As a result of this commitment, we get the labor insertion of two guides for the Atapuerca park.

PALEOMANÍAS

This third basic component in the Paleorama policy aims to bring tangible archaeological heritage to the public, as well as a financing system.

The thematic merchandising requires investigation. Research, primarily oriented to the singularity of the site, in order to rescue and select the main relevant aspects with the greatest persistent, interpretive and evocative potential: firstly we get a souvenir, that evokes what we have visited and, secondly, oriented to our target market sector (students, families, adults, professionals, etc.).

The object itself is not the goal. This should answer a personal need to enjoy an object that otherwise would be impossible to handle. In addition, these objects causes a taste for knowledge (material in which is manufactured, symbolic representation, historical importance in the related stage, etc.)

In this sense, Paleorama tries to produce the most significant elements of human prehistory, creating a catalog of more than 300 elements that can be ordered as a single unit, or inside a didactic luggage as a response to school needs in education.

DEVELOPMENT OF NEW RESEARCH LINES AND ACCESSIBILITY OF HERITAGE. RESEARCH AND DEVELOPMENT

As we said before, these projects must be subject to continuous analysis, evaluation and improvement, both in infrastructure and in educational media. In this case Paleorama, aims to generate an awareness of heritage values, where the population should be the focus of exploration and a fundamental part of intervention on the quality of it.

With this idea, Paleorama is developing a range of programs focused on the disclosure of information to the general public as an Open Source model, where all individuals, companies and institutions can take advantage of Paleora-

Fig. 6 Archaeological Ceramic Reproductions

ma's experience, to improve the quality of the supply, education values, archaeological studies or accessibility projects.

MANAGEMENT AND ENHANCEMENT PROJECTS: Open Source information, Proto-Franchise Model (export knowledge), Accessibility and Revitalization Awards and Scholarships in Experimental Archaeology.

Open source is a way to share all kinds of useful information on license free to use (our is free experience for anyone to take advantage on and evolve with it).

We develop the same idea with revitalization awards as well as scholarships in Experimental Archaeology. Everything is part of the same. You have to share, in order to produce quality information already contrasted. This is the main

Fig. 7 Digital Media

goal of our work.

Arqueómetro: Under a website environment into which is going to be displayed all data from archaeological visited sites (timetables, access, basic information about the site, interpretation centers, media, etc.), people will use these resources as an initial guide. However, all this information will be completed with the proper analysis of visitors, where they can express their evaluations (prices, access, treatment, educational offering, etc ...) in order to know the reality of the site itself.

It is a way to generate a comprehensive resource assessment, becoming an analysis tool.

DEVELOPMENT OF INNOVATIVE PROJECTS USING DIGITAL TOOLS: 3D MEDIA

We are interested in digital tools as a way to approach heritage from a modern perspective.

The digital offer must be the result of a deep archaeological study to generate the sought scientific outcome. Without this premise, any attempt to generate a credible offer, will become a mere graphical representation.

Our intention is, therefore, a great scientific and technical effort, because with the digital on-line 3D models generated by photogrammetric procedures accompanying deep explanatory material in addition, we intend to create a free heritage database.

In this sense, we are generating a complete catalog of scanned heritage and archaeological objects, analyzable, as a school and educational resource.

REZIME

DINAMIZACIJA ARHEOLOŠKOG NASLEĐA U ŠPANIJI. PERSPEKTIVE NA OSNOVU ISKUSTAVA U ATAPUERKI (BURGOS) I ARKVEOPINTO (MADRID)

Ključne reči: dinamizacija, nasleđe, obrazovanje, rekonstrukcije, muzeji na otvorenom, Atapuerka, Arkveopinto, Španija, praistorija, radionica.

U demokratizaciji kulture i potrage za novim sredstvima kojima možemo da prezentujemo prošlost, razvili smo muzeje na otvorenom gde se odvijaju putovanja kroz ljudsku evoluciju, uz potpunu primenu naučnih principa. Možemo pratiti evoluciju ljudske vrste od najranijih afričkih predaka pa sve do savremenog doba i glavnih događaja u evropskoj i španskoj kulturi. Ovakav vid prezentovanja prošlosti dopunjen je organizovanjem velikog broja radionica radi boljeg razumevanja tehnika i procesa koji su korišćeni tokom različitih istorijskih epoha.

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THE OPENARCH PROJECT: ARCHAEOLOGICAL EXPERIMENT OF PLANTING GRAPEVINE IN VIMINACIUM*

ABSTRACT

This article presents an experiment of planting grapevine according to Roman practice. The experiment was performed in Viminacium and marked the beginning of experimental archaeology at the site of Viminacium. Basis of the experimental vineyard consists of reccomendations given by Roman authors who wrote about different breeding, production and traffic of grapevine and wine. During the experiment the replicas of agricultural Roman tools were used, and made it easier to understand the ways an ancient grapevine breeder worked.

Keywords*: OpenArch, culture project of the European Union, experiment, Roman agriculture, grapevine.*

INTRODUCTION*

On the 19th of March 2013, as part of the OpenArch project,[1] which is an international culture project of the European Union, an experiment of planting grapevine according to Roman practice was performed in Viminacium (Fig. 1). This event marked the beginning of experimental archaeology at the site of Viminacium, aiming to throw light at everyday life in the Roman Empire. The target groups of these actions are scientists, but also a broader public interested in this matter, reached through the methods of museum pedagogy. In order to achieve this, the purpose of the experimental vineyard in the Archaeological park of Viminacium is growing grapevine in the way it has been done some two millenia ago.

Grapevine, actually its products like grapes and wine, represent one of the important factors of Roman economy, culture, tradition and everyday life. It is therefore no wonder that numerous ancient authors wrote about this plant and its fruit in differ-

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1 The OpenArch is a five-year cultural project of the European Union which brings together eleven partners from eight European countries: Sweden, Finland, the Netherlands, Great Britain, Germany, Spain and Italy, as well as Serbia, project Viminacium of the Archaeological Institute. This project aims to establish a permanent partnership between the participants – archaeological open-air museums. The project includes performing archaeological experiments, staff exchange and intensive dialogue with visitors. At the same time, within the project, dialogue among archaeologists is established in order to reach standards for performing archaeological experiments, but also with other experts, whose help is often needed for such

experiments. Finally, it is planned to publish several publications and multimedia presentations related to the project contents.
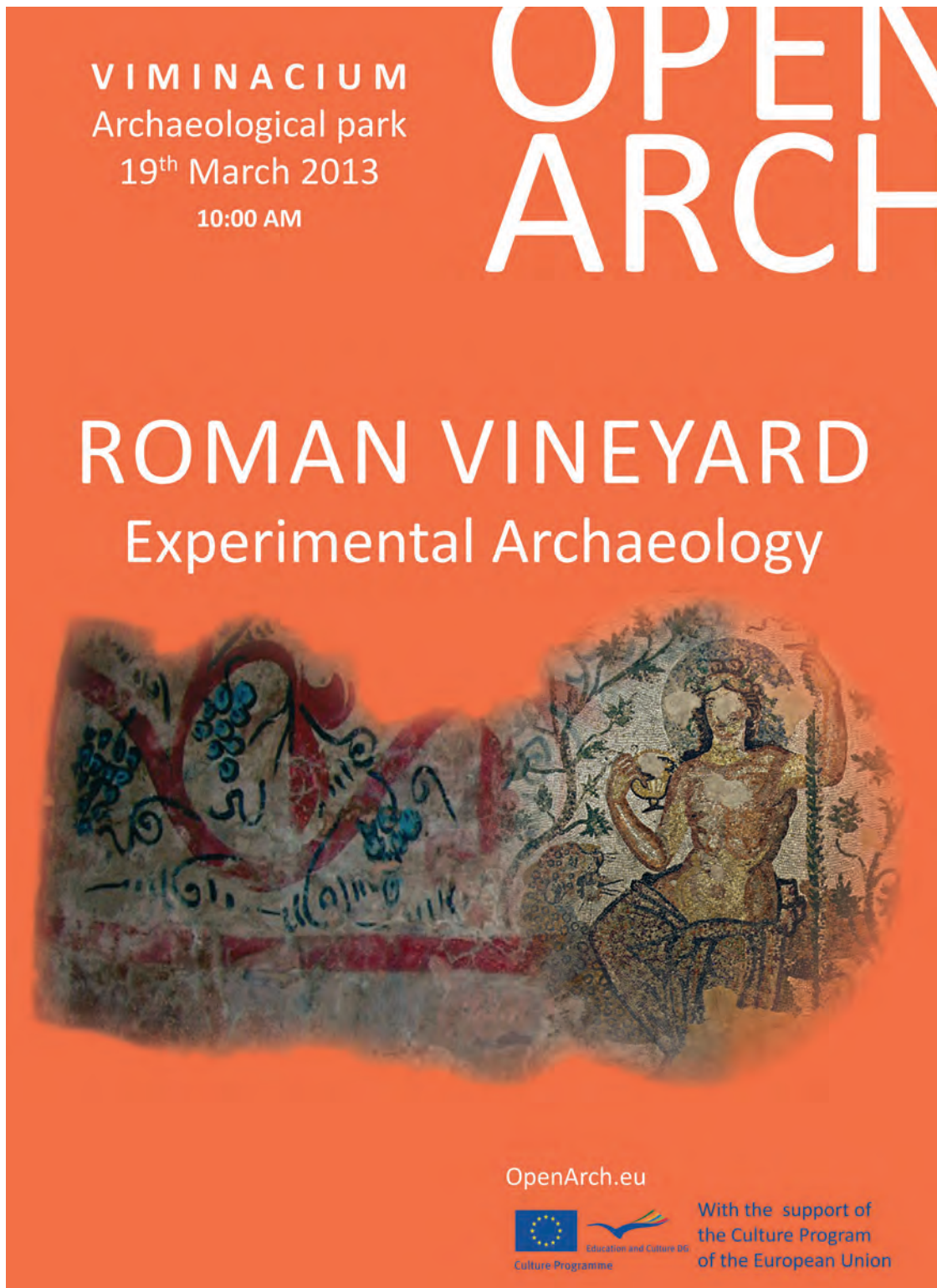
Fig. 1 Poster – Roman vineyard

ent ways. Data about grapevine and wine are left by Roman authors who wrote about aspects of its breeding, production and traffic. Here, several shall

be mentioned: Cato[2] , Varro[3] and Columella[4] . Ex-

2 Cato, *De Agricultura*, written around 160 BC.

3 Varro, *De Re Rustica*, written around 30 BC.

4 Columella, *De Re Rustica*, written around 60-65 AD.

actly recommendations from their writings represent basic rules which were followed while performing the experiment at Viminacium. More precisely, two sources were taken as the most appropriate to be applied in the Viminacium vineyard.

First of all there is Columella[5], who wrote a voluminous work entitled *De Re Rustica* in twelve books. The work was written in the 1st century AD, representing the most detailed description of ancient grapevine breeding. It is also of great importance that he quoted other authors, so there is a broader practice and knowledge on this matter.

Another source is Geoponica[6], which is not from the period of the Roman Empire. The original Greek text of the author *Cassianus Bassus*, from the end of the 6th and the beginning of the 7th century is not completely preserved, but some of their parts were compiled by Constantine VII Porphyrogennetos in the middle of the 10th century. The work represents as a compilation of agriculture practices and recommendations. Most of the texts within this voluminous work (twenty volumes) are rooted in Roman agricultural practice.

TOOLS USED DURING THE EXPERIMENT

The breeding of grapevine according to recommendations of ancient authors leads one into a broader spectrum of mechanisms and customs which were available to people of that time. First of all, the dynamics of actions was based on a different system (lunar cycle), while the working area was rather specific (wine). Due to the quickest way possible of introducing Roman grapevine breeding, replicas of agricultural tools were made

5 Columella, *De Re Rustica* in twelve volumes has been completely preserved and forms an important source on Roman agriculture. Grapevine is described in the third and the fourth book, while vinary is described in the twelvth book.

6 Cassianus Bassus lived at the end of the 6th or the beginning of the 7th century. He compiled from earlier writers a collection of agricultural literature. Dedicated to his son, his work was entitled *Eklogaiperigeorgias*. The usual Latin version of this title is *Eclogae de Re Rustica*. The original Greek text of Cassianus Bassus has been lost, but some of the contents have survived as part of a collection entitled *Geoponica* (in twenty volumes) completed about the year 950 and dedicated to the emperor Constantine VII Porphyrogennetos.

used during the Roman period and adjusted to the soil structure in the Serbian Danube valley. By using such tools, which is still in a way different compared to modern tools, made it easier to understand the ways an ancient grapevine breeder worked during Roman times.

Spade (*pala*). Holes for planting grapevine in the Serbian Danube valley were usually dug only with a spade, so a replica of a Roman spade was used during the experiment (Fig. 2). Spades were

Fig. 2 Replica of Roman spade

broadly in use in Roman agricultural production. Apart from their usage in gardening, vegetable breeding and drainage, it was also used in vineyards. Written sources describe several tools which, according to their shape and function, colud be called spades: *pala*, *bipalium* and *scudicia*. The replica of the Viminacium spade was made according to a mediaeval type which was widely used throughout the Balkans. Soil quality and structure surely caused different blade shapes, so the Mediterranean types and quite different from those used in the inland.

Spade finds from the Roman provinces at the territory of modern Serbia are not so numerous, indicating that apart from the iron spades, wooden spades were also used. Most of them are known from the Brović hoard near Obrenovac (Бојовић 1978: 185-195) and Šljivovac near Kragujevac (Петровић 1966: 253-256). Still, one can presume that such a tool was frequently used on this soil and that a small number of finds is caused by insuficcient number of performed research. Chronologically, all of the finds discovered belong to the period of Late Antiquity, i.e. 3rd and 4th century (Поповић 1988: 33-34).

Bident hoe (*bidens*). The second tool used during the experiment was a bident hoe (Fig. 3).

Fig. 3 Replica of Roman bident hoe

In written sources, it is mentioned as *bidens*, which is an abbrevation of *bidensrastrum*, in order to make a difference from rake (*rastrum*) which had more dents (White, 1967: 47-49).

Bident hoe is one of the most popular tools used in agriculture. *Bidens* which weights less, the so-called light bidens, was an obligatory tool used in vineyards. It was used for spreading soil around the vine roots, at the same time making sure that roots do not get cut.

Finds of bident hoes are not so rare at the territory of Serbia, so this kind of tool was divided into several basic types and variants (Поповић 1988: 44-46). They are of simple construction, usually hammered from a single piece of iron, with two flat, more-or-less parallel dents. The dent ends are flat, horizontally connected at the upper ending. In the middle of the horizontal part there was a handle hole. This type was found at the broader territory of the Danubian Limes (Grocka, Požarevac area, Boljetin, Majdanpek) and it is usually dated into the 4th century.

Fig. 4 Replica of Roman garden hoe

Garden hoe (***ascia-rastrum***). Written sources describe the garden hoe as a kind of agricutural tool representing a combination of a bident hoe and a pickax (Isidore, *Etymologiae*, 19. 19. 12), (Fig. 4).

Garden hoes were used for all of the works for which a bident hoe or different kinds of pickaxes were used, actually for surface cultivation of gardens and preparing the soil for planting grapevine (White, 1967: 67-68).

Finds of this tool are not rare at the territory of Serbia and they all belong to the same type, with a flat blade in the shape of a pickaxe on one side and a bident hoe on the other side. There is a handle hole in the middle. There are several variants of this type coming from the Serbian Danube and the Morava valleys: Sremska Mitrovica, the „Zelengora" field hoard, Saldum, Salakovac near Požarevac (Поповић 1988: 47-48). Chronologically, they all belong to the Late Antique period, i.e. the 3rd and 4th century.

DESCRIPTION AND RESULTS OF EXPERIMENTAL GRAPEVINE PLANTING

During the experiment, it was decided to plant twenty vines and to follow their development from planting to picking, all of that by following Roman practices of agrotechnical measures applied in ancient times (Fig. 5). Since the number of vines was small, it was necessary to show Roman practices as authentic as possible. This is why trees were used as supports for grapevines, actually all of the vines were planted next to oak trees. The way of planting vines next to trees in not necessarily a Roman practice, but it is known that Romans highly appreciated this kind of planting. The best wines of Roman times (Phalerian and Surrentine) came from vineyard which were planted in such a manner.

The practice of growing vines next to trees exists today also, but rarely and only in those climates and economic conditions which allow that. It is encountered all over Italy, in the areas of Tuscany, Veneto and Romagna, under the name of malberate. During the eight decade of the 19th century, one of the latest descriptions of growing vine next to trees in Serbian vineyard areas was left by Konstantin Jiriček. He describes *thick vines* growing around trees on the slopes of Oplenac (К. Јиречек 1959: 71-190).

As best tree sorts, Roman authors recommend planting vines next to poplar, maple, ash and oak (Siberian oak – *Ulmus pumila*), the latest one used as support in the Viminacium vineyard during the experiment. These tree sorts either possess weakly developed, not very huge roots, which do not disturb the

Fig. 5 Archaeological experiment – grapevine planting

vine roots, or their leaves are not too thick to shade vine leaves. Tree height should not exceed forty Roman feet, while the first branches which would be used as support for vine should go in the east-west direction. In such a way, the vine branches spread wreath-like over the cut branches of a host-tree.

During planning the future vineyard and since the experiment mostly relies on enological science, directions were followed given within enology. The first thing determining the future vineyard was the sort of vine to be planted, actually a sort typical for the area. The sources reveal that the best Roman sorts were white wines, sweet and with the aging capacity. This is why Phalerian wine was regarded as suitable for drinking after ten years and the Surretine wine even after twenty-five years of aging in closed vessels.

In Roman vineyards, numerous sorts were grown in different climatic conditions and different soils. Still, not all sorts are suitable for being grown just in any areas. This was also known to the ancient authors, so they gave directions about which sorts are more or less suitable for certain areas. The climate of the wider Viminacium area is certainly different from the Mediterranean cli-

mate. This is why the choice was made which was appropriate to the mild continental climate and the soil of the Stig. It is quite possible that after the occupation, the Romans came upon certain vine sorts at the territory of what is now modern Serbia, but it is also possible that during the four hundred years of their domination, they made a selection.[7] During the reconstruction of the vine sort, there was an important fact at disposal about re-establishment of vineyards all over Europe undertaken by Marc Aurel Probus (*Marcus Aurelius Probus*). He abolished the prohibition by the emperor Domitianus, which prohibited planting vineyards outside the Apennine peninsula and the first areas to be re-planted were the slopes of southern Fruška Gora (*Alma Mons*), the hills above the Danube along the *Via Militaris* and Zlatno brdo

7 Data not strictly confirmed report that vines planted on these two locations were brought from Asia Minor. The names of sorts grown at that time are known and there are even descriptions of some of them, but it cannot be claimed whether they remained unchanged until present times. Even if a DNA analysis would determine the origin, it would not mean too much, since there are numerous mutations of vine, caused mostly by growing conditions. Growing conditions are those determining development of vines even more than its original potentials.

Fig. 6 a-c The appearance of the vine in May 2013, (a-b); in August 2013 (c)

(*Aureus Mons*) near Smederevo (Mirković *1968*: 139; Mócsy, 1974: 298-299).

White tamianika is a sort which in many ways correspond to sorts known from ancient Roman sources. It gives white wines which only get better when left to age. It is not known with certainty when this sort was imported into this area. In the middle of the 14th century, it is mentioned in written sources describing the vicinity of Dubrovnik and Kotor.[8] Ancient sources are also determined about not planting different vine sorts in one single vineyard, so this practice was also followed while planting the Viminacium vineyard. The single sort planted was the white tamianika.

After choosing the sort, the planting spots were chosen. Ancient authors left numerous data about this matter, so some of them were applied. As written in the Geoponica (V, 4), planting must always be adjusted to the features of the chosen location. If a vineyard is planted in a warm area, vines must be orientated towards the north and vice versa, if it is planted in a colder area, the vines must face the south. If the climate is mild, it is the best to orientate the vine rows towards the east. Mild winds suit vines, but it can also easily be damaged by stormy winds. The opinion of most of the vine breeders is that vineyards should not be planted near rivers, let along swamps, since moisture and cold air permanently raise from these areas, bringing bad air. In the mentioned work *De re rustica*, Columella (III, 1.10.) confirms that neither cold climate nor hot summers suit vine, although it grows better in warmer climatic conditions. Rainy weather brings more damage than hot weather and it is better to plant vines in a hot area than in a rainy one.

According to Celsus (*De re rustica*, III, 1.8.), soil shoud not be too hard, neither too loosely, but closer to loosely, neither too rich nor too poor, but closer to fertile, neither too flat not too steep, but hilly, neither damp nor dry, but mildly damp. Similar data are known from Geoponica (volume V, 7), in which there are methods described of checking whether soil is fertile enough for planting vine resembling modern pedologic methods. During the experiment, holes were dug

8 Within Negrulj's classification from 1946 and according to its geographic origin, white tamianika is regarded as a sort originating from the Middle East, which in a certain way can help reconstruct the sorts planted at the Aureus Monsu during the eigth decade of the 2nd century.

two Roman feet deep, intended for planting, but the fertility checking was performed only in one hole. Some of the excavated soil was taken and put into a glass vessel. After that, soil and water were mixed until a perfect sediment is formed, well visible through the glass. This mixture needs to be tasted, certainly only a fingertip of it, and according to the taste it leaves on one's senses, future wine can be estimated, since the taste of water is expected to correspond to the taste of wine. If the taste is unsatisfactory, such a soil shall not give good wine. On the other hand, if the taste is nice and sweet, future wine can be expected to be of good quality.

All of the instruction mentioned above are applied for more than two millennia and, with some modifications, they are known to every winegrower, no matter where he/she grows his/her vineyard. According to ancient authors, the Viminacium vineyard is not placed in an area ideal for growth. This is why the Viminacium vines were planted next to Siberian oak trees, since according to Geoponica, in such a way they would be more resistable to inconvenient climatic conditions.

Ancient authors also recommend the best times for planting. From the very beginning of its cultivation in the European areas with mild continental climate, vine is planted during the time of its biologic quiescence. This corresponds to the seasons of spring and autumn. Roman practice also determins even more precisely the time of planting by bringing it in connection with the movement of the Moon and the Sun. Columella (III, 14.) recommends that planting in dry and warm areas is better in autumn. Rainy and cold areas, also including the Viminacium area, are better to be planted in spring. During spring, there are about forty days suitable for planting and these are from the Idae of February to the spring equinox. In Geoponica, there is one more information (V, 6, 10). By following the cycle of the Moon, it is recommended to plant during the increasing Moon. In any case, all of the ancient sources agree that it is not suitable to plant vine after the spring equinox. The Viminacium vine was therefore planted in spring (on the 19th of March), slightly before the spring equinox. This was another way of following ancient sources on the matter.

The last action undertaken in this experiment was planting itself. In ancient vineyards, measuring was performed, since vines were planted at distances of five Roman feet. Measuring was not performed in the Viminacium vineyard, since the vines were planted next to oak trees. On the other hand, the data about depth of holes differ from author to author. It is recommended that they should not be less than two and a half feet deep on flat grounds, resembling the Viminacium one. According to the opinion of the authors of the experiment, the hole depth described by Columella was suitable and it was therefore applied.

For the soil type of Viminacium (heavier mechanic structure), planting of vines with the already formed roots was recommended. The Romans often planted two vines in a single hole, so this is what was also done in Viminacium. On such occasions, their roots were separated with pebbles and they were placed one opposite to the other, slightly diagonally into the hole. Either during planting one or two vines into a single hole, the measure which even in modern times is often applied is to mix manure with soil and to fill holes with such a mixture.

Apart from regular measures undertaken while plantin Roman vineyards, some other, rather exotic measures were sometimes performed, in order to ensure the planted vines to be fruitful and grow tasty grapes. For grapes of good quality, grape seeds were sometimes put into the holes – if a planted sort was white, seeds of red vines were put and vice versa.

In order to root the vines better and be fruitful, a mixture of crushed oak bark and lens was put into the holes. Dried lens or broad bean seeds were also put into the holes to reject rodents, which was also applied in the Viminacium vineyard. This specifically was the last action performed during the experiment on the 19th of March 2013.

CONCLUSION

After following the growth on vines in the Viminacium vineyard it was ascertained that in May 2013, all twenty of vines were still alive. In August 2013, two of them withered during the very dry summer, still leaving eighteen healthy vines (Fig. 6 a-c).

The next step of Viminacium experiment is an attempt to cultivate some of the species grown at the Apennine peninsula. In this way, one should be able to understand whether in Roman times, it was pos-

sible to transfer plant species, actually whether the species grown in Italy were also capable of growing elsewhere, thus making it possible to produce excellent wines also in our region. Further steps of this experiment might give answers to this question.

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REZIME

OPENARCH PROJECT: ARHEOLOŠKI EKSPERIMENT SAĐENJA VINOVE LOZE U VIMINACIJUMU

Ključne reči: OpenArch, projekat kulture Evropske Unije, eksperiment, rimska poljoprivreda, vinova loza.

U okviru međunarodnog projekata kulture Evropske Unije, OpenArch, 19. marta 2013. godine u Viminacijumu je izveden eksperiment sađenja vinove loze prema rimskoj praksi. Za osnovu oglednog vinograda u Viminacijumu uzete su preporuke rimskih autora koji su se bavili različitim aspektima uzgoja, proizvodnje i prometa vinove loze i vina. To je pre svega Kolumela, sa svojim monumentalnim delom *De re rustica*. Drugi spis pod nazivom Geoponika nastao je sredinom X veka i predstavlja kompilaciju saveta o poljoprivredi. Većina tekstova u ovom obimnom spisu vuče korene iz rimske prakse.

Radi što bržeg uvođenja u svet rimskog vinogradarstva izrađene su replike poljoprivrednih alatki: ašova, dvozube motike i baštenske motike. Prilikom eksperimenta sađenja vinove loze, određeno je da se da prati dvadesetak čokota od njihovog sađenja, pa sve do prve berbe, primenjujući rimsku praksu za sve agro-tehničke mere vinogradarstva tog perioda.

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HOPLITES AND ANCIENT GREEK BATTLE FAIR. FROM EXPERIMENTAL ARCHAEOLOGY TO EXPERIENTIAL LEARNING. AN INSIGHT VIEW OF POPULARIZATION METHODS

ABSTRACT

The modern needs on observing and examine the past and the history, demand new and not conventional presentational methods. This article presents with the use of several examples, the ways that Association Koryvantes uses experiential learning for the promotion and the popularization of Archaeology. Innovative ways of communication, which enable archaeology outcomes to be accepted by the general public with a maximum effectiveness.

Keywords: experiential learning, interactive participation, Association Koryvantes, popularization, experimental archaeology.

INTRODUCTION

The development in the archaeological world over the past several decades has been undoubtful and multidimentional. The several routes in which archaeology has been evolved in combination with other sciences has given us new dimensions on the understanding of an archaeological discovery. The modern needs on observing and examine the past and the history, demand new and not conventional presentational methods. Methods that have to involve the receiver and make him part of what is going to be presented.

Especially children, as the most related to this, have to be in the centre of those presentational methods and techniques. Experiential learning and interactive participations can help children to learn

Fig. 1 Kinaesthetic Activities with children in Biskupin Archaeological Festival, 2011 (photo Association of Historical Studies Koryvantes)

by exploring, experiencing, and transact with the world around them. This form of education is not conventional. Children are allowed to learn naturally, on their own terms. Experiential education can occur via acts like creative workshops, playing, pretend playing, imaginative participations.

Fig. 2 Interactive workshops with children in Biskupin Archaeological Festival, 2011
(photo Association of Historical Studies Koryvantes)

One to one transaction enhances physical learning, a language that includes kinaesthetic activities, natural to most children (Griss 1998).

Neuroscientists also confirm that learners who have been offered several modes of representation generate more brain activity, because they try to correlate these stimuli. (Watson, 2005). Thus, stimulation of multiple sensory experiences (speech, actions, pictures, symbols) can offer deeper understanding of a new concept. This position is also reflected in Howard-Jones' (2011) findings that simple learning games help students recall easily newly learned information. These results give rise to the elusive theory of 'edutainment' (experiences that combine education with the entertainment of games).

Furthermore, recent neuroscientific research adds new perspectives to better understand the role that kinaesthetic activities and movement plays in learning (Jensen, 2005; Watson, 2005). Jensen (2005) stresses the importance of integrating movement activities into everyday learning. According to him, brain-compatible learning means that educators should teach lessons along with movement, drama and the arts. Finally, a Johns Hopkins University neuroeducation research group found that intense training in visual arts, music and dance was associated with better geometric sensitivity performance (Johns Hopkins University NeuroEducation Initiative, 2009). These promising results can help educators further their understanding of the ways their students learn and can provoke thinking with regard to broader educational issues.

EXPERIENTIAL LEARNING

The Association of Historical Studies 'Koryvantes' deals with experimental archaeology, historical reconstruction and reenacting. It concentrates on the study of ancient Greek warfare through experimental archaeology techniques, covering a time range from the 15th to the 3rd century BC. Until now we have reconstructed successfully various types of warrior accoutrement

Fig. 3 Interactive workshops with children in a Greek Private School, 2008
(photo Association of Historical Studies Koryvantes)

from the 10th to the 5th century BC. The Kory-
vantes Association has been active officially from
2009, as a non–profit, living history association.
The Association counts more than 45 active mem-
bers in Greece and abroad, amongst them writers,
researchers, reenactors and history enthusiasts.
During these four years of activity, the Association
has managed to be productive on many levels re-
lated to historical research issues, e.g. participation
in experimental archaeology projects, publications
of experimental results, participation in numerous
educative public events and international docu-
mentaries (Bakas 2012).

Working with the scope of research and
reconstruction of ancient weapons and armors
covering most of the Greek Military History from
Bronze Age down to the appearance of firearms,
the Association of Historical Studies Koryvantes
is in position to comprehend the unrealistic nature
of reconstructions undertaken under a set of lax
approaches and image-copying approximations
and it stresses the need to introduce methodolo-
gies and techniques of Experimental Archaeolo-

gy. This need rises in all ages from Mycenaean to
Late Byzantine – especially the latter for which
we do not have any real finding relying solely on
few artistic depictions.

Without any doubt experimental archeology
has indisputable advantages as an interactive me-
dium between performers and the general public.
Living history and a revival of the past in real-
istic fashion can be achieved by a natural fusion
of protagonists and spectators (Bakas 2010). Our
club had the opportunity to implement experi-
mental archeology with interactive applications
during several events and workshops, combin-
ing the archeological reconstructions with the
live communication with the audience. Generic
activation of the human senses (touch, hearing,
vision, smell) and the simultaneous participation
of a receiving audience during the presentation
guarantee acceptance of the results of experimen-
tal archaeology (Bakas 2012). In this context, our
Association participates regularly in various pub-
lic activities, such as demonstrations and lectures
for children and students, public presentations at

Fig. 4 Transaction with children in Biskupin Archaeological Festival, 2011
(photo Association of Historical Studies Koryvantes)

cultural events and public lectures about Ancient Greek martial arts. These aspects are easy to find in modern interactive marketing and have been introduced at many archaeological parks (Yorke and Uzi 2004, 10–20).

Our participation on the Biskupin Archaeological Festival in Poland (17–25 September 2011) gave us a critical opportunity to deploy various popularization methods under the guidance and strategic plan of educational supervisors. The results of experimental archeology, such as a technical movement, a hoplite phalanx drill and phalanx formation, were combined harmoniously and amusingly with the participation of small children during the event. The audience and mostly the children were the aiming center of our presentations. We used several means trying to convince the children that the heavily armored hoplites were not some fearsome monsters but somehow «heroes» who were willing to be approached and could be friends with them.

One interesting workshop was the «Hoplitodromia» race, a race used to be held by the ancient Greek warriors and athletes carrying only a shield. Each time 5 randomly selected children were urged to participate on this race, in front of the hundreds of the audience. The final price for the winner would be a Koryvantes t-shirt and an olive wreath. While the whole history of the Hoplitodromia race was described by a specialist through a microphone, the children had the opportunity to realise the importance and the cultural meaning of this representation and participation.

The end result of the workshop was surprisingly successful and satisfactory. The collaboration between the hoplites and the children, and the two–way interactive transaction gave the children the opportunity to express themselves in the most effective way. When an interactive lesson of experimental archeology is being linked to kinesthetic experiences, the result is that the children gain a deeper understanding of the content than an isolated course. A flexible approach to History and Archaeology education is necessary to encourage this kind of learning. The experience we obtained doing this interactive course helped us cultivate a more holistic view on this subject and gave us more ideas for our upcoming public presentations.

Another interesting workshop was during our participation in Gallo-Romain Internation-

Fig. 5 Kinaesthetic Activities with children in Biskupin Archaeological Festival, 2011
(photo Association of Historical Studies Koryvantes)

al Archaeological Festival in France (June 2-3 2012). Our participation was under the directions of educational specialists who guide us on new popularization techniques and activities. Along with individuals visitors we had the opportunity to welcome primary schools with their teachers. During this, while on our exhibition tent, we urged the children to try to touch and wear our armour (always in safety mode). We gave emphasis on creativity, imagination and collaboration. We then urged them to talk between each other and try to make stories of imaginary ancient warriors and heroes. This exercise gave the students enough space to move, play and create their own piece of artistic work and encouraged conversations and working in groups in order to support their historical and social learning. It was impressive how aesthetically valuable, the choreographies they created were. The freedom to experiment and create moves and scenarios was regarded as fun, and also the sheer enjoyment of the physical movement opposed to 'bookish' learning. This kinaesthetic experience was appreciated by all the participant children.

Nevertheless, we were also aware of the fact that students' creativity might be affected by

our presence, but surprisingly nothing happened. A meaningful interpretation of the results regarding the relationship between kinaesthetic learning and students with specific learning needs in history is needful. It is important to remember that the supervising teachers noted that during this workshop the students with 'specific learning needs in history' and 'behaviourally challenging children' who are 'kinaesthetic learners', were very active, participative and 'really enjoyed it'. According to the teachers this workshop gave them an opportunity to 'have a different way of learning', feel included – as they 'did as much as anyone else' – and, above all, 'helped their learning on history and archaeology going further.

CONCLUSION

Thinking about traditional archaeology and modern educational methods as two diverse and non-overlapping fields is at least erroneous and should stimulate the debate on the importance of a holistic educational system, in which all areas of the curriculum should be linked and be opened to new options. Resolution of this problem would

have catalytic effects in education as it has the prospect of breaking through the current curriculum structure, the teaching guidelines and the educational system in general.

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REZIME

HOPLITI I ANTIČKO GRČKO BORILAŠTVO. OD EKSPERIMENTALNE ARHEOLOGIJE DO EMPIRIJSKOG UČENJA. RAZMATRANJE SUŠTINE METODA POPULARIZACIJE

Ključne reči: empirijsko učenje, interaktivno učešće, asocijacija Koryvantes, popularizacija, eksperimentalna arheologija.

Savremeno doba zahteva nove i nekonvencionalne metode prezentacije kojima se tumače rezultati dobijeni proučavanjem prošlosti. U ovom radu je prikazana upotreba nekoliko novih metoda, koje društvo Korivantes koristi u eksperimentalnom učenju i promociji i popularizaciji arheologije. To su novi, inovativni načini komunikacije, koji omogućavaju razumevanje arheologije u široj javnosti u najvećoj mogućoj meri.

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ARCHAEOLOGICAL EXPEDITION AS ESSENTIAL ASPECT OF SCIENCE AND EDUCATION IN THE SYSTEM OF HISTORICAL AND CULTURAL HERITAGE

ABSTRACT

Any museum carries out three paramount functions: a competent preservation of historical heritage of mankind, studying and classification of collections of artifacts and its promoting. These three components of museum work are consistently interconnected and equal in their importance. We suggest to pay attention to such sphere of museum activity as organization and carrying out archaeological expeditions. Expeditions not only carry out their direct functions, which are detection and research of archaeological objects. They also become peculiar organizations capable to keep, revive and propagandize objects of a cultural heritage. Moreover, archaeological expeditions, creating the customs, traditions and behavior rituals, become peculiar examples of a certain subculture.

Keywords: archaeology, expedition, Nymphaion, excavations, Hermitage.

Archaeological objects shouldn't be isolated from a modern society and „assigned" to scientific archaeological elite which would use them for especially scientific constructions the information about which practically isn't known to a wide range of people. This heritage shouldn't act in the immobilized kind, in passive forms of culture on inaccessible regiments of museum depots. It is necessary to study the archaeological heritage simultaneously within the limits of the several scientific disciplines considering archaeological objects in different aspects: archeology – as a source base for reconstruction of events of the past; museology – as an object of protection and presentation by museum means; monument studying – as a substantiated memory of the past; cultural science – as a cultural phenomena. Any museum carries out three paramount functions: a competent preservation of historical heritage of mankind, studying and classificating collections and its promoting. These three components of museum work are consistently interconnected and equal in their importance. In this aspect we suggest to pay attention to such sphere of museum activity as organization and carrying out archaeological expeditions.

Even from the structure of the Department of Classical Antiquities of the State Hermitage Museum (St. Petersburg, Russia) one can see that a special attention is paid to archaeology. The De-

Fig. 1   Department of Classical Antiquities The State Hermitage Museum

partment is divided in two parts – the main part with the collections bought or presented and another one consisting of archaeological complexes and other subjects found exclusively in the course of systematic archeological excavations (Fig. 1). Strictly speaking all Departments pieces have once been found during excavation, at first casual or illegal, later – professional. And on the one whom found and transferred an item to a museum frequently depends, will it enter a circle of scientific interest of researchers or lay down on regiments dead cargo.

After Crimea joining Russia in 1784 the acquaintance with antique monuments which remained at coast of Black sea begun (Fig. 2). Thus on the cape Kara-Burun (on modern cards this cape is called Kamish-Burun) was found ancient city Nymphaion. The site of this ancient settlement occupies a plateau on the shore of Kerch strait (in the ancient time - Bosporus Cimmerian), to the west from which are located barrows and

Fig. 2   The map of the Nothern Black Sea Area

a soil necropolis. Nymphaion was based by colonists from Greece presumably in the first half of VI century B.C. (Fig. 3). Natives from island Samos probably took active part in the basis of this settlement which was named after the Greek word "source" (Νυμφαῖον or Νύμφαιον). Thanks to the convenient arrangement near to harbor and to the fertile earths, Nymphaion soon became one of the leading centers of trade and the supplier of bread

Fig. 3   View of the plateau on the cape Kamish-Burun and the Kertch strait
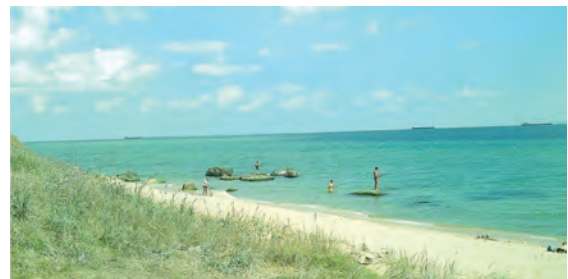

Fig. 4   Seashore of the Kerch strait

in the Bosporan state (Fig. 4). That's how ancient author Strabo described the city: "Panticapaeum is the metropolis of the Bosporians and is situated at the mouth of Lake Maeotis.The distance between Theodosia and Panticapaeum is about five hundred and thirty stadia; the district is everywhere productive of grain, and it contains villages, as well as a city called Nymphaion, which possesses a good harbour"(Strabo VII. 4).

The first regular archaeological researches of Nymphaion and its necropolis were made in 1876-1880 by the Imperial Archaeological Com-

Fig. 5 View on the place of excavations

mission when the site of ancient settlement and barrows of Nymphaion have been described and put on the plan (OAK 1867, 1868, 1876-1880). Excavations proceed up to now. They stopped only twice, from 1914 to 1938 and from 1941 to 1945, both as a result of World wars. Nymphaion archaeological expedition of the State Hermitage Museum at the Crimea peninsula, now Ukraine, exists more than 70 years. During this time through it passed thousands of people. The monument causes a great interest in a wide range of people in Russia and abroad (Fig. 5).

In the expedition work specialists of the highest class, such as archaeologists, restorers, artists, architectures, photographers. They make site plan shooting, select found material and re-

Fig. 6 Fresco with a ship from Nymphaion

Fig. 7   New exhibition devoted to art and culture of the Bosporan Kingdom

store it. Then they fix the material; make drawings and photos before carrying them to the museum. Beginning from 90ies of the 20th century all founds are kept in Kerch.

Popularization of subjects found during excavations and cultural education through archeology is carried out in different ways. The results of excavations are regularly published as reports and scientific articles and sounded at annual archaeological conferences. International scientific conferences as for instance "Bosporan Phenomena" are periodically organized. And of course subjects once found in the expedition are exposed in St. Petersburg (the Hermitage Museum) and in Kerch (Fig. 6). Recently in halls of the Department of Classical Antiquities in the Hermitage was opened the new permanent exposition devoted to art and culture of the Bosporan Kingdom (Fig. 7). Also from time to time temporary exhibitions are made where items found in Nymphaion take part. Such exhibitions were held in Russia, Ukraine, USA, Spain (Уильямс, Огден 1995; Древний город Нимфей 1999).

Also expedition bears educational function. Annually students of the St.Petersburg State University pass here their archaeological practice. Sometimes they are joined by the students from Belgorod and Niznij Novgorod Universities. Next year they often come back on a voluntary basis taking their friends with them. After the excavations students from the St.Petersburg State University come to the Hermitage on museum practice in order to study archaeological collections more thoroughly. Members of the archaeological circle from Dnepropetrovsk came in the year 2012 to try themselves in practical archaeology. Later most of them will work as specialists in museums, institutes, libraries. Besides, on the place of excavations excursions for different visitors such as experts, members of other expeditions, people having rest in Kerch and boarding houses are organized. Often here come buses with tourists from a neighbor's city Feodosiya. Since last year the

Fig. 8 Archaeological camp

Kerch museum arranged permanent excursions for all visitors of the ancient city.

Nowadays when new countries appear everywhere it is necessary to build relations anew not only between them but also between various organizations in these countries. In this situation organizing new complex international archaeological expeditions is a very good opportunity which can help to set friendly contacts both interstate and international. But of course not all passes so successfully as one can wish. Local inhabitants sometimes are not friendly. For example, sometimes in steppe round the camp there are fires which are very dangerous especially during the night when everybody sleep.

Besides it is impossible to dismiss constant activity of „black archeologists". They undertake illegal excavation all year long. But especially attentively they look after the work of expedition so it is necessary to watch the place of excavations constantly. It is especially actual when excavations take place on a necropolis. At the moment the problem of safety of a site of ancient settlement during the interseasonal period should be solved because the place of excavations has neither fence, nor protection. As a result after the departure of the expedition acts of vandalism take place: boards are pulled down; holes dig out, walls broken. That's why it is necessary to expand

educational work in order to increase a level of consciousness and culture of population.

And certainly for the decision of the problems mentioned above structure of participants of expedition is of a great importance. Long years it represents a solid collective of adherents where there is an absolute equality irrespective of age and the social status of its members. Each season approximately 100 persons passes through expedition The main kernel of constant participants of the expedition is approximately 60% from total number.

Life of the expedition has its customs and traditions developed for last decades. The tent camp is located in steppe on the territory of a site of ancient settlement (Fig. 8). Because of the absence of water it is brought in tanks. Products are brought from a city; the garbage is taken out by special cars. We rigidly watch an ecological condition around. After the camp removal all traces of residing are destroyed.

This way of life, almost torn off from civilization, develops special human relations when life of everyone proceeds in close dialogue with all members of collective. It inevitably demands creation of a stable psychological climate of collective of adherents that can be reached by different ways. For example, certain selection of the future participants of expedition is absolutely necessary

because it is frequently found out that not all of them understand what exactly they will do. Some people assume this voyage as a certain way of pleasant rest on a seacoast.

Unlike fashionable now role-playing games an expedition don't recoup role game but create some kind of role techniques. Various competitions are regularly held here. As long as all member of expedition, except „the higher command structure", cook by turn we regularly organize competitions on the best preparation of a dinner or on the most original dish. Dances and discos are often arranged. Birthdays and, of course, the City Day are marked. It is a separate holiday when on the improvised platform in the camp center the dramatized representation is arranged. On a seacoast in the evenings are arranged fair-shows, singing and playing guitars around a fire. Several collections of songs written in the expedition were already published. Sometimes we spend evenings of memories where new participants of expedition can learn a lot about stories and tradition of the Nymphaion expedition. Children who come with parents aren't forgotten also and take a certain part in camp life. Competitions of children's drawings with rewarding of winners in different nominations are arranged.

As a result the social stratum of people who passed the archaeological school and is now capable, together with real experts, to teach newcomers skills and working methods of excavations and ceramics sorting is created. Whence they arrive all of them consider Nymphaion expedition as their second homeabout which they care. Annually here come to work representatives of many countries, such as Germany, Poland, USA, New Zealand, Belgium. So it is not surprising that people try to register in advance for the next season as long as the list of participants is limited. And they are very much upset, when for whatever reasons they don't manage to arrive.

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REZIME

ARHEOLOŠKA ISKOPAVANJA KAO NAJVAŽNIJI ASPEKT NAUKE I OBRAZOVANJA U SISTEMU ISTORIJSKOG I KULTURNOG NASLEĐA

Ključne reči: arheologija, iskopavanja, Nimfej, Ermitaž.

Svaki muzej ima tri najvažnije funkcije: kompetentno čuvanje svetske istorijske baštine, proučavanje i klasifikaciju zbirki nalaza i njihovo popularizovanje. Ove tri komponente muzejskog rada se međusobno prožimaju i podjednako su važne. U ovom radu je pažnja posvećena onoj sfe-

ri muzejske aktivnosti u okviru koje se organizuju i sprovode arheološka iskopavanja. Iskopavanja pored otkrivanja arheoloških objekata, postaju specifičan metod koji je u mogućnosti da sačuva, oživi i popularizuje predmete kulturnog nasleđa. Štaviše, arheološka iskopavanja kroz formiranje običaja, tradicije i rituala, postaju specifični primeri određene sub-kulture.

Sve ovo možemo pratiti na lokalitetu Nimfej (Nymphaion)na Krimu u Ukrajini, na kome istraživanja sprovodi Državni Muzej Ermitaža već više od 70 godina. Tokom ovog perioda, kroz njega je prošlo na hiljade ljudi. Osim stručnjaka, kao što su arheolozi, restauratori, umetnici, fotografi, ovde kao volonteri rade studenti i predstavnici raznih zemalja. Predmeti otkriveni tokom iskopavanja se izlažu u muzeju Ermitaž i u gradu Kerču. Takođe se organizuju povremene izložbe na kojima se mogu videti predmeti otkriveni u Nimfeju. Ovaj lokalitet pobuđuje interesovanje velikog broja ljudi kako u Rusiji tako i u inostranstvu. Učesnici iskopavanja održavaju redovne sastanke u Ermitažu, dok studenti dolaze da proučavaju arheološke zbirke. Primer arheološkog iskopavanja Nimfeja pokazuje da slične organizacije bez sumnje podižu svest javnosti o očuvanju i daljem razvoju interesovanja za svetsku kulturnu baštinu.

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ARCHAEOLOGICAL HERITAGE AND MODERN SPECTACLE AS CULTURAL ENTREPRENEURSHIP EXPERIMENT

ABSTRACT

Although some conservative scholars believe that science should only deal with the scientists, it is proved that science is a genuine cultural need of human society. The popularization of science in this sense represents a two-way street. On the one hand, it raises the educational level of non-scientific audience, and the other increases the degree of financial autonomy of scientific projects. It turned out that the popularization of science is of particular importance to the so-called non-profit research among which those archaeological undoubtedly occupy a leading position. Historic character of the archaeological heritage and the changed nature of the contemporary reception of the audience under the influence of modern media, film and information technologies have created a fertile ground for the use of modern spectacle in order to popularize the archaeological heritage. This paper analyzes that relationship with its benefits and side effects as an experiment within the cultural entrepreneurship.

Keywords: heritage, spectacle, cultural entrepreneurship, media, communication, benefits, side effects.

The usual interpretation of the notion of spectacle in modern culture is primarily associated with a particular kind of Hollywood production movies, which usually include sumptuous production design, special effects and scenes involving many people (Prijatelj 2010: 53). Of course, such visual framework includes the so-called lofty themes and scenario based on important historical and religious events. The content itself is sufficiently immense, so it goes well with a glamorous, somewhat pretentious phenomenal form that will successfully entertain a wide audience with a two-fold objective - to provide entertainment and education. Although contemporary critics of mass culture, this often unjustly identified with a media spectacle, think that the

Hollywood approach to history, archeology and art directly threaten the traditional understanding of individual experience and ontological cognition of the essence of cultural heritage (Božović 2010: 15-16), the fact is that new mechanisms of global communications stipulate new ways of presentation of heritage. Among these new ways, the modern spectacle is the most complex form of effort to "revive" the artistic, and primarily archaeological heritage, and to be interpreted in a way that is understandable to the general cultural audience. At the same time, the form of the spectacle is the most complex and the most attractive mechanism of presentation, promotion and marketing of cultural heritage, that tends to transform the mere observation of the work of

art into a kind of virtual experience on the edge between the empirical "participation" in a particular episode, or into any of the forms of cultural history from a long gone era (Sandell 2007: 120–125). From simple animations with the help of effective illustrations, mini-trailers based on the combination of documentary and feature film, perfect 3D reconstructions, through archaeological parks with adequately costumed curators and guides, thematic workshops and video games, and reality shows with a simulation of life conditions in a certain era – a modern spectacle as one of the key mechanisms of the new museology and heritology represents a sort of a "tool" of cultural entrepreneurship (Kotler N. i Kotler P. 1998: 41). When it comes to the archaeological heritage which can be a particular semantic, semiotic and visual riddle for laymen, mechanisms of spectacle (Martinović 2010) can be an ideal means to "tell" and interpret the content to interested audience, and at the same time to make it look attractive enough to potential audience.

The fact that we live in a world of a new techno-cultural reality (Kellner 2003: 12) that functions through mechanisms of spectacle based on a combination of information and entertainment as premises of postmodernist *online* and digitized society, sets up a wide range of communication rules within the unified public space that for several decades now tends to sublimate different public and social categories. In this, global milieu, science and culture have long ceased to be an isolated island populated by selected individuals with the holy task of cognition and interpretation of new knowledge. Information technologies, through networking mechanisms of fantastic databases, have directly caused their accessibility by targeting any human activity within the field of global communication, presentation and marketing. Culture is in that way democratized to the limit, and the popularization of science, art and heritage became an issue of sustainability of entire cultural and research systems, and with the expansion of the global economic crisis an issue of its justification in terms of institutional investment.

According to the data of Europe's Conference for Culture in 2010, the Union allocated only

Fig. 1 Society of spectacle – audience with completely changed perception and expectations

1% of the total funds for investment in culture with the announcement of important restrictions within that modest budget in the future.[1] To the protest of workers and cultural professionals was answered with the expert advice in the field of cultural entrepreneurship as the youngest among the private management initiatives. At a conference held in Brussels in October 2011, the primary topic was the digitization of culture with unambiguous tendency of its globalization, market positioning, and increase of real potentials of self-sufficiency, and definition of projects, programs and activities that produce their own finances.[2] All of these elements, as well as the realization of the need for better positioning and modern presentation of heritage stipulated the need for redefining and reviewing various models of animation and communication of wide audience as consumers of cultural con-

1 The percentage is given approximately, since an EU fund for culture covers as well recreation and education. (for more information see http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/General_government_expenditure_statistics).

2 Selected papers from Brussels Conference 2011 you may find on http://ec.europa.eu/culture/events/forum-2011_en.htm

Fig. 2 Two sides of medal - Archaeological park in Viminacium without guides-animators

Fig. 3 …and with them dressed as Romans

tents. Having in mind that the reception of that audience is for more than half a century conditioned by standards and amenities that are dictated by electronic and visual media, then a well designed simulation, visual effects, adrenaline timed activities and dynamics appear as prerequisites of successful operation within a successful cultural entrepreneurship that in addition to exhibitions and promotional contents includes cultural tourism.

Did the spectacle at whole came to archaeological and artistic heritage with Indiana Jones and Lara Croft or for the attractiveness of the cultural heritage are more important ideal, often animated 3D reconstructions, video games and historical fiction novels, are interesting phenomenological issues in the cultural history of the late 20th century, although it is the fact that the spectacular archaeological discoveries such as Schliemann's at Hissarlik or Carter's in the Valley of the Kings are

Fig. 4 Popular films about archaeology, art and history change the interest and expectations of audience

older than the age of motion pictures, television, Big Brother and Facebook. It seems that the magic of spectacle as both epic and cultural category, is historically caused by factors of understanding of the divine and sublime in the distant past, so the reciprocity of archeology and a sort of public performance with elements of theater, is a kind of

Fig. 5 Digital animations and games introduce teenage and younger audience with heritage in an attractive way

Fig. 6 Living history concept is one of the most popular educational approaches in communication with audience

continuum inside which is only needed to find the right balance in terms of presenting proven facts in an interesting way. Otherwise, archaeological finds, especially those within the archaeological field, and even well-designed archaeological parks like Viminacium (Serbia) would not be interesting to a wide audience that carries the financial power that is of great importance for new research, and for store and maintenance of existing sites, galleries and museums.

Thinking of a spectacle as a category that makes an observer's role passive (Božović 2010: 27) from the point of museology and heritology has long been untenable because it is in a direct contradiction with the fundamental starting point for the revival of the past that is based on interactions with the aim of increasing the understanding of museology and heritology contents. In order for an archaeological heritage spectacle to be successful in terms of interpreting the thematic defined content, the audience must not be passive. Sensation, directly provoked by the appearance of conceptualism in contemporary art that using staging, multimedia techniques, direct communication, animation and other, often cinematic and theatrical means provokes the audience to interact, has violated as a whole the ideal of cultural heritage as a cultural content that is classy and in festive silence "consumed" by se-

lected cultural elites.

The idea of heritage that requires specialized knowledge, study and special preparation in order to be contemplated in a 1:1 ratio between observer and work, in conditions of changed perception and new means of communication, has become unsustainable. Heritage, whether it's museum item, archaeological sites or intangible heritage, must adopt the principles of the spectacle culture in order to communicate with a new audience. Above all, it must be sure to which target group is addressed, what is expected of the "dialogue" that will be lead both with the local community that represents the primary group that makes regular visitors, but also with other potential consumers of services offered, for cultural entrepreneurship as a special task to itself sets the animation and design of that part of the audience who might never would have chosen art or cultural heritage as a priority interesting content.

What are the benefits and what the negative effects of the interaction between heritage and spectacle?

The fact is that museums, galleries and archaeological sites on a global level, in recent decades record level of attendance that could not be imagined in the period between the two world wars. Also it is a fact that the new museum audience knows no class, social, religious or other dif-

Fig. 7 Crowded museums and archaeological sites are possible side effects of new way of communication with audience of all ages, classes and origins

ferences, or more precisely that the concept of mass culture when it comes to museology and heritology received the most positive possible meaning. Stimulating, creative mechanisms through various interactive workshops and entire shows that are played in museums, archaeological parks and similar areas dealing with the cultural heritage, are of incalculable importance for raising the level of education in the widest possible audience, and for initiating creative processes of individuals. Institutions that carry out such contents directly benefit the local and wider community, by improving economic and social infrastructure, and also by representativeness in terms of prestige, which has never been of secondary importance in the culture.

Fig. 8 Nobody complains because too many people visit museums and sites

And although this illustration might seem too perfect to be real, besides undoubtedly good effects of connection between heritage and spectacle, this interaction has potential negative effects. First among them is related to, let's use an expression peculiar to the theater, the possibility of "false playing" of the content, or the oversized, and therefore false, unscientific display of facts in order to achieve greater sensation. In these situations, it often happens that the archaeological and museum objects are installed or used outside of the scientifically based and professionally justified context in order to make the content that is directed toward the audience more interesting, more sensational and more challenging. Interpretation, scenic and digital effects, costumes which are increasingly being used to enhance the understanding of the effect of a previous era, they are all "tools" that should be handled carefully and skillfully.

The second, today a real measurable negative effect of the interaction of heritage and spectacle, is enormously increased number of visitors to certain museums and archaeological sites. No matter how paradoxical it may sound, but too many people inside a museum or an archaeological park directly affect the microclimate changes in those areas which physically endangers the

museum objects and archaeological excavations at the sites. A large number of visitors set new requirements to conservators and restorers, and especially to the management of institutions involved in the presentation, promotion and preservation of cultural heritage. Each innovation of security services increases the cost of presentation of work of art. However there is no data that any museum or archaeological park in the world complains because there is an enormous number of visitors, because the museum without a great audience is only a large, modern equipped warehouse of old, interesting items.

The fact that the culture of spectacle in the 21st century has become an indispensable part of the new ways of communication and presentation of heritage clearly suggests that it is a key tool of cultural entrepreneurship. Although still in the experimental stage, because it involves training particular profile curators, animators and demonstrators, as well as a distinction of desirable uses of spectacle in relation to "false played" scenarios and kitsch, spectacle has proven that its dispensed, selectively designed application in museums and archaeological parks had a positive, multi-disciplinary effect. As if an entire industry based on the modern idea of big profits found reference system of high-profile, educational, yet exciting themes to create on a principle of interactive games a space in which learning becomes a top-notch entertainment.

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REZIME

ARHEOLOŠKO NASLEĐE I MODERNI SPEKTAKL KAO EKSPERIMENT KULTURNOG PREDUZETNIŠTVA

Ključne reči: nasleđe, kulturno preduzetništvo, medij, komunikacija, benefit, negativan efekat.

Činjenica da je kultura spektakla u 21. veku postala nezamenljivi deo novog načina prezentacije i komunikacije baštine jasno sugeriše da je ona i ključni alat kulturnog preduzetništva. Iako još uvek u eksperimentalnoj fazi, jer podrazumeva obuku naročitog profila kustosa, animatora i demonstratora, kao i jasno razgraničavanje poželjnog načina upotrebe spektakla u odnosu na "preigrana" scenarija i kič, spektakl je dokazao da njegova dozirana, selektivno oblikovana primena u muzejima i arheološkim parkovima ima izrazito pozitivan, multidisciplinarni učinak. Kao da je čitava jedna savremena industrija utemeljena na ideji velikih profita pronašla referentni sistem visokoprofilisanih, edukativnih, a opet uzbudljivih tema kako bi na principu interaktivne igre stvorila prostor u kome učenje postaje vrhunska zabava.

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ARCHAEOLOGICAL SITE STOBI: DIFFERENT ASPECTS OF POPULARIZATION

ABSTRACT

In 2008, the Government of R. of Macedonia established the National Institution for Management of the Archaeological Site Stobi. The purpose of NI Stobi is permanent presence of educated staff at the site which will conduct the excavations, conservation, presentation and popularization. In the past three years, NI Stobi initiated various projects, as well as many activities which contribute in different ways towards the appropriate management and further development. This article illustrates the efforts and challenges of NI Stobi for effective results in the archaeological work, conservation and general popularization.

Keywords: Stobi, heritage, investigation, conservation, presentation, popularization.

The archaeological site Stobi is located in the centre of the Republic of Macedonia, about 80 km to the south of Skopje along the European Route E75, at the confluence of the two rivers Vardar and Crna (ancient Axios and Erigon) (Fig. 1). The geographical location itself implies that Stobi must have had a long history of habitation which is confirmed archaeologically by the discovery of cultural strata that date back to the Late Bronze Age. During its existence and development Stobi had several major urban phases beginning with Livy's *urbs vetus* of the 2nd century BC,[1] climaxing with the Early Roman *municipium*, as well as the Late Antique capital of Macedonia Secunda and declining with the end of the 6th century as many other old towns (Fig. 2).

It was not hard for Leon Heuzey in 1861, almost a millennium later, to map the position of the once important city with its ruins scattered across

Fig. 1 Map of the Republic of Macedonia

the field that the locals called "Pusto Gradsko" or literally translated - "deserted town".[2] The first ex-

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1 Livius XXXIX. 33.

2 Heuzey et Daumet 1876

Fig. 2 Aerial view of Stobi in 2009

cavation and the first publication happened during the First World War by the German officers,[3] but it was not until the archaeological project of the '20s and the '30s, conducted by the National Museum of Belgrade, that Stobi became a major antiquity site in Macedonia with many excavated public and residential buildings. The puzzle of Stobi continued to be focus number one during the following decades of the century andthere is not a year when the excavation or conservation activities halted. During the '70s there was a large Yugoslav - American joint project directed by Djordje Mano-Zissi and James Wiseman which significantly contributed towards the establishment of Stobi as a referent site in Macedonia for the Roman period and the Late Antiquity.[4] The '70s were the beginning of tourism at Stobi. The maintenance of the site for many years was the responsibility of the Museum Veles and later in 1998 the jurisdiction was transferred to the National Institute for Protection of the Cultural Monument, later renamed in National Conservation Centre. Unfortunately,

these two institutions located 30 and 80 km from the site could not establish a solid model for appropriate care, protection and presentation of the site. Finally in 2008, the Government understood the need of permanent presence of educated staff at the site and founded the National Institution for Management of the Archaeological Site Stobi as a unique model so far.

The basic goals of NI Stobi are the archaeological investigations, conservation, maintenance and presentation of the archaeological site. According to its Statute the institution should have 3 different departments: Museum and research, Protection and Administrative department. In three years only the first is fully developed with permanently employed archaeologists while the other two, thanks to the economic crisis, are functioning with personnel hired on projects and temporary contracts. The departments have clearly defined the areas that they cover but they also have multidisciplinary approach at certain challenges depending on the actual issue.

The Museum and research department is responsible of the archaeological excavations, documentation, storage of artifacts, publications and exhibitions. There are six employed archaeologists who cover the different periods in terms of muse-

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3   Hald 1917

4   For the full bibliography of Stobi until 1973 see Radošević 1973; For more recent publications see the Bibliography in Mikulčić 2003

Fig. 3 Excavations of the Theatre in 2009

um work, the numismatics and they take care of the documentation as well as the digital data base. Beginning with 2009 and 2010, NI Stobi is conducting two active excavation projects.

The first project is part of the so called "capital projects" of the Government for systematic excavation. In 2009 and 2010 the excavations were applied on a large area of almost 2 hectares with 500 workmen and more than 50 staff members (Fig. 3).[5] The project continued in 2011 and 2012 on a smaller scale with a smaller budget and it is mainly focused on completing the excavations on several locations in order to understand the full context of the area and allow the beginning of the conservation (Fig. 4).[6] The priorities of the project are the full investigation, publication and conservation of the Temple of Isis, the Theatre, the Episcopal Basilica and the large residential segment of the 6th century urban phase.These excavations are followed by annual temporary exhibitions at the Museum of Macedonia where besides Stobi the public is able to see the uncovered artifacts from other sites as well. The results of these excavations are about to be published in the Studies in Antiquities of Stobi, an

Fig. 4 The Temple of Isis after conservation in 2012

archaeological journal published in three volumes until 1981. NI Stobi intends to publish the fourth volume in 2013 with many new and old results on different aspects of the cultural heritage in Stobi. Apart from the journal, in 2012 NI Stobi published "*Inscriptiones Stoborum*" by Slavica Babamova as the first volume of the Studies in the Antiquities of Stobi Monograph Series.

The second excavation project is the fieldschool organized by NI Stobi, the Balkan Heritage Foundation and the New Bulgarian University. Since 2010, every August, Stobi accepts applicants from all around the world, mainly archaeol-

5 Blaževska 2011
6 Блажевска 2012

Fig. 5 Excavations at the Field school in 2012

Fig. 6 Exhibition of Early Christian frescoes in the National Bank in 2012

Fig. 7 Workshop for Conservation and Documentation of Roman Mosaics in 2012

ogy and history students.The field school has two sessions of 15 days in which the applicants are trained in basic methods of excavation and creating field documentation (Fig. 5). Besides field work, the project includes lectures, finds processing and excursions which allow every participant to be introduced to the history, archaeology and cultural heritage of Stobi and Macedonia. At the end of the project every student receives a certificate and university credits depending on the number of sessions he attended. The excavations are usually conducted in areas which are included in the capital project in order to complete certain excavated sectors. The financial benefit of the field school is great contribution in the maintenance and development of the site and it certainly is one of the main assets of self-financing.

In 2010 the digital data base of Stobi was initiated. It contains the full documentation of the excavations and conservation since the '60s. It is being constantly updated with the new material and it needs to be extended with what is available from the first half of the 20th century. Also much of the documentation of the National Conservation Centre that concerns the Stobi projects of the '90s has to be recovered. Right now the data base is easily ap-

proachable from the computers in the Stobi network and most probably in few years will be available online, similar as the data base of the American School of Classical Studies in Athens.

The Conservation Department of NI Stobi needs to employ an architect and conservators for mosaics, stone and marble, metal and pottery on permanent terms. The pottery and metal conservation are covered by young people who have temporary contract with the NI Stobi. The conservation of architecture, mosaics and frescoes are done with personnel of other institutions and unemployed but qualified staff hired on NI Stobi conservation projects.Until this moment NI Stobi managed to complete 5 different projects. One of the most interesting is the conservation of the 4th century wall paintings from the Old Episcopal Basilica. The oldest Christian frescoes in the R. of Macedonia were conserved with a financial support of the US Ambassador's Grant for Cultural Preservation. The beginning of the project was marked by official signing of the grant at Stobi, an event covered by the media in Macedonia and abroad. The whole process was followed by reports on the Stobi website and the Embassy web page. An exhibition at the National Bank in Sko-

Fig. 8 World Monuments Day at Stobi

pje with a printed booklet about the frescoes and the conservation process, presented the project results in front of the wider audience (Fig. 6)[7].

Same as the field school, NI Stobi, Balkan Heritage and New Bulgarian University organize international workshops for conservation of pottery, fresco and mosaics. The workshops have the same educational character as the archaeology field school where the participants have active role and contribution in the preservation of the cultural heritage (Fig. 7).

The Administrative Department has two segments which include employees which deal with the legal and financial sides of the institution and personnel hired for the presentation of the site. Besides the four tour guides and the people at the souvenir shop which are involved in the presentation *in situ*, the NI Stobi needs a presentation manager who will develop and control the presentation and the popularization on a much higher level. At the moment, the responsibility for online presentation, the realization of educational programs and most of the graphical design is transferred to the archaeology department and the director.

The Stobi website was constructed by the NI Stobi and designed by the Seavus software company from Skopje as a donation for the archaeological site. After almost a century of different activities Stobi finally got a new, very important window for the world. The website offers a full overview of the history of the town, a map with information on the presented buildings, the history of past excavations, future publications, needed donations and past donors as well as regular update on the new activities. All the potential visitors of Stobi can easily find information how to reach the archaeological site and they can book their tour online. The traffic to the website is usually directed from the Stobi Facebook page (in Macedonian and English) and through the media in cases of an event with a greater significance. The number of visitors and their interest in the web content is followed by Google Analytics in order to improve the anomalies of the site and establish a general idea what the visitors of different profiles like.

Regarding the worldwide popularization, the NI Stobi applied at the World Monuments Fund which placed Stobi on the World Monuments Watch List for 2012 and 2013. Stobi is listed among 67 sites of 41 countries which needed the WMF advocacy and the global attention in overcoming the challenges of cultural heritage preservation. On September the 22nd, NI Stobi organized a World Monuments Watch Day as the other sites on the WMF list. The open day for visitors involved elementary school students of the local communities and international students of NOVA school in Skopje who participated in an art colony and mosaic workshop inspired by the archaeological treasure of Stobi (Fig 8). It was a nice opportunity to present the site, educate students and exchange ideas in an interactive way.

Publications (scientific and popular), field school, workshops, online presentation, donations, educative programs, cultural events and exhibitions are the road for presentation and popularization of Stobi as an archaeological site. Maybe this approach seems bit conservative but it is certainly an ethical way to make the site available to the public and establish sources for self-financing without vulgarizing the cultural heritage.

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REZIME

ARHEOLOŠKI LOKALITET STOBI: RAZLIČITI ASPEKTI POPULARIZACIJE

Ključne reči: Stobi, nasleđe, istraživanja, konzervacija, prezentacija, popularizacija.

Duga istorija naseljavanja arheološkog lokaliteta Stobi počinje sa bronzanim dobom i prelaznim periodom. Livije spominje Stobi kao *urbs vetus* u helenističko doba, koji se kasnije, za vreme ranog carstva, razvio u *municipium* i najveći grad na severu provincije Makedonije. U kasnoj antici, Stobi je glavni grad provincije *Macedonia Secunda* i značajni hrišćanski centar. Klimatske promene s početka VI veka, varvarski napadi i verovatni zemljotres, obeležili su poslednje godine istorije Stoba.

Početkom 1861.godine, Stobi je postao predmet interesovanja mnogih naučnika. Prve istraživačke kampanje sprovedene su u vreme Prvog svetskog rata, a neke od najvećih između dva svetska rata. Arheološka istraživanja nastavljena su i u narednim decenijama i traju do danas. Arheolozi, arhitekti, istoričari i drugi naučnici publikovali su veliki broj radova koji razmatraju

istoriju, arhitekturu, religiju, rituale sahranjivanja itd. što je doprinelo da Stobi postane jedan od najvažnijih lokaliteta na Balkanu tokom rimskog perioda i kasne antike.

Budući da ovaj lokalitet ima najveću površinu za prezentaciju, sa puno sačuvanih spomenika iz različitih perioda, bio je otvoren za turiste još od sedamdesetih godina prošlog veka. Jurisdikcija je ranije bila poverena Muzeju u Velesu, a kasnije prenesena na Nacionalni konzervatorski centar. U 2008. godini, Vlada Republike Makedonije je osnovala Nacionalnu ustanovu za upravljanje arheološkim lokalitetom Stobi. Cilj Nacionalne ustanove Stobi je permanentno prisustvo educiranog personala na lokalitetu koji bi rukovodili iskopavanjima, konzervacijom, prezentacijom i popularizacijom lokaliteta. U protekle tri godine, Nacionalna ustanova Stobi je inicirala niz projekata, kao i znatan broj aktivnosti koji su doprineli na različite načine boljem rukovođenju kao i budućem razvoju arheološkog lokaliteta Stobi.

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THE IOVIA - LUDBREG ARCHAEOLOGICAL OPEN-AIR MUSEUM

ABSTRACT

Iovia-Botivo (present day Ludbreg, Croatia) was founded in the first century AD. After several centuries of prosperity, Iovia was most likely devastated during the invasion of the Goths in the late fourth century AD. The tradition of urban life was not abandoned; instead, this Pannonian settlement has existed in continuity up until today. During the four seasons of excavations (2008-2011), a smaller balnea and sizeable building with a portico were discovered in the very centre of Ludbreg (Somođi Garden). An optimal plan for presentation was made with all due consideration for the site's specific situation. By applying principles of cultural management and interdisciplinary cooperation between the national government, the municipal authorities and researchers, it was possible to provide a sound, legally secure future for this site. Objective of this paper is an overview of positive results obtained by implementing management principles from research to presentation i.e., giving new purpose to a cultural monument in compliance with the principles of sustainable development.

The global financial crisis adversely affected the capacity for investment in the cultural heritage, leaving the burden of funding almost exclusively to the state. Considering global trends, there can be no illusion concerning the augmentation of state funding in this sector. Therefore, it is of utmost importance to devise a long-term *modus operandi* for balancing scholarly needs with realistic financial capabilities.

In the course of this economic crisis, the value of a specific cultural monument (whether aesthetic, historical, scholarly, spiritual, sociological or symbolic) came into conflict with economic value. Therefore, their re-evaluation is needed with the aim of recognizing the vast potential of cultural capital. This goal can (hopefully) be achieved exclusively by long-term strategic planning, based on interdisciplinary cooperation, alignment of both professional and economic principles and with the well-argued, objective and consistent articulation of values. The utility of cultural capital (both specific monuments and the cultural landscape as a whole) is rooted in the clear articulation of values which can strongly impact the growth of national identity (i.e., by stimulating diversity). Therefore, it is extremely important to conduct studies encompassing the value of the cultural heritage with associated analyses of both the benefits and anticipated costs resulting from cultural policy. The proper devel-

Fig. 1 Aerial photograph of the site after archaeological excavations in 2011 (photograph by J. Kliska). By permission of the Croatian Conservation Institute, Zagreb.

opment of the potential of cultural capital is possible through the application of a system of economic values (always with a pragmatic attitude on the validation of value) by implementation of objective (as well as subjective) criteria and regulations. By identifying, adjusting and re-evaluating of cultural resources, numerous possibilities (often unrecognizable) for the utilization of cultural capital can be opened (Benhamou 2003: 255-262; E. P. 2006; Klamer 1997: 74-87; Klamer 2001; Klamer 2003a: 465-469; Klamer 2003b; Klamer and Throsby: 2000, 130-145; Throsby 1999: 3-12; Throsby 2001: 26-30, 69-71, 87-88; Throsby et al. 2010).

Since the cultural heritage is still palpably neglected in relation to other social and economic priorities, it is clear that much more attention should be accorded to long-term governmental planning for cultural heritage by conducting cost-benefit analyses. The aim should be implementation of objective, thorough and systematic procedures that would lead to enhancement of the cultural heritage and ensure sufficient funding for the improvement of individual cultural monuments when there is a clear need for this

(Throsby 2003b: 275-285; Throsby 2007). Furthermore, for providing sound future for a particular cultural monument, it very important to apply economic postulates (as well as SWOT and cost-benefit analyses) with a pragmatic attitude towards actualizing value and with the introduction of objective (and subjective) criteria and legal regulations. In addition, when implementing a developmental strategy, due consideration must be accorded to pre-existing fiscal and administrative measures which can ease the process of cultural heritage revitalization. Furthermore, into consideration should be taken decentralization of jurisdiction over the cultural heritage, with the goal of reorganizing administrative responsibility by the involvement of lower levels of authority. Taking responsibility and care for a particular cultural monument, a local government can, with strong developmental plan for cultural potential, strengthen the local population's identity, raise awareness of cultural history among individuals and encourage further growth of local business, as well as creating job opportunities (both full and part-time). In line with the principles of self-sustainable development, local governments should
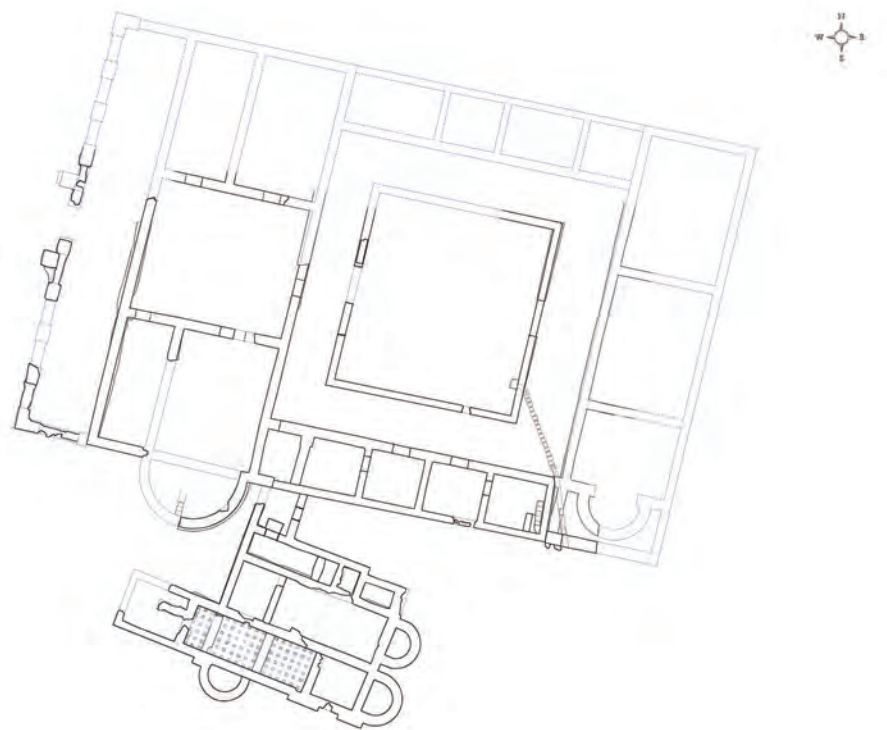
Fig. 2 Ground plan of the site with reconstruction based on extrapolation and mirroring symmetry of the data collected
with ILRIS-3D laser scanning (by: Vektra d.o.o.). By permission of the Croatian Conservation Institute, Zagreb.

draft guidelines for cultural tourism with the aim of maximising the positive impact on the cultural (especially architectural) heritage. The steady growth of cultural tourism in each local community is dependent upon the cultural program, social and organizational structure, proficiency, and the psychological and (desired) social prestige (as a method of diversity). The results of this development strategy can be measured by the TIAS (tourism impact and attitude scale) (Antolović 1998; Antolović 2003: 100-109; Antolović 2009; Antolović 2010; Bachleitner and Zins 1999: 199-209; Benhamou 2003: 255-262; Choi et al 2010; Dumont, E. (ed.); Dumont, Asensio and Mortari; E. P. 2006; Lankford and Howard 1994: 121-139; Throsby 2001: 76-78, 128-130; 138-147; Throsby 2003a: 183-186; Throsby 2005; Throsby 2006; Vaughan 1984: 1-36).

The objective of this paper is to present the example of ancient Roman archaeological site Iovia-Ludbreg (future archaeological open-air museum) and how it can (despite the global financial crisis) be positively managed by applying the principles of vision, mission and goals, thus leading to revitalisation grounded in self-sustainable development.

Iovia-Botivo (Ludbreg, Croatia) was founded in the first century AD along the left bank of the Bednja River. *Iovia* was situated on an important route that ran along the Drava River, connecting Pannonia's major provincial centres, e.g. *Poetovio* (Ptuj) and *Mursa* (Osijek). A connection with the southern regions of the province was made possible by a route passing through nearby *Aquae Iasae* (Varaždinske Toplice) which continued down to *Siscia* (Sisak). After several centuries of prosperity, *Iovia* was most likely devastated during the invasion of the Goths in the late fourth century AD. The tradition of urban life was not abandoned; instead, this Pannonian settlement has existed in continuity up until today (Deluka et al. 2003: 733-742; Egger 1924: 340-341; Gračanin 2010:20; Gregl and Migotti 2004: 131-143; Jarak 1994: 35-36; Mayer 1935: 69-82; Migotti 1994: 51-53; 2002: 51-66; Mócsy 1974: 222, 225, 309, 329-342; Tomičić 1997: 34).

Project *Iovia*-Ludbreg was developed in compliance with the European Commission's

guidelines for cultural monument management principles (Dumont, E. (ed.); E.C. 2005; 2006; 2007; E.P. 2006). Planning of specific works began once positive responses were obtained to the questions of whether the presentation and revitalization are desirable, whether demand for its protection exists, whether it can be harmoniously integrated into the existing environment and whether the site will be accessible, understandable and educational for the wider public. Next step was resolving legal matters, making of preliminary SWOT analyses and schedule for implementation of short-, medium- and long-term plans. After the pre-existing state of the site was determined, the necessary interventions (archaeological excavations, interim conservation, additional documentation, etc.) were defined. At the same time, the main contours of cultural tourism needs were determined with reference to target visitors and users. Furthermore, while these first steps were defined, particular attention was accorded to the interplay between the positive (strengthening identity, pride in local history, revitalization of the local community, improvement of infrastructure, job creation, etc.) and negative outcomes (devastation due to increasing numbers of visitors, stereotyping, increased pollution, etc.) of this cultural heritage protection method. After operative tasks were organized and assigned, it was possible to start with archaeological excavations.

Archaeological excavations (2008 - 2011; conducted by Tajana Pleše, PhD, Croatian Conservation Institute) in the very heart of the present-day town of Ludbreg (Somođi Garden) are a continuation of systematic test digs (1968 - 1979) conducted by the Archaeological Museum in Zagreb. These systematic test digs were confined to free, green surfaces, mostly in the backyards of private lots, therefore limited solely to small test trenches. Since Ludbreg is an active small town with the corresponding infrastructure, it was not possible to expand the research area of these certainly intriguing finds. The results of this pioneering work made it possible to presume the general (?) layout of Roman *Iovia*. All of the discovered architectural structures may be dated from the 2nd to 4th century AD (Vikić Belančić 1984: 119-166).

Although it is entirely clear that these excavations will never be comprehensive because Ludbreg completely overlays the previous Roman settlement, the opportunity created by the earlier, pioneering efforts had to be seized. Prior to the continuation of excavations, it was imperative to resolve the legal aspect of ownership of the Somođi Garden (large estate of total area of 3629 sq m in the very centre of Ludbreg). The best long-term option was to purchase the Somođi Garden. After the purchase, a written confirmation from the new owner (i.e. municipal authorities) was made, legally defining the Somođi Garden as a future archaeological open-air museum. Municipal authorities also conducted a SWOT analysis and compiled cost effectiveness studies that showed how this type of tourism product could nicely supplement with the very potent religious tourism based on a pilgrimage site of the Shrine of the Precious Blood of Christ (Choi et al. 2010: 213-220; E. C. 2007; Klamer and Throsby 2000: 130-145; Throsby et al. 2010). Furthermore, careful coordination of dual funding (research was financed by the Croatian Ministry of Culture and by the Ludbreg municipality) facilitated the achievement of excellent results in a short period.

During the four seasons of excavations, a large portion of Roman architecture was discovered in the Somođi Garden. In the south-east part of the site, a small *balnea* was discovered. The Iovian baths (230 sq m) belong to a group of smaller city baths, widespread throughout the Empire. Built as compact, unpartitioned buildings (*Blocktyp*), they fulfilled the rules of economical and structural efficiency. Similar baths were discovered in Baden-Baden, Pforzheim-Hagenschieß, Saint-Rémy de-Provence and Heilbronn-Wartberg. (Smith 1875: 188; Durm 1904: 200-217; 700-718; Heinz 1983: 9-23,176-185; Yegül 1992: 48-91). On the northern side of the baths, a large part of sizeable building was discovered (assumed portico and peristyle villa type). The dimensions had to be estimated by extrapolation and mirroring symmetry of all collected data because of the Somođi house and its very deep foundations (assumed total area: c. 1500 sq m). The building was defined on its western part with a colonnaded portico, through which one could enter a wide space divided into five rectangular rooms. On the eastern side the building was organised around square courtyard, defined by corridors and adjacent wings. Both buildings were re-

modelled during several construction phases, clearly indicating a long period of usage (Pleše 2012: 310 - 321).

After excavations, ancient Roman site of *Iovia* was documented with ILRIS (Intelligent Laser Ranging and Imaging System)-3D laser scanning. The precision of this method enables much easier designing, and the result is an exemplary base for making interpretative graphic aids.

Once the documentation was complete, both making of general architectural design and conservation/restoration works could begin. At the same time it was possible to deal with the questions of *in situ* presentation. Thanks to scholarly/professional synergy, it was possible to make a general design solution that was developed both pragmatically, in accordance with professional postulates and funding possibilities.

Here should be mentioned that the decision to pursue the idea of presenting this Roman site was made on the basis of several factors. First, that was the clear scholarly value, as new data will enhance the rather meagre knowledge of Roman settlements in the Croatian part of Roman province of Pannonia. Equally important was the enhancement of cultural (very few archaeological parks in Croatia), social (awareness of the Roman heritage by the local population) and economic (endorsing small and medium-sized local businesses) values. Furthermore, since the site is easily legible and therefore relatively simple to present, it would be a great loss not to make the most of its educational value. Because of these factors, instead of re-burying after excavations, the decision was made to present this site as an archaeological open-air museum (E. C. 2005; E. C. 2006; Klamer 1997: 74-87; Klamer 2003b). Employing management principles, the project's main vision is to open a self-sustaining, open-air museum within ten years (as of the beginning of excavations). The mission statement was formulated through the scholarly aim of supplementing knowledge on the Croatian part of the Roman province of Pannonia and making this site a mainstay of Outdoor Education Days (required by the *curricula* of elementary and secondary schools). Another mission principle was the strategy rooted in the merger of strong religious tourism (based on pilgrimages to the Shrine of the Precious Blood of Christ) as well as with other open-air museums in the northern parts

of the Roman province of Pannonia e.g. *Flavia Solva* (Leibniz, Austria), *Poetovio* (Ptuj, Slovenia) and *Aquae Iasae* (Varaždinske Toplice, Croatia). The value of this site is defined by making it the hub of successful collaboration between the local community and researchers.

The presentation plan encompassed the scholarly and professional demands concerning conservation *in situ*, combined with the needs of successful cultural management, thus resulting in alignment between the latter two factors as well as cost effectiveness. Given the fact that mainly building foundations were found (due to the aforementioned reasons), a decision had to be made as to how to present them. Complete restoration (in the manner of *Carnuntum*, the present-day villages of Petronell and Bad Deutsch-Altenburg, Austria) as well as wire-frame reconstruction was out of the question due to the lack of data. Presentation of the site at ground level was dismissed because in the long run it is very expensive to maintain and also difficult for visitors to understand. Building a structure over the entire site would be very complex and rather difficult to justify. Reburial of the site was not taken into consideration due to all of the reasons cited above. Therefore, conservation of the foundations and restoration of the walls (all built of Lithothamnium limestone from local quarries) to a height of approximately 120 cm was chosen, as this will secure clear visual communication with visitors.

Implementation of the plan began with conservation/restoration works on the foundations and with the construction of a drainage system. The original Roman walking surface will be levelled. Alignment with the higher surrounding level will be accomplished avoiding visually aggressive fences and structures. All communications will be adapted for disabled persons and strollers. At each visually expressive point, a 3D reconstruction with a brief, simple explanation will be set up, thus emphasizing the accessibility of information. A dilapidated two-storey building in the north-eastern corner of the estate was torn down, thus improving the visual ambience and making space for the educational corner where several Roman military tents with Roman games (*latrunculi, reges, duodecim scripta,* etc.) will be displayed. The south-eastern part of the Somođi Garden is left unexplored for the next genera-

tions and future technology. However, above it a wooden structure resembling a small theatre is going to be built. The whole site, according to the landscaping study, will be defined with "green walls" that will also define the boundaries with neighbouring properties. The only remaining building on the estate (the Somođi house) will be reused. One third of the building will be remodelled as the head office of the tourism board. Among its primary functions, it will provide exemplary protection of the site and enable monitoring of the entrance. A small museum will be arranged in the other part of the Somođi house. A permanent display, formed as a cross section of Ludbreg from prehistory to the present, will be based on archaeological finds. The excavated part of Roman *Iovia* will be explained through 3D interactive models and videos.

A priority in the successful promotion of the Iovia-Ludbreg project was the creation of a trademark (*Iovia*-Ludbreg), which would be the visual backbone of the whole brand. The first series of souvenirs with the trademark was made in cooperation with the municipal authorities and produced exclusively by local small and medium-sized businesses, thus serving as an anti-recession measure. The collection is represented by two replicas of Roman coins (a *nummus* of Maximianus and a *denarius* of Lucilla), *Conditum paradoxum* (spiced vine made according to the instructions from *De Re Coquinaria* by Apicius), *Mel Ioviae* (locust blossom honey), *Spiritus mellis Ioviae* (mead) and *Spiritus pruni cerasi Ioviae* (cherry brandy), an homage from Ludbreg's beekeepers and winemakers to their Roman ancestors. Apart from these souvenirs, a collection of environmental tote bags, T-shirts, caps, mugs, magnets etc., all with the *Iovia*-Ludbreg trademark, is also available.

Since the ultimate goal is to familiarize visitors with the cultural heritage, promotion already began during the early phase of works: verbally (from active participants), using printed matter (newspapers, informative leaflets and brochures), notices on local television, press conferences, and online (newsletters, Facebook and e-forums). Furthermore, the site is promoted with multimedia presentations (both occasional, in public discussions, and permanent, via an exhibition), scholarly/professional lectures and with mesh banner with aerial photographs and short texts set up in the main square (near the main entrance to the site).

The *Iovia*-Ludbreg project can be considered a model of interdisciplinary collaboration between the national government, municipal authorities, small and medium-sized local businesses and researchers, all of them acting for the benefit of the site and its visitors. Project was primarily based on cost effectiveness and fundamental management principles with strong pragmatic attitude. In making of this project all members of core group were fully aware that this site has primarily local significance (i.e. that excavated Roman architecture is part of provincial settlement of Roman province of Pannonia) and that it will never be fully researched (due to the above mentioned problem of modern town built entirely on previous Roman settlement), as it is clearly emphasised with a site trademark. Bearing that in mind, it was possible to create feasible project, with carefully balanced professional postulates and funding possibilities, thus providing a sound, legally secure future for this site.

It is hoped that the *Iovia*-Ludbreg open-air museum will effectively combine both scholarly and popular demands, up-to-date techniques of excavation and documentation, proper conservation and restoration methods and a diverse tourism product. By adhering to these principles, we ensured that this archaeological site would avoid the fate of excavated monuments that were later abandoned and forgotten.

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REZIME

IOVIA - LUDBREG ARHEOLOŠKI MUZEJ NA OTVORENOM

Ključne reči: Iovia – Ludbreg (Hrvatska), konzerviranje i prezentiranje arheološkog nalazišta, muzej na otvorenom, kulturni kapital, razvojna strategija, kulturni menadžment.

Antička Jovija (*Iovia-Botivo*; današnji Ludbreg, Hrvatska) nastala je u ranocarsko vrijeme na važnoj podravskoj prometnici koja je povezivala Ptuj (*Poetovio*) i Osijek (*Mursa*), dva velika centra provincije Panonije. Dobru je pak povezanost s južnim dijelom provincije Panonije omogućavala blizina Varaždinskih Toplica (*Aquae Iasae*), gdje se priključivala cesta iz smjera Siska (*Siscia*). Pretpostavlja se kako je Jovija nakon nekoliko stoljeća prosperiteta bila razrušena tijekom provale Gota krajem 4. stoljeća n. e. No, tradicija urbanog života na ovom prostoru nije zamrla, nego se kontinuirano nastavila sve do današnjice. Prva sustavna sondažna istraživanja je na širem prostoru grada Ludbrega proveo Arheološki muzej u Zagrebu (1968.-1979.).

Zahvaljujući brizi Grada Ludbrega o kulturnoj baštini te svjesnosti Ludbrežana o njihovom antičkom nasljeđu, stvoreni su (prvenstveno imovinsko-pravni i financijski) uvjeti za uspješan nastavak istraživanja. Lokalna samouprava je za potrebe istraživanja osigurala veliki slobodni prostor (3629 m²) u samom centru grada („Vrt Somođi"), omogućivši time određivanja šireg konteksta nalaza. Tijekom četiri sezone arheoloških istraživanja (2008 - 2011) koja je u „Vrtu Somođi" proveo Hrvatski restauratorski zavod, u cijelosti istraženo kupalište (231 m²) te veliki objekt (oko 1590 m²) organiziran oko kvadratnog, nenatkrivenog dvorišta te određena sa zapadne strane trijemom s kolonadom.

Poštujući specifičnu situaciju ovog nalazišta smještenog u središtu grada, napravljen je plan prezentiranja kojeg zajedno provode znanstvenici, lokalna samouprava te državna uprava. Njime su obuhvaćene znanstvene i stručne potrebe konzerviranja i prezentiranja *in situ* u kombinaciji s načelima uspješnog kulturnog menadžmenta, a s posebnim naglaskom na skladnoj integraciji dinamičnog malog grada i njegovog antičkog nasljeđa. Provođenjem navedenih metoda možemo se nadati kako smo uspjeli osigurati sigurnu budućnost ovog nalazišta.

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MUSEUM EDUCATIONAL ACTIVITIES
IN THE CASE OF ARCHAEOLOGY IN PTUJ

ABSTRACT

In this paper we discuss about some of the most successful activities and educational programs of museum in Ptuj in Slovenia. In Ptuj-Ormož regional museum we have started with innovatory program of representing an archaeological material to the youngest population. Along with the exhibition Prvošolčki v ptujskem muzeju (First graders in Ptuj museum) we have, with various activities, approached them the historical development of the town Ptuj.

With such schemed work we also continued through other themes, we acquainted all generations about everyday life in Roman Poetovio. The upgrade of this work is cooperation with surrounding societies, among which is the most active with Society of Women and Girls of Hajdina Commune, with schools and with Ptuj Spa.

On the present-day Slovenian territory the Ptuj museum is after the Ljubljana (1821) and the Celje museum (1882) the third oldest institution of that kind, and it is the central museum in the Ptuj-Ormož area. It takes care of the preservation of the moveable cultural heritage in that area from the oldest time periods to the present age (Vomer Gojkovič and Kolar 1993, 9-20). We present the cultural heritage for visitors of all ages in form of museum collections, occasional exhibitions and diverse activities of popularization (publications, lectures, workshops etc.). We pay a special attention to young visitors. Through various activities and educational programs we get them acquainted with the life in the past by using museum collections and objects. The museum is an educational institution where visitors, on the basis of studying the museum material, get an insight into the cultur-al and historical development of this region (Kolar 2003: 12). It is also a place where lovers of the cultural heritage get together in order to present the customs and habits of the Ptuj-Ormož area to the domestic and foreign public (Fig. 1).

Fig. 1 Former Collection of small archaeological material in Ptuj - Ormož Regional Museum (1967-2011)

Fig. 2 First-graders at modelling of pottery from clay

Fig. 3 Pottery, which was made by first graders

Fig. 4 Title page of publication
The first graders in Ptuj Museum

Thanks to the exhibition *Prvošolčki v ptu-jskem muzeju (First-Graders in the Ptuj Museum)* we started with an innovative program presenting archaeological material to the youngest population. With the exhibition *First-Graders in the Ptuj Museum* we made the children acquainted with the cultural heritage in the Ptuj-Ormož area, and at the same time, we informed them about the universal development of the mankind from the oldest time periods to the present days. The exhibition is the result of a co-operation with the first-graders visiting the Olga Meglič Elementary School in Ptuj who, in the school year 1989/90, took a close look at the collection of small archaeological findings (Fig. 2). After the children had been acquainted with the pottery production process, they shaped different objects made of clay. They replicated prehistoric and Roman pottery products. Some objects were air dried and some of them were burnt (Fig. 3).

The children, under the leadership of museum experts, then put their products into vitrines. The exhibition consisted of six vitrines in which 42 objects were exhibited. The ceramic production was accompanied by eight panels on which the ceramic production process at different time periods was explained by text and pictures. The exhibition poster showed the first-graders at work. The invitation to the exhibition and the catalogue front page were designed in the same manner (Fig. 4).

The text in the catalogue (Kolar and Vomer Gojkovič, 1990. Kolar and Vomer Gojkovič 1991, 66) is meant as learning material presenting the manufacture of pottery products from prehistory to Early Middle Ages; the text is complemented by photos and drawings. In the first part of the catalogue there is an illustrated chronological table showing the development of pottery fol-

Fig. 5 Children have prepared cultural program at the opening of the exhibition *The first graders in Ptuj Museum*

Fig. 7 Visitors playing the games, which were included in the exhibition *Roman Everyday Life in Poetovio*

lowed by a description of how pottery was being made. In the second part of the catalogue the visitor gets acquainted with the activities which the children performed during a lesson dealing with the collection of small archaeological findings with emphasis on ceramic. The catalogue ends with the list of children who participated in manufacturing the exhibited objects, and with the list of basic Slovenian literature about archaeological ceramic. On the occasion of the exhibition a video-film had also been shot, it was shown at the opening when the children also prepared a short program (Fig. 5).

During the course of the exhibition we prepared that kind of lessons also for the pupils visiting other schools. After they had heard a short explanation about the development of ceramic in various archaeological time periods and they had seen the video-film, the pupils shaped similar objects made of clay which were afterward put in a vitrine. More than 1300 pupils from various elementary and secondary schools attended those Art

lessons. After the exhibition had been closed the interest in such new active educational approach went on, therefore, we informed, with the help of the video film, the teachers of elementary and secondary schools in the northeast Slovenian area about our activities. We were the first museum in Slovenia that started with the pupils' active approach in Art lessons and with organizing museum educational workshops.

In the following years we continued the project *First-Graders in the Ptuj Museum* with various pedagogical and andragogical workshops that were linked with the archaeological collection or with occasional archaeological exhibitions (Pintarič 2010, 16-21. Stergar 2010, 220). A higher stage of that sort of activity was the co-operation with surrounding societies; the Society of Women and Girls of the Hajdina Commune belonged to the most active ones, furthermore with schools and the Ptuj Spa (Amber Expedition 2010-2011). By organizing thematically-oriented workshops (e.g. jewellery, clothing, ceramic) we

Fig. 6 The exhibition *Roman Everyday Life in Poetovio*

Fig. 8 Offer of Roman foods at the International Scientific Symposium *Ptuj in the Roman Empire, Mithraism and its Era*

Fig. 9 The Society of Women and Girls of the Hajdina Commune in palatium of Ptuj Castle

Fig. 10 Enthusiasm of visitors of the exhibition Who Made Little Vid a Shirt

acquainted people of all generations with the everyday life in the Roman *Poetovio*. On occasion of the exhibition *Roman Everyday Life in Poetovio* (Vomer Gojkovič and Žižek 2008: 10-11, 69-72), we prepared small tables meant for board games (Fig. 6). The visitors could imagine themselves as residents of Poetovio and play games which have already been known by ancient Romans (Fig. 7). In this way we tried to present the pulse of the town and its surroundings in the Roman Era and to bring the past closer to all age groups, among them there were also groups of people with special needs.

The museum is also a place where lovers of cultural heritage meet and socialize with each other in order to present customs and habits of the Ptuj-Ormož area to the domestic and foreign public. Some societies actively cooperate with the Ptuj Museum. Here, the Society of Women and Girls of the Hajdina Commune must be mentioned, because it participates in the preparation for numerous museum events and, thus, take cares of the preservation of old habits. The Society of Women and Girls of the Hajdina Commune has been

cooperating with the museum since 1999 (Utrinki 2009), when the society members, during the international conference *Ptuj in the Roman Empire, Mithraism and its Era* (Vomer Gojkovič and Kolar 2000, 83-85), gave their contribution to this scientific meeting by preparing a warm reception for the conference participants in Hajdina and by serving them ancient Roman food (Fig. 8). They also took part in many other museum events (Fig. 9). So e.g. at the exhibition *Cheers! Drinking Vessels from Slovenian Museums* (Kolar and Vomer Gojkovič 2006) that was also shown in Wine Museum in Buttrio, Italy (Perko et al. 2007a, Perko et al. 2007b). At the exhibitions *Who Made Little Vid a Shirt* (Vomer Gojkovič and Kolar 2007.) (Fig. 10) and *Roman Everyday Life in Poetovio* (Vomer Gojkovič and Žižek 2008, 127) they exhibited their own products (Fig. 11), and at the opening of the exhibition they sang old folk songs (Fig. 12) and served traditional food. The Slovenian Archaeological Society honoured in 2010 their efforts for preserving the local traditions and the cultural heritage in its original environment with a merit certificate (Nagrade 2010: 161); in 2011 the Slo-

Fig. 11 Triclinium with Roman food, prepared by the Society of Women and Girls of the Hajdina Commune

Fig. 12 Performance by folk singers at the opening of one of the exhibitions

Fig. 13 Granting Valvasor honourable recognition granted by the Slovenian Museum Society awarded the Society of Women and Girls of the Hajdina Commune in 2011

Fig. 14 The Society of Women and Girls of the Hajdina Commune as Romans at the 5th Roman games in the Ptuj Spa 2012

venian Museum Society rewarded them with the Honorary Valvasor Prize for the cooperation with the Ptuj Museum (Valvasorjeva 2011: 15), (Fig. 13). The Society of Women and Girls of the Hajdina Commune takes part in presenting the Roman cultural heritage not only together with the museum, but also with other societies and institutions. Thus, this 2012 they again appeared dressed as Roman women (Fig. 14) at the fifth Roman Games organized by the Society 69, Society for Roman History and Culture Ptuj. In the middle of June 2012 they accepted the invitation of the Varaždin Spa and appeared as Roman women presenting Roman food at the traditional Aquafest.

The Hajdina Commune, the Hajdina Tourism Society, the town Varaždinske Toplice (Croatia) and the Homeland Museum of Varaždinske Toplice prepare a cross-border joint project dealing with the Roman Era heritage. The project title is *Archaeological Parks in the Area of Ager*

Fig. 15 The Society of Women and Girls of the Hajdina Commune at the granting document of thanks of the Slovenian Archaeological Society in 2010 in Celje

Poetovio – Vicus Fortunae and Ager of Aquae Isasae. The objective of the proposed project is to speed up the cross-border cooperation in the area of the Roman Era heritage. The project will contribute to the improvement of the common identity and the recognisability of the area, to knowledge extension about the common cultural heritage, to the preservation of the cultural heritage and to the increase of tourism on the basis of the Slovenian-Croat cooperation in the field of Roman provincial archaeology.

In connection with the future *Archaeological Park Vicus Fortunae*, we prepare various educational workshops which include knowledge about the history of the town, acquaintance with different forms of jewellery and ceramic products, their techniques and the cooking skills of the ancient Roman cuisine.

We mentioned only some projects performed at our museum and in cooperation with other institutions. By implementing pedagogical- andragogical education dealing with cultural heritage we achieved some success which can be seen by the fact that we received several national rewards (Fig. 15).

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REZIME

MUZEJSKE OBRAZOVNE AKTIVNOSTI NA PRIMERU ARHEOLOGIJE U PTUJU

Ključne reči: Slovenija, Ptuj-Ormož regionalni muzej, pedagoška i andragoška obrazovna aktivnost, kulturno nasleđe.

Regionalni muzej Ptuj-Ormož je centralni muzej u ptujsko-ormoškoj oblasti. Muzej brine o očuvanju pokretnog kulturnog nasleđa ovog područja od najstarijih vremena do danas. Za posetioce svih uzrasta predstavljamo kulturnu baštinu u vidu muzejskih zbirki, povremenih izložbi i različitim popularizacijskim aktivnostima (publikacije, predavanja, radionice i sl.). Posebnu pažnju obraćamo mladim posetiocima. Kroz različite aktivnosti i edukativne programe možemo ih uz pomoć muzejskih zbirki i predmeta upoznati sa životom u prošlosti. Muzej je obrazovna institucija, ali je takođe i mesto gde se ljubitelji kulturnog nasleđa susreću i druže kako bi predstavili običaje i navike ptujsko-ormoške oblasti domaćoj i stranoj javnosti.

Zahvaljujući izložbi »Prvi razred« u Ptujskom muzeju započeli smo sa inovativnim programom predstavljajući arheološki materijal najmlađoj populaciji. Ovom izložbom smo učinili da se

deca upoznaju sa kulturnim nasleđem ptujsko-or-moškog područja, a istovremeno, obavestili smo ih o univerzalnom razvoju čovečanstva od najstarijih vremena do današnjih dana. Tokom izložbe pripremili smo lekcije i za učenike različiteih škola. Nakon što su čuli kratko objašnjenje o razvoju keramike u različitim arheološkim vremenskim periodima i videli video film, učenici su oblikovali slične predmete od gline. U narednim godinama nastavili smo projekat »Prvi razred« u Ptujskom muzeju sa različitim pedagoškim i andragoških radionica povezanim sa arheološkim zbirkama ili sa povremenim arheološkim izložbama. Na ovaj način pokušali smo da predstavimo puls grada i okoline u rimskom dobu i da približimo prošlost svim starosnim grupama, među kojima su čak bile i grupe ljudi sa posebnim potrebama.

Ptujski muzej je takođe i mesto gde se ljubitelji kulturnog nasleđa sastaju i druže u cilju predstavljanja običaja i navika iz ptujsko-or-moškog područja. Neka društva aktivno sarađuju sa Ptujskim muzejom. Tako, *Društvo žena i devojaka* iz opštine Hajdina učestvuje u pripremi za brojne muzejske manifestacije i samim tim, preuzma brigu o očuvanju starih navika.

U očekivanju buduceg Arheološkiog parka *Vicus Fortunae* pripremamo različite edukativne radionice koje uključuju poznavanje istorije grada, poznavanje različitih dizajna i tehnika izrade nakita i keramičkih proizvoda, te rimsku kuhinju. Primenom pedagoško-andragoškog obrazovanja u prezentaciji kulturnog nasleđa postigli smo zavidan uspeh o čemu govori nekoliko nacionalnih nagrada koje je Muzej dobio.

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EDUCATIONAL PROGRAMMES OF THE NATIONAL MUSEUM IN BELGRADE AND THEIR SIGNIFICANCE IN EDUCATION, PRESENTATION AND POPULARIZATION OF SCIENCE

ABSTRACT

Archaeological collections from the Palaeolithic, Mesolithic, Neolithic times, Bronze and Iron age, as well as cultures of classical Greek and Hellenistic period, Roman times, until the first centuries of Christianity and the Great Migration period constitute part of the National Museum's in Belgrade rich treasures. Besides collecting and research, professionals from the National Museum place great focus on the representation of the heritage through thematic exhibitions, publications and specific public programmes.

In this paper presented are several methods of work with different categories of visitors by way of archaeological collections. Combined with new ways of communication and forms of informal education, they open up possibilities for a development of new, qualitative relations with audience of all ages and types. Educational programmes of the National Museum in Belgrade are an integral part of learning and leisure activities that contribute to the creative development of individual and to the popularisation of various spheres of science.

Keywords: museum, public, education, popularisation of science.

The National Museum in Belgrade is the central museum institution in Serbia, housing more that 400.000 archaeological artefacts and works of art from the Palaeolithic times to the modern art, from the territory of present-day Serbia and its surroundings. Besides collecting and research, professionals from the National Museum place great focus on the representation of the cultural heritage through thematic exhibitions, publications and specific public programmes, designed for education of the whole of public and popularisation of the science.

Founded in 1844, the main intention of the museum from the very beginning was to be accessible to all interested citizens. Already in the annual reports from 1886-87 a guide, *presenter of collections to Museum's visitors...well-known Toma* is mentioned (Fig. 1).[1] The focus on public continued to be in the core of the museum activities, especially visible while the museum was in force under the name of the Museum of Prince Paul (1935-1944). Fulfilled was the vision of the contemporary director Milutin Kašanin who emphasized that the museum *must be to every man accessible, not at all boring, eagerly visited high school, appealing and vivid house, in which not only knowledge is gained and enriched but sensibility is being developed* (Fig. 2).[2] In 1930-ies the Museum was a meeting centre of the young people interested in specialized courses as well.

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1   Поповић, Јевремовић 1994:13
2   Кашанин 1936:5

Fig. 2 Visitors in the exhibition space of the Museum of Prince Paul, 1935-1944

Fig. 1 Toma, the first presenter of the National Museum, 1880-ies

Museum custodians were main actors in a development of visitor's programmes until the middle of the 20th century. However, growth of the number of visitors after the WWII and the state educational reform posed the formation of the separate department for work with public. In the year 1954 the Promotional Department for educational and publicity activities and cultural relationships was founded, running international and inter-institutional cooperation, public relations, publishing and museum education.[3] The department, renamed in 1978 into the Department for cultural–educational activities,[4] successfully carried out different educational activities in accordance with interests of museum public and social movements. Efforts to transform museum characterise its activities at the beginning of 21st century. Very poor conditions of the museum exhibition spaces caused gradual removal of the permanent display after 1999 and the shutting down in 2003. At the same time the analyses of the effects of the museum performance and the vision for the future lead to creation of the Strategic development plan that included reorganisation of institutional departments. In 2004 separate Department for education and public activities was established, and public relations and international cooperation were omitted from its activities.[5] Starting weaknesses, poor technological resources and personnel dilemmas

were prevailed over, and the Department for education and public activities developed in the highly professional service whose activities, programmes and visitor surveys are one of the main actors in the general development of the Museum.

Custodians in the Department of education are involved in all activities of the National Museum created for public, in exhibitions (permanent display, thematic, temporary exhibitions), special events as well as customary activities of the Museum, including so-called attached museums.[6] With the lack of the permanent display in the central building, conduct of the educational department is the most visible in temporary exhibitions. The museum educators are timely involved in their preparation, acquainted with the exhibition theme, its goals and selected exhibits. They are involved in a creation of the exhibition design, suggesting changes to make more adaptive display to different categories of audience. At the same time with the author(s) of the exhibition they prepare additional didactic contents of the exhibition, as well as guiding tours, interpretational and educational programmes for youngest visitors, schools and adult public.

In the relationship of the museum and public, the most sensitive is rapport between the museum and the youngest. The first contact with a museum is of the essential importance, and some-

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3   Мано-Зиси 1964-1965:355

4   Поповић, Јевремовић 1994:31

5   Gavrilović 2012:46

6   The National Museum has following attached museums within its structure: Gallery of Frescoes (from 1973), Memorial Museum of Nadežda and Rastko Petrović (1975), Lepenski Vir Museum (1978), Museum of Vuk and Dositej (1979) and Archaeological Museum of Iron Gates (1996)

Fig. 3   Activities with the youngest visitors, the exhibition *Vinča – Prehistoric Metropolis,* Gallery of Serbian Academy of Sciences and Art, 2008

times the indifference of the host or unnecessary rebuke is enough to discourage a child as a beneficiary of cultural contents and consumer of a new knowledge. The important question is of the most suitable approach for the youngest to familiarize with museum contents and potentials of the modern museum to offer knowledge and experience in multiple fields and not just mere facts about themes studied and presented in display.

Educational activities of the National Museum intended for the young visitors are realized in cooperation with psychologist or pedagogue. Programmes are prepared with careful choice of topics and working methods, suitable for the particular age. Museum objects are chosen from the range of artefacts or works of art from current exhibitions or museum collections. Programmes differ according to age of the young public. The most detailed attention is placed in the work with pre-school and early-school children through individual workshops. Collective visits of school groups are typical for higher classes of elementary school. The great challenge represents creation of attractive programmes adequate and interesting for teenagers from 13 to 18 years old and their stay in the museum. For families with kids 3 to 12 years old joint events within programmes of the Children's club are organized.

The experiences in the work with the youngest, children by the age of 8, as part of the standard activities of the National Museum, are demonstrating all of the particulars of the work where communication and interpretation were develop according to target audience group. Most of the programmes include different visual materials important for the pre-school children to directly express themselves. Using small-scale materials (beads, kernels, thread, scissors, paper) children practice coordination and motion of the hands and with larger objects and materials (sponge cubes, parts of Styrofoam models, cushions) they move complete musculature. What has

Fig. 4 Museum workshop, the exhibition *In Touch with Antiquity,* National Museum, 2006

to be encouraged more and is not utilized enough in our educational institutions is verbal expression as well as dance, acting and mime that allow children to, understand through motion space concepts, numbers, letters, and to practise visual memory and verbal communication.[7] Thus, for children of this age is important to prepare educational programmes combining several learning methods, and to allow them to spontaneously and through play, using reproductions, replicas and didactic aids, accept the subject and idea of what is being exhibited (Fig. 3). Precedes fine preparation for the museum visit, together with preschool teachers. Museum experiences afterwards, in the next couple of weeks, are excellent base for additional numerous activities inside classroom/playroom (finishing works of art, making of posters, mini-exhibitions, performance or making jointly picture book).

Good preparation, knowledge of children's psychology and their cognitive abilities are necessary in the work with children 9 to 12 years old. That is the age when all children through the

formal education, alongside basic literacy, are gaining different subject knowledge, and its right reception becomes qualitative ground in future academic efforts (Fig. 4). On the other hand, lacklustre of school programmes, its performance with in advance determined outcomes, results and system of grades, could produce lack of interest and, already at that age, boredom and nonattendance of school lessons. The situation is a bit simpler in the beginning classes, but there again almost everything depends on inventiveness and enthusiasm of a teacher, and his/her willingness to enable common meetings and events outside schoolrooms. The authenticity of encounter with new contents, creative personalities, future working places, and materials, apparatus and objects that are not part of children's daily life, could generate avalanche of different and new sensory and emotional feelings, necessary in the development of creativity, strengthening intellectual abilities and upgrading existing knowledge.

The cooperation of the National museum with schools is not recent; it was carried out in accordance with the times, educational system

7   Garman, Piantanida 1996

Fig. 5 Museum workshop, exhibition *Belgrade before Belgrade. Roman Portrait and the Residents of Singidunum,* Belgrade Fortress, 2012

and determined results during last several decades with modest success. School visits, realisation of education units, participation of schoolchildren in quizzes and artistic competitions were common methods of work at that time.[8] Today highly institutionalized educational system and optional realization of the syllabus outside classroom, as well as organisational and financial crises of leading cultural and scientific bodies, played a part in weakening of connections between schools and cultural institutions that managed, in previous system, to instil the need in young generations to cultivate personal experiences and creativity in the fields of culture, art and science. It contributed to the weakening of the informal learning, intensity of which could be fully experienced just in museums. With richness of contents and programmes museums could enhance the quality of development of school age children (Fig. 5).

As to the current programmes of the National Museum for children up to 12 years old they are the most attracted by preparation of theatrical performances, reading of historical sources, dramatisation of shorter texts, data search, creation of joint picture books and guides, encounters with actors playing historical persons, and all other forms of activities involving research, speech, mime and creative work with artistic materials. Valuable are children's fondness for collecting, passion for gathering small items and, still at that age, tendency for orderliness that can refine and complement their

8   Gavrilović 2012: 38-39

activities unburden with teenage bunt characteristic for children of later age.

All mentioned forms of work with preschool and school children up to 12 years are applied in the actions of the Children's club of the National Museum established in 2004 with the idea to create an appreciation of cultural heritage, history and art in the youngest members of community, as well as to encourage their curiosity, creativity and acquirement of a new knowledge. The members of the Club gather in museum workshops organised during exhibitions, special occasions or other events. Children from different social settings and with different background partake in those programmes, and that contributes to their understanding of tolerance, cultural diversity and appreciation of other people's customs, habits, language and behaviours. Sometimes the Club's activities are aimed for particular age, and sometimes topic, choice of materials and methods allow simultaneous work with children of different age where younger children learn to rely on older ones and at the same time older children are taught to carefully interrelate with younger ones. One of characteristics of the Children's club is an inclusion of parents in the gatherings and workshops, and following specific rules and activities represents added experience for parents and childe companions, one they are involved with particular eagerness (Fig. 6).

Fig. 6   Children's club of the National Museum, family programme, 2005

Facts speak about the success of the Club: in numerous museum's workshops around 1,000 members participated and more than 100 educational programmes was organized. Some of them

were realized inside the museum space (*In touch with Antiquity* (2006), *Magic of Amber* (2006), *Trajan's Market in Rome* (2006), *Mosaics from Gamzigrad* (2009), *Italy and Restoration of the Magnificent Crate – Treasure from Princely Graves from the National Museum* (2011)) and others outside the museum, in different city spaces where the museum had exhibitions (*Mystery of the Lepenski Vir* (2008), *Vinča – Prehistoric Metropolis* (2008), *French-Serbian Cooperation in the Field of Archaeology* (2008)). Various anniversaries, winter and summer breaks, events and happenings were the occasions for specific thematic workshops for the Club members and for the youngest guests of city of Belgrade (such as the International Museum day, European Heritage Days, Science Festival, Belgrade Days, etc). Although the implementation could seem effortless and breezy, the preparation of the educational programmes for the youngest requires the thorough knowledge of teaching methods, museum materials and superb communication skills, and only with fulfilling those preconditions could new programmes, that can like existing one in best possible way meet the needs of the youngest, be developed (Fig. 7).

The Children's Club of the National Museum, having been active for nine years ago, have now more than 300 members that outgrown the limits of didactical programmes for children up to 12 years old. Successfully realised pilot-programmes were the guidelines for the establishment of the Teen's club of the National Museum (2008) for youth between 13 and 18 years of age. Although founded as a logical extension of the Children's club, especially in the terms of approach to target audience, the Teen's club did not generate result that could be consider relevant for resourceful work with young people of mentioned age. Reasons probably could be found in the lack of conditions for the continuous work with young people as well as in limited accomplishment in a creation of contents relevant to specific frame of mind of young people that should be conveyed in their language and style with means that are familiar to them (Fig. 8).

Young people in senior classes of an elementary school and in a high school are entering the world that is presenting them new ques-
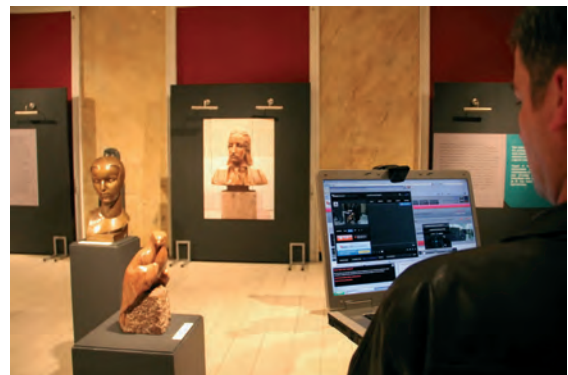
Fig. 8 Educational and research project for young *1+1: Life and Love,* National Museum, 2011

tions in all the spheres – in economy, politics, science, technology, and social relations. To answer those new requests the formal education should become more flexible, sensible, functional and based on cooperation and engagement of all relevant partners – participants in education.[9] This is not the task for schools only but for larger community, witch should through different interested groups contribute to the flow of educational programmes suitable for the development of various abilities and potentials of youth. However, insufficient cooperation of educational cur-

Fig. 7 European Heritage Days, 2005

9   Strategy on development of education in Serbia until 2020, Ministry of Education, Science and Technological Development of the Republic of Serbia 2012

riculum with quality-driven endeavours leaves huge space for the choice of less valuable leisure time activities that are not able to answer to real needs of young people. Although society in general is quick to throw over many of troubles to educational institutions, it is hard to believe that schools can struggle on their own with weakening of hitherto educational objectives and goals without consistent support of the state.[10]

Although for the majority of young persons the response to any kind of institutional way of spending leisure time is characterised with a rebellion and refusal to partake in anything unfamiliar, even not knowing the essence of it, some of the museums recognized their problems and demands. They offer various contents in language and style of youth, and with familiar instruments. One of more favourable ways of the work with teenagers in museum is teamwork on joint projects. It creates opportunity for each individual to give the maximum in the most well known field and, in the same time, it offers sense of strength and protection of the group. The main goal of these projects is to make museum objects known in interesting and comprehensible way, and to experience culture, art and science through embodied experience, to demystify them and recognize as something familiar and something that person can relate to.

In planning of these educational projects it the museum all phases of preparation and realisation are developing jointly with young people. They are responsible for their own learning and have control over their personal work.[11] The goal of this approach is involvement and engagement of the young people in the museum activities, recognition of the importance of their opinions in the choice of methods and forms of work, and practice in a teamwork and group solving of questions. It encourages creative questioning, analytical spirit and ability to contemplate the world on different plains. Young people determine the course of research in which chosen subject is investigated from different angles (analysing original, studying research topic through modern media or scrutiniz-

ing materials from other museums, libraries and archives) and they are gaining habit and requirements for the creative learning. The choice of project presentation is on the young people as well; they have to agree on the form of a public presentation of their work. Presentations could differ in genre: exhibition, photo album, map or model, reconstruction of historical events with electronic media, performance, video clip, animation, computer game, glossary or touristic guide. The young people are in the centre of the project and museum educator is just observer and, sometimes, when array of ideas is too overwhelming and it is threatening to lead the project a bit astray, co-pilot. It is necessary in each phase of the project to reflect on its goals, existing resources and possibilities, rounding up all the aspects in an evaluation, the last phase of the project when participants openly, from different standpoints, discuss the project, observing weakness as well. During the life span of the project cooperation with teachers is necessary and they have to be informed about all the stages of the project developing continuously in the museum, classroom and other places to be able to participate timely in particular phases of the realisation, when institutionalized support of the school is needed.[12]

The teamwork in the implementation of the museum's educational programmes with teenagers could bring surprising results, which exceed by quality, ideas and forms all anticipated outcomes. Patient and skilful museum educator, carefully listening to the needs of young people for creative exploration and original expression, has a possibility to maximise all of the potentials of the juvenile groups and enable results equal to genuine cultural product presented by way of exhibition, performance, video clip or theatrical play inspired with museum collections or topics. On the other hand, the experience gained by the

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10 In our society situation is burdened with imposed rhythm of life where parents pay less attention to the needs of their children as well as degradation of ambition for further academic studies

11 Garman, Piantanida 1996

12 Recent encouraging example of the National Museum activities with young people is participation in the educational project 1+1: Live and Love, realized in 2010-11 with eleven museums from the Balkan region. Successful cooperation of the Balkan museums on the common project was the result of the establishment of the Balkan Museum Network, with the support of Swedish NGO Cultural Heritage without Borders, and with financial backing of the Swedish International Development Agency (Sida). Exhibition catalogue: Гавриловић, Грујић 2011

Fig. 9 Museum in the suitcase project, programme
Inhabitation in the Past, 2008

Fig. 10 Visitor's programme *National Museum for
citizens*, National Museum, 2013

involvement in educational programmes of the museum might not only encourage further deepening of the knowledge but also strengthen the self-esteem and belief in personal potentials and talents that were not apparent or expressed before. Thus each positive experience in work with young people is precious contribution in building and nurture future museum visitors and future collaborators and professionals.[13]

The cooperation of the Department for education with educational institutions in the last several years is happening outside the Museum as well. Absence of the permanent display lead to preparation of different outreach programmes, such as the *Museum in suitcase*, applicable in non-museum spaces, schools, pre-school institutions, student homes, cultural centres, libraries, gerontology centres, peoples' universities, NGO

for disabled people, centres for children without parental care and all other places where interest for learning and understanding museum materials was shown (Fig. 9).[14] The implementation in spaces familiar to participants, where they feel relaxed and "at home" is the advantage of these programmes. During workshops reproductions and replicas of selected objects that could replace original artefacts are used. They are tangible, could be handled and copied, which is very helpful in working with young children, elderly and certain categories of disabled people. The concept of the educational programme *Museum in the suitcase* does not differ from programmes happening in the museum, and they are effective and valuable way of making museum collections and materials as well as new information more familiar to interested participants.

Programmes integrated in the *Museum in the suitcase* project had positive reception from educators in different institutions, and topics like *Food in the past*, *Inhabitation in the past* and *Clothing in the past*, part of the courses *The History of everyday life*, proved to be an excellent addition to the choice subjects for the elementary schoolchildren.[15] Teachers have been offered various topics included in the programme *Talking pictures* also (*Blue doors, Family, Groups and individuals, Brothers and sisters, Body in the art, Modern art, Know Belgrade*) realised together with psychologist with great success in more than

13 Report of the Department for cultural-educational and promotional activities, Reg. No. 900/43, 2nd of December 1982, Archive of the National Museum. Working with young people was cherished in the National Museum for several past decades. State educational reform and transition to so-called directional education in 1980-ies demanded the flexibility in activities of the Department. New forms of engagement were found for pupils of the high school Dimitrije Tucović that educated future museum technicians, registers and conservators. In cooperation with colleagues from other curatorial departments additional lectures, practical work in storage rooms, manipulation with artifacts, icons, paintings, etc. were prepared for students. Cooperation of the Museum and educational institutions on organizing practical work and hands-on activities resulted in building of several of nowadays experts, museologist, scientist and lecturers that remember sometimes with nostalgia their first encounter with "behind the scenes" museum activities

14 Gavrilović 2012: 52-53

15 Annual report of the National Museum for 2008, Reg. No. 163/1, 4th of March 2009, Archive of the National Museum

20 elementary and high schools.[16]

The great help in the implementation of educational programmes of the National Museum represents university senior students, engaged in museum work as obvious way to gain knowledge and practice. All interested students are gathered in the Club of associates of the National Museum, and the goal of this group is to support and help the development of educational activities and programmes of the National Museum. The Club consist of young associates studying archaeology, history, history of art, pedagogy, adult learning, special education and other fields. The engagement in the Club of associates provides students with opportunity of further professional training in the field of interpretation of cultural heritage and popularisation of the science, and in cooperation with experts of different profile they cultivate their cognitive and organizational skills and abilities. For the young graduates the programme of collaboration in the curatorial departments, behind the scene, is developed as well, and they participate in various projects, research documenting, exhibitions and in the preparation of different events.

The members of the Club of associates are mostly engaged as museum communicators, animators and museum docents. They receive visitors, offer guiding tours, and are involved in various educational programmes and workshops, Their participation in a development of programmes for their peers is very valuable as well as in activities created for visitors not interested in usual lectures, visitors that want to have new experiences and possibility to perceive various contents, presented also in different media, in another way (Fig. 10).

Based on cited experiences, visitor surveys, evaluation of the educational programmes developed despite severe circumstances and the positive reception, we can assume that educational programmes of the National Museum are the important link between the museum and visitors. Creating programmes for the specific target groups, respecting needs of the public based on their age, educational background or working environment and changes in our community in the last two decades, crystallized forms of continu-

ous active work with public that could be implemented in the museum visitor programmes related to new permanent display, now in preparation.

Inspiring collections of the National museum offer abundant possibilities for different programmes that can give additional quality to the museum visit. Ideas could be drawn form interest of the public, their questions and thinking. Very stimulating and motivating for the public are subjects that connect different historical epochs or styles, as well as those related to present day. These require excellent knowledge of the museum materials, teamwork and cooperation of custodians from different fields.

The refurbishment of the National museum building and the new display expected in the near future will help young visitors to strengthen cultural habits, taste the joy of learning, build up connections to their surroundings, develop their self-esteem and enjoy at the place they are always welcome. For the adult public, citizens of Belgrade and guests, the stay in the museum will secure meaningful and active leisure activities in pleasing settings. For those high set goals we are obliged to provide high-quality exhibition spaces with expertly communicated exhibits, that is the positive environment for everyone and anyone and surroundings visitors will always come back with pleasure and anticipation of new discoveries.

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REZIME

EDUKATIVNI PROGRAMI NARODNOG MUZEJA U BEOGRADU I NJIHOV ZNAČAJ U OBRAZOVANJU, PREDSTAVLJANJU I POPULARIZACIJI NAUKE

Ključne reči: muzej, publika, edukacija, popularizacija nauke.

U sastavu Narodnog muzeja u Beogradu nalaze se arheološke zbirke koje pripadaju periodu paleolita, mezolita, neolita, bronzanog i gvozdenog doba, kulturi klasične Grčke, helenizma i antičkog Rima, do prvih vekova hrišćanstva i Seobe naroda. Pored prikupljanja, obrade i istraživanja, stručnjaci Narodnog muzeja veliku pažnju posvećuju predstavljanju nasleđa pripremom tematskih izložbi, publikacija i posebnih programa za publiku, u svrhu obrazovanja ukupne javnosti i popularizacije nauke.

U ovom radu predstavljeni su metodi rada sa različitim kategorijama posetilaca koji su bazirani na arheološkom nasleđu. Udruženi s novim vidovima komunikacije i oblicima neformalnog obrazovanja, otvorili su prostor za razvoj kvalitativnih odnosa sa publikom svih uzrasta i profila. Svojom utemeljenošću, pokazali su se kao sjajna baza za ulaganje u dalji razvoj i negovanje odnosa sa posetiocima kao sastavni deo ukupnih komunikacija kojima je Muzej prisutan u javnosti.

Poslednjih decenija ustanove kulture različitog tipa prepoznate su kao mesta opštekulturnog, neformalnog obrazovanja koja doprinose razvoju kreativnosti i dopuni znanja. Među njima se posebno izdvajaju muzeji koji predmet svog proučavanja – originalni muzejski predmet, koriste kao sredstvo edukacije i komunikacije. Komunikacija muzeja sa zajednicom kroz edukaciju, praktične aktivnosti, razonodu i rasterećenost može od muzejskih kuća da učini ustanove koje bogatstvom svojih zbirki i interpretacija doprinose neformalnom učenju, razvoju kreativnosti i popularizaciji svih domena nauke.

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SENIOR VISITORS, JUNIOR ENTHUSIASM:
ANALYSIS OF VISITORS' QUESTIONNAIRE[1]

ABSTRACT

The basic idea of the paper is to analyse opinions, requests, suggestions and impressions about the Viminacium Archaeological Park. For a better understanding of visitors' impressions and comments, a questionnaire was made for foreign (English speaking) visitors from cruise ships, in order to improve the general touristic offer. All answers were transferred to statistical charts and the results gained through this analysis will be presented in this paper.

Keywords: Viminacium, tourists, Archaeological Park, visits, analysis, questionnaire.

INTRODUCTION[1]

Just seven years ago, an Archaeological Park was established within the area of the archaeological site of Viminacium. During 2003, following field works, the large city baths and the northern gate of the military camp were protected with a construction made of laminated wood and so-called French tents. Also, part of the Pirivoj necropolis, with the mausoleum, was protected in the same way.[2] Within this construction is the Viminacium underworld, with tombs which contain original frescoes, as well as copies of those now kept at the National Museum of Požarevac.[3]

After Viminacium was identified as a tourist destination and Archaeological Park, all the necessary facilities were established: infrastructure, staff, security etc. After that, a tourist itinerary was defined in which three protected objects were included: *porta praetoria* – the northern gate of the military camp (Golubović and Tapavički-Ilić 2012: 71), *thermae* – the Roman baths (Golubović and Tapavički-Ilić: 70) and the Mausoleum with underground fresco painted tombs (Golubović and Tapavički-Ilić: 71-72; Anđelković 2012: 1-6.). After finishing the building of the *Domus Scientiarum* – the scientific and research centre, this was also in-

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2 More about Viminacium Archaeological Park in: Maksin et al. 2011: 331-339; Golubović and Tapavički-Ilić 2012: 67-73; Tapavički-Ilić 2013: 315-326; Golubović and Korać 2013: 65-74.

3 More about fresco presentation in the Viminacium underworld in: Anđelković 2012: 1-6.

Sex

■ male ■ female
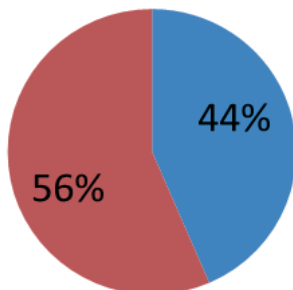
Chart 1

Occupation

■ retierd ■ still working
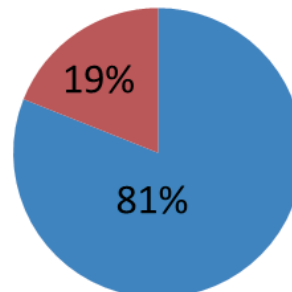
Chart 2

Age

■ <30 ■ 30 - 60 ■ >60
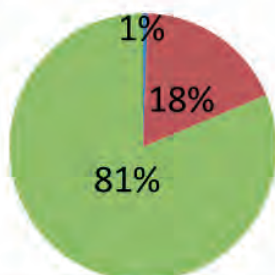
Chart 3

Education

■ basics ■ high school ■ college ■ university
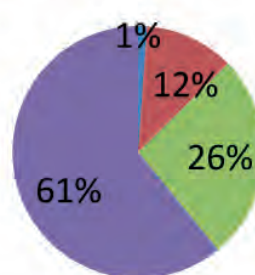
Chart 4

How often do you travel

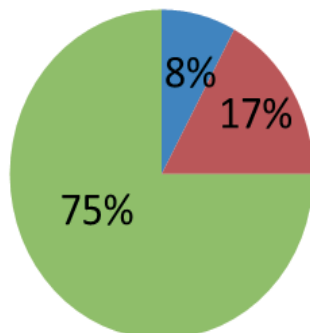■ < once in a year ■ once a year ■ >once in a year

Chart 5

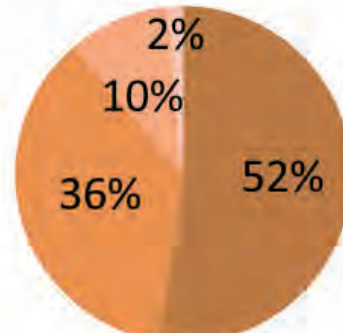## Accompanied by

■ family ■ friends ■ colleagues ■ alone

Chart 6

cluded in the tourist itinerary. (Nikolić 2012: 66-68; Golubović and Tapavički-Ilić 2012: 73; Golubović and Korać 2013: 71.)

VIMINACIUM VISITS

According to research in 2006, the profile of visitors to Viminacium was as follows: 35% were children's excursions, 25% different group visitors, 20% individual visitors, 19% travellers on cruises, while only 1% were individual foreign visitors. Since 2007, and the arrival of early official visitors to Viminacium, their number has been increasing rapidly. During 2007, 50,000 people visited Viminacium. In the same year, from the Danube port, visitors came from 12 American, 35 Danish, and 47 Dutch cruise ships. During 2008, Viminacium was visited by around 65,000 visitors, out of whom 55,000 came via the mainland and 10,000 by ship. Already in 2009, the number of visitors had grown to around 72,000, with 55,000 by mainland and 17,000 by ship. In 2011, Viminacium was visited by 75,000 tourists. Of these, 15,000 arrived by ship.[4] (Maksin et al. 2011: 340.) The same trend continued in 2012, with 15,000 out of a total of 75,000 tourists coming via the Danube. During this time an average of one ship per week arrived with a group of between 120 and 150 tourists from English-speaking areas.

ENGLISH SPEAKING VISITORS

Large cruise ships, (Viminacium has an agreement with Uniworld and Viking companies) with tourists from English-speaking areas, travel along the Danube for between two and four weeks. For instance, the Uniworld company offers two cruises: Eastern Europe Explorer, a 15 day cruise from Vienna to Bucharest, and the Grand European Explorer, a 29 day cruise from Basel to Bucha-

rest, with two extraordinary ships: River Countess and River Duchess. They cruise through seven or ten countries and include visits to capitals and cultural monuments. Although there is an accent on historic and political changes in Central and Eastern Europe in these cruises, organizers also point out historical and archaeological monuments and ruins. Those who are fans of architecture and archaeology will enjoy spectacular structures and ancient ruins.[5]

This means that, before booking, every tourist is informed about the cruise schedule, so that they know exactly what to expect. While travelling through Serbia, these ships stop only in Belgrade, Viminacium and Donji Milanovac.

For the purpose of this paper, a questionnaire was designed for the season of Spring/Summer 2012 and filled out by 180 persons. The questionnaire was composed according to the tour which included visits to the Roman baths, the Mausoleum and the Domus Scientiarium.

ANALYSIS

The first part of the questionnaire was optional and it aimed to provide basic information about the visitors. There was an almost equal number of men and women in the tours (Chart 1), most of them were retired (Chart 2), they were of certain ages (Chart 3) and majority of them had a university degree (Chart 4).

The second part of the questionnaire included questions about their previous travelling experience. This information helped us to understand with which archaeological sites they could compare this visit to Viminacium. Here they were allowed to mark more than one answer. Most of them travelled more than once a year (Chart 5) and more than half of them travelled accompanied by family (Chart 6). 97% of the examinees had travelled to Europe before (Chart 7) and they visited

4 We would like to thank our colleague Emilija Nikolić, who provided all this information to us from the T-PAS socio-economic study.

5 More information about this cruise at the site: http://www.uniworld.com/Plan-your-Cruise

In Europe before

■ yes ■ no

3%

97%

Chart 7

Visiting ancient sites

■ in Europe ■ elsewhere

44%

56%
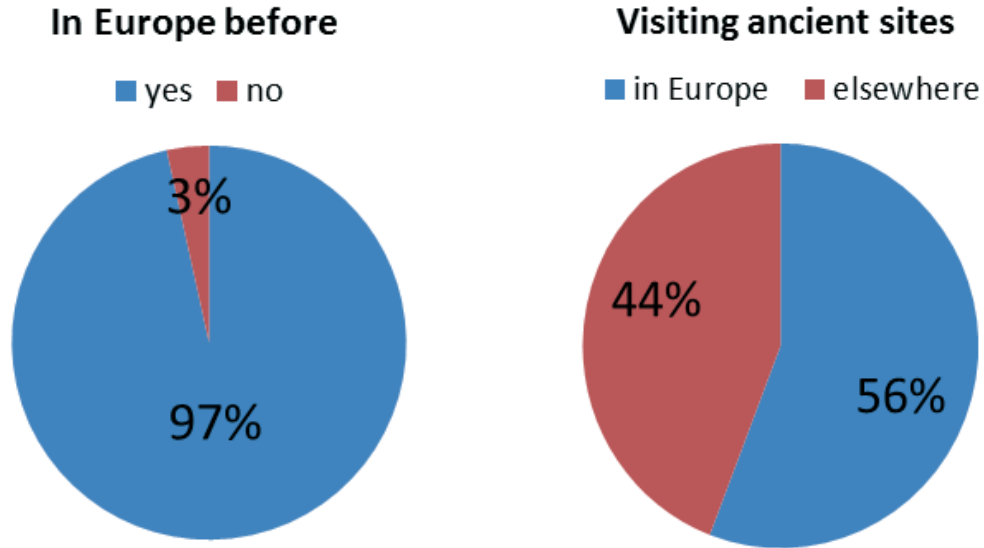
Chart 8

ancient sites both in Europe and elsewhere (Chart 8). Tourists from the US mostly visited ancient sites in South America – Mexico, Peru etc. Lots of them travelled to China, Egypt or Tunisia. When it comes to Europe, the most visited sites were Pompeii, Ephesus and Hadrian's Wall.

The rest of the questions were regarding Viminacium, with the aim of discovering their impressions, to help us improve future visits.

Most of the visitors had never been to Viminacium before, and most of them would like to return to the Archaeological Park too, prefer-

General impressions about Viminacium

■ yes
■ no
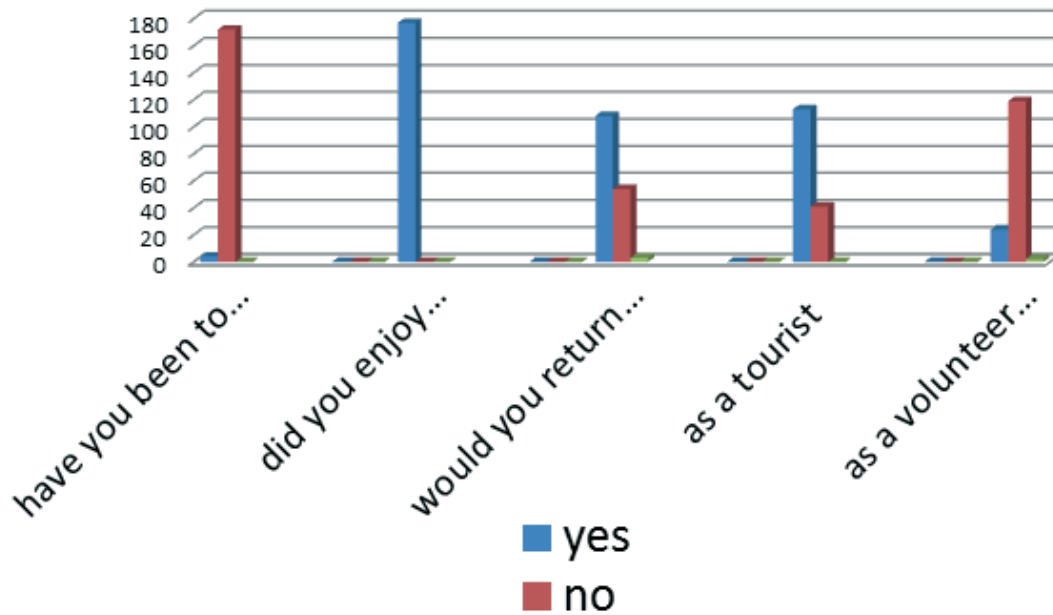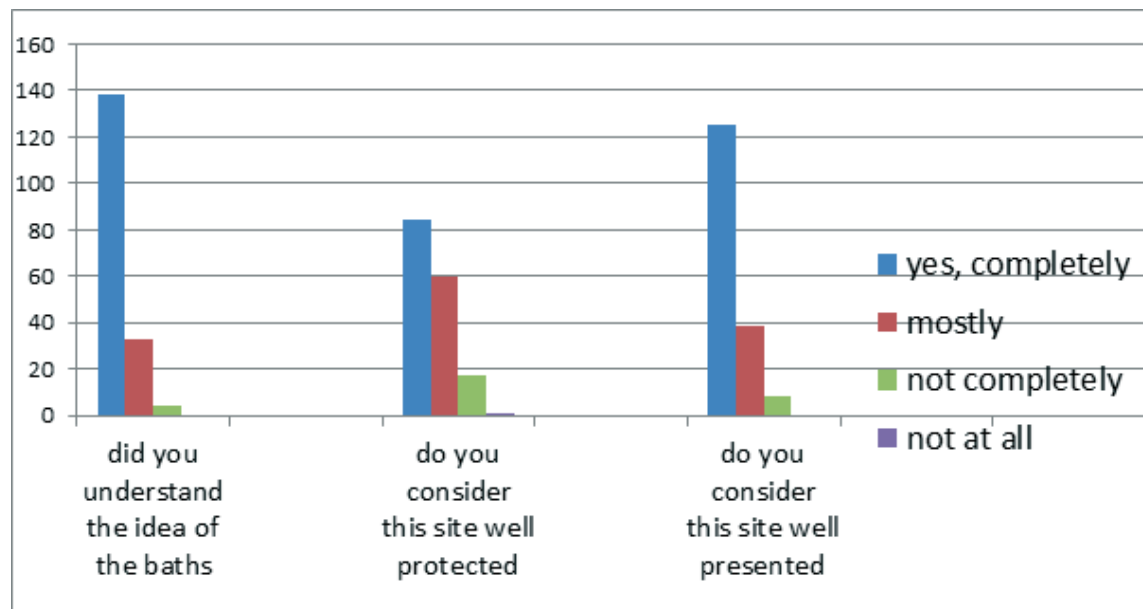
Chart 9

Chart 10

ably as tourists rather than as volunteer archae-ologists, most probably because of their ages. The general impression is that all of them en-joyed the visit (Chart 9).

Other questions were directed toward spe-cific points of interest included in the tour. These questions were created in order to indicate that the Archaeological Park of Viminacium is a well-protected and well-presented tourist desti-nation in terms of world heritage. Also, it was im-portant to know what moments of the tour were the most important ones regarding their impres-sions: archaeological remains, reconstructions, explanations of the expert guides or, at some points of the tour, costumed staff.

Regarding the Roman baths, most of the visitors agreed that they understood the con-cept of the thermae. The majority of examinees considered that the site is well-protected and well-presented and most of their impressions were based on the explanations of the expert guides (Charts 10 and 11).

During the visit to the Mausoleum, most of the visitors understood the idea of the Mausole-um, and majority of them considered the site to be well-protected and well-presented. Their impres-sions were based on the explanations of the expert guides as in the previous case (Charts 12 and 13).

A visit to the Viminacium underworld is specific because there is a sort of theatre implied, where costumed staff-members greet the visitors and an ancient Charon, dressed in black, leads them through dark corridors to the entrances of the tombs with frescoes.[6] The majority under-stood the idea of the underworld, considered the site well-protected and well-presented (including the idea of frescoes presented within the tombs). Still, due to either their age or health problems, some of the visitors were not able to go through dark passages, which most of the visitors thought represented an exciting experience. It is interest-ing that only 4% of them based their impressions on costumed Romans and the Charon, while more than half of the examinees still thought that the most important contribution to their impressions were the explanations of the expert guides (Charts 14, 15, 16 and 17).

Domus Scientiarium, as a replica of a Roman villa, provides real Roman design and an authen-tic atmosphere to the visitor, with all additional contents. There is a kitchen with Roman food, a library, a museum and a gallery space and a large

6 More about this in: Anđelković 2012: 1-6.

Your impression is based on

■ archaeological remains   ■ reconstructions   ■ explanation of the expert guide
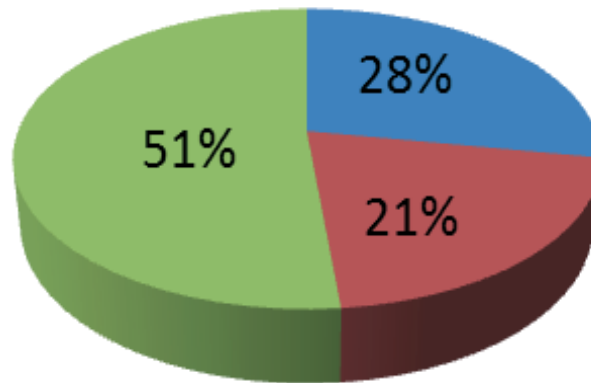
28%

51%

21%

Chart 11

open air atrium surrounded by rooms where guests may stay. Thus visitors preferred the central atrium, and thought that the Domus was inviting enough for them. They were interested in tasting Roman food and considered that the ancient atmosphere was well revived. Most of them were not interested in dressing like Romans (possibly because of their age) and said that they would not be interested in

■ yes, completely

■ mostly

■ not completely

■ not at all

did you
undertand the
idea of the
Mausoleum

do you
consider this
site well
protected

do you
consider this
site well
presented
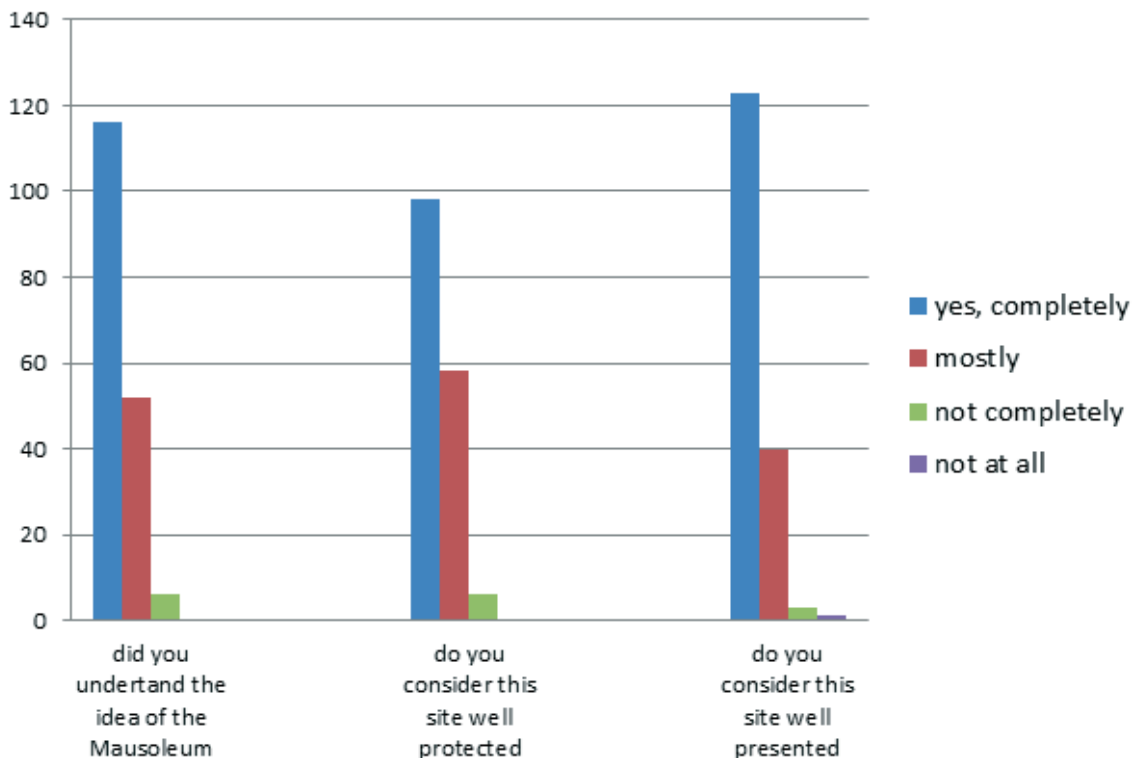
Chart 12

Your impression is based on

■ archaeological remains   ■ reconstructions   ■ explanation of the expert guide
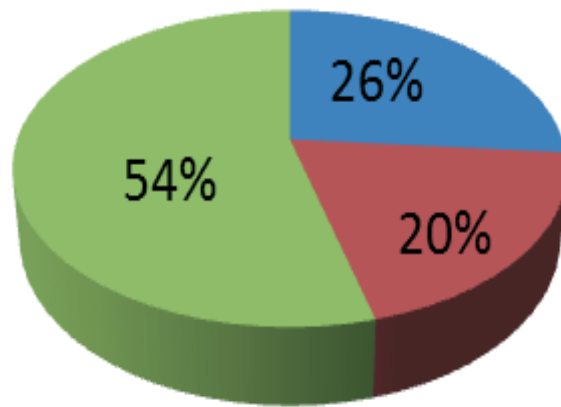
Chart 13

staying at the Domus, giving pollution in the air (from nearby thermal power plant) as an explanation. This is a big problem for Viminacium, as the bad smell of the coal mine is a potentially large factor in visitors refusing to come to the park and stay in the Archaeological scientific-research centre, especially those who suffer from asthma or allergies (Charts 18 and 19).

Next to the Roman tavern, where guests are greeted with wine and ceramic shards bearing
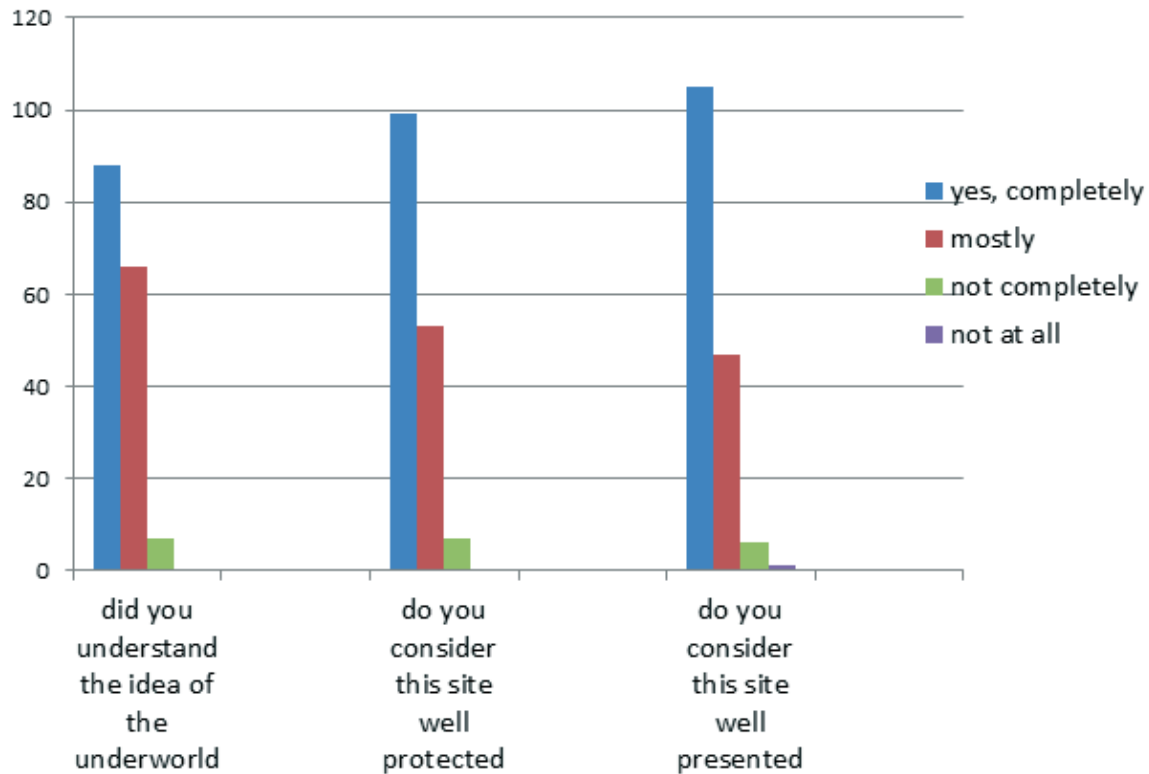
Chart 14

Your impression is based on

- archaeological remains
- reconstructions
- explanation of the expert guide
- Charon and costumed Romans

Chart 15

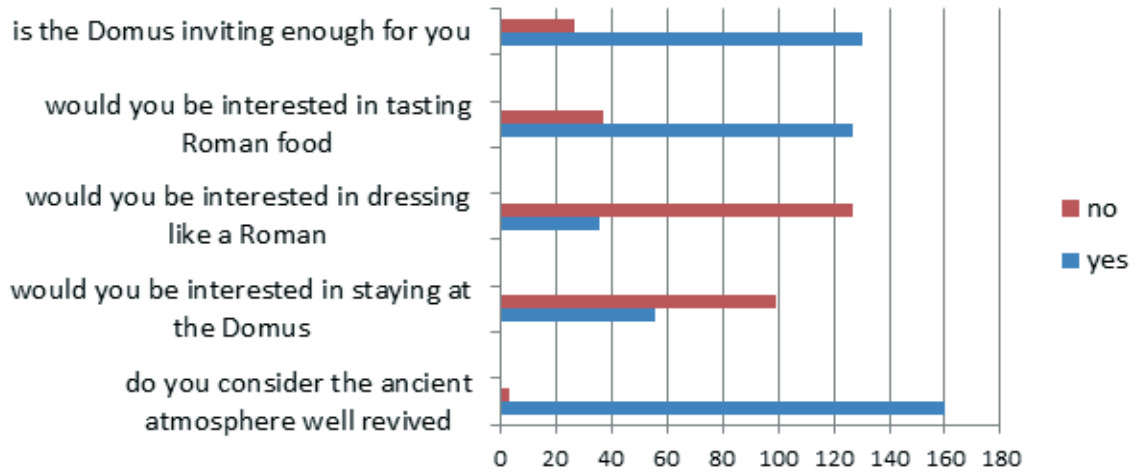your impression about the underworld passage
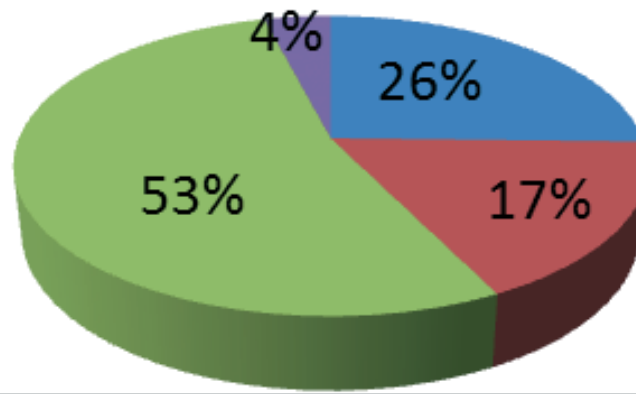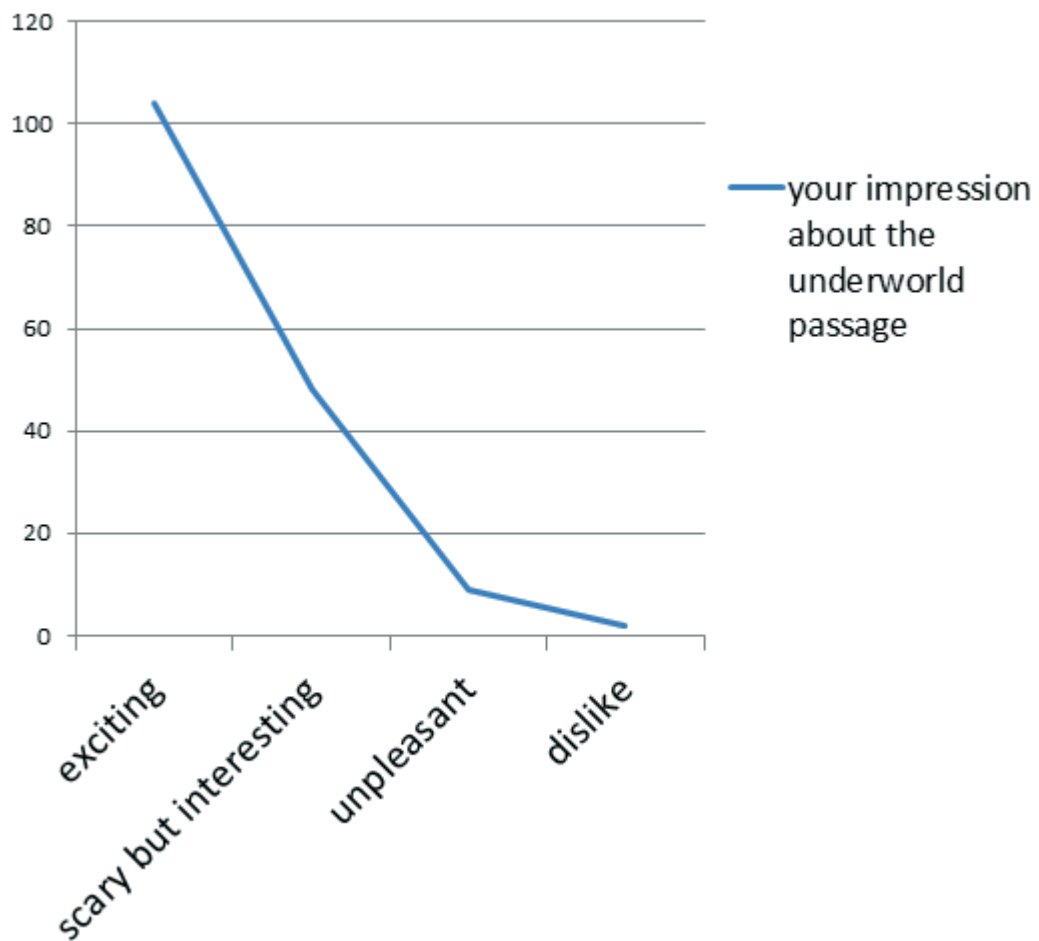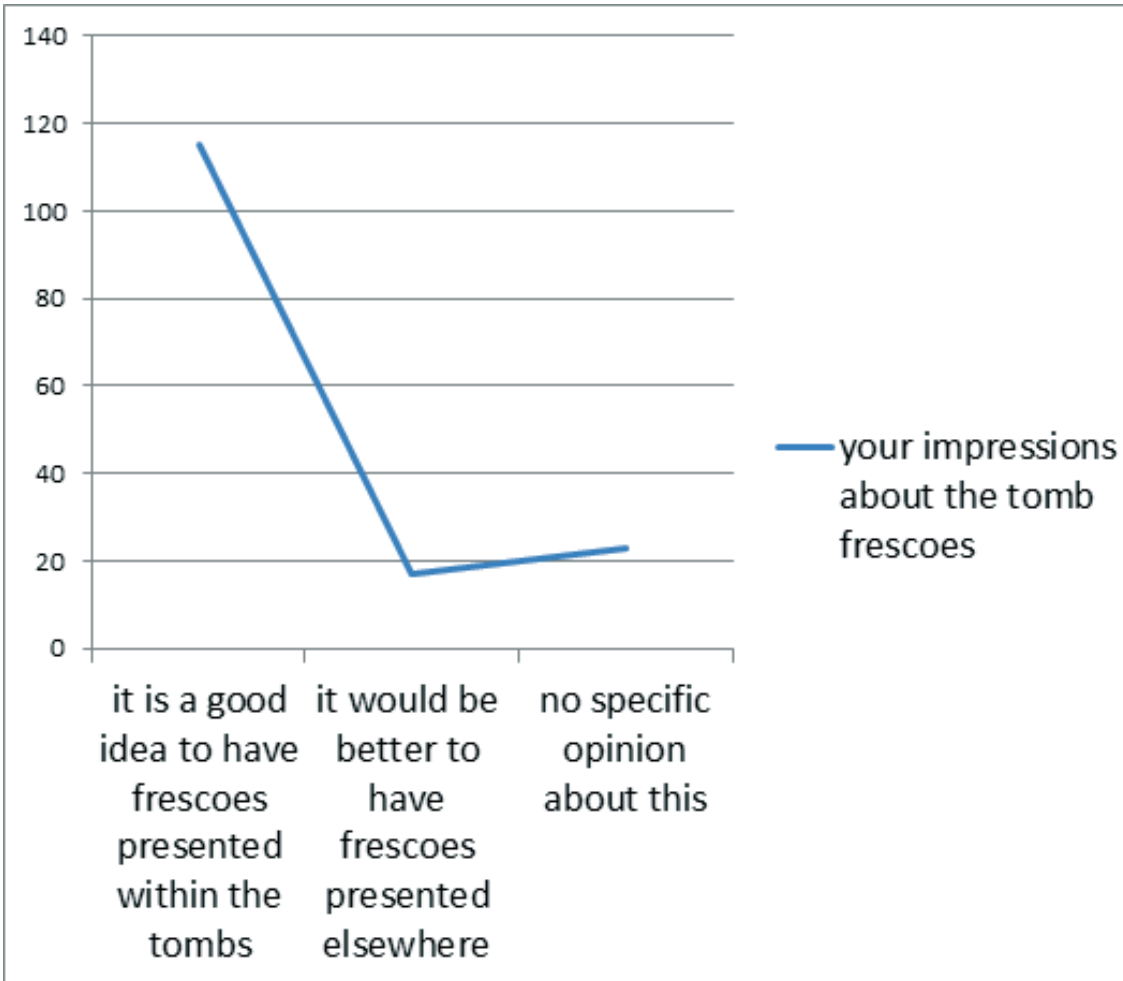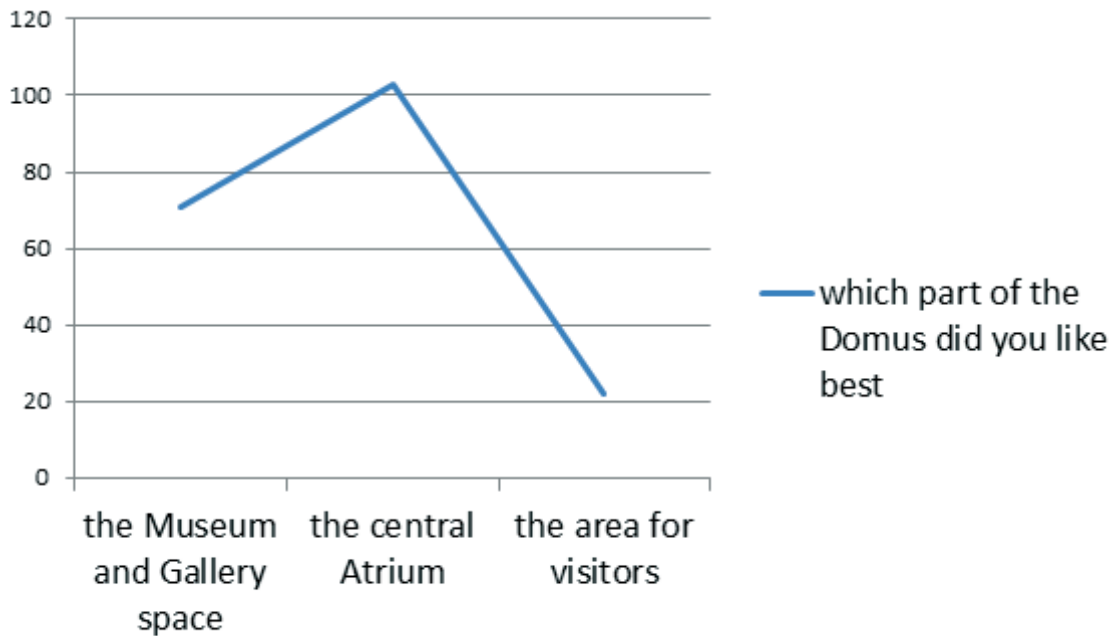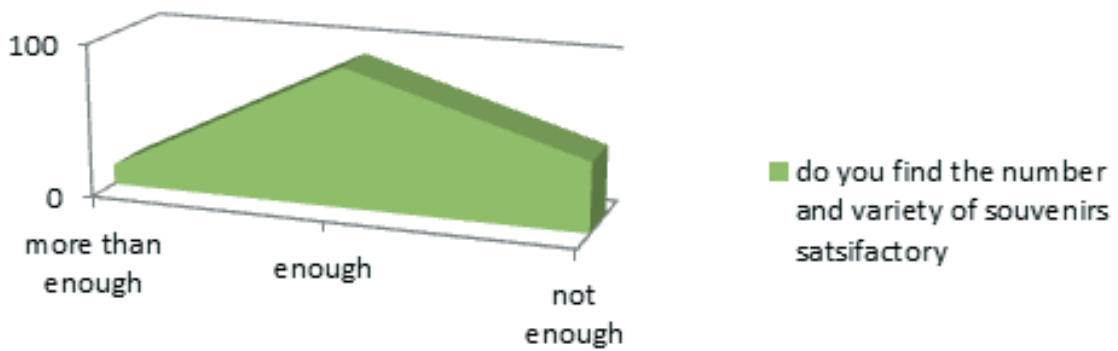
Chart 16

Chart 17

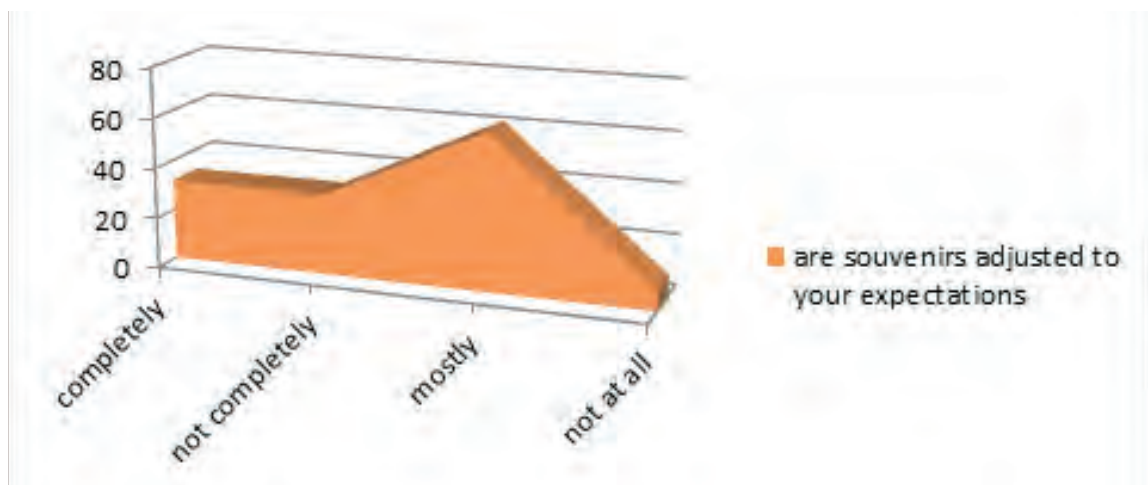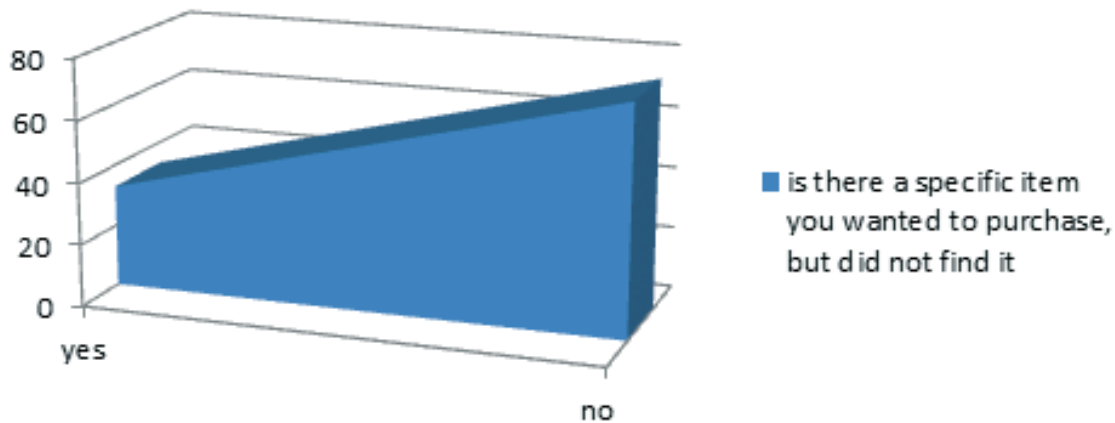Chart 18

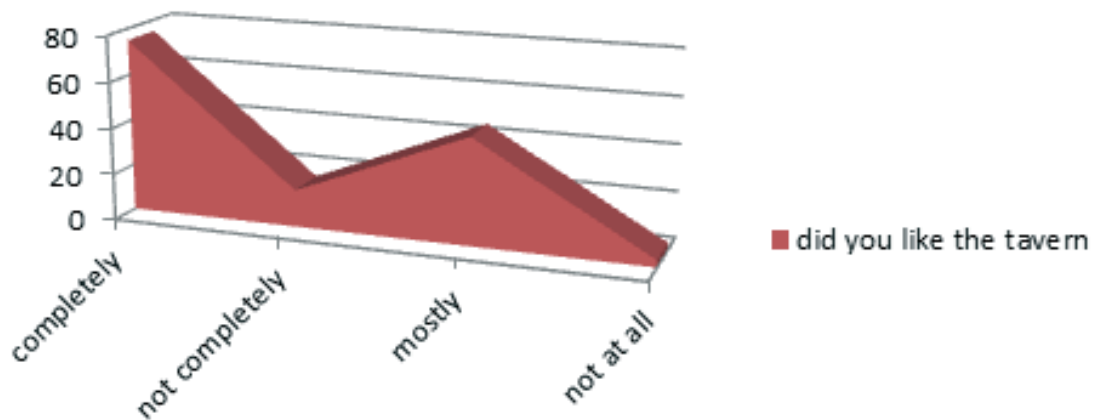Chart 19

Chart 20

Chart 21

Chart 22

Chart 23

hand-written Latin quotations, there is a souvenir shop. Most of the visitors found that the number and variety of souvenirs is satisfactory enough, and that souvenirs were mostly adjusted to their expectations. They also said that there was not a specific item which they wanted to purchase that they could not find in the souvenir shop. The majority of the visitors liked the tavern and they were impressed with drinking wine from replicas of Roman cups, as well as with the Latin inscribed ceramic shards (Charts 20, 21, 22, 23, 24).

As well as the questions, the visitors were also asked to add comments. Some comments are as follows:

Some of the visitors wished to go and see the open pit and this industrial complex and others were interested in the whole process of archaeological excavation and wished to see a presentation of all its phases. Noticeable is a wish of the visitors to see more antique structures presented.

Other comments included recommendations and suggestions to improve the range of activities on offer at the park, tied to additional souvenirs like multimedia, educational guides, models of the park, posters of frescoes, etc. Some also regarded physical elements to make sight-seeing for elderly persons easier, as well as videos which could be shown to visitors with walking difficulties who were not able to see some parts of the park.

Much praise was given to the educated and pleasant guides. The whole presentation of the park was rated very highly, as both an educational experience and a perfect way to preserve history.
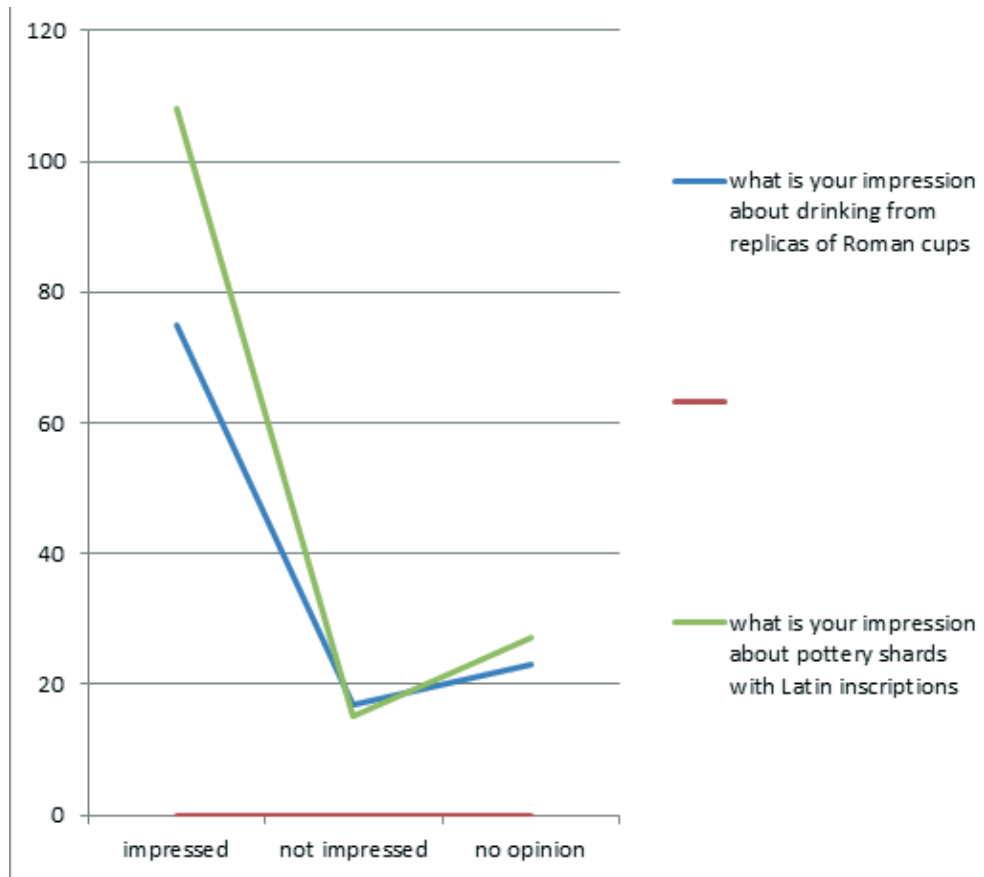
Chart 24
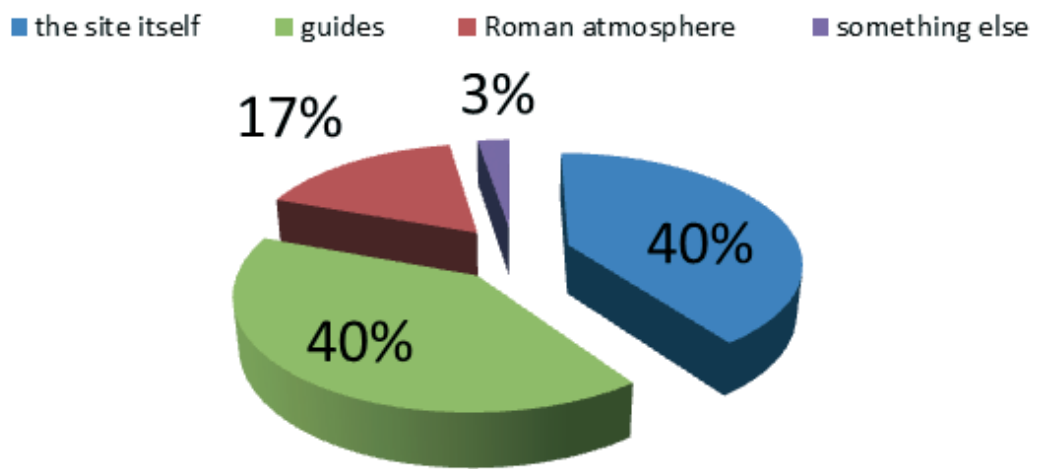

Impressions about Viminacium are mostly influenced by

Chart 25

CONCLUSION

Most of the visitors from cruise ships had already been to some other archaeological sites or parks and this makes their answers and comments even more valuable, especially considering the fact that they mostly visited already well-known sites such as Pompeii or the Egyptian pyramids. They favourably compared the "new born" Archaeological Park of Viminacium with these gigantic world heritage sites.

If we look back at the analysis and charts of the visitors' impressions of the Roman baths, where 51% of examinees stated that their impression was based on the explanation of the expert guide, at the Mausolem 54% stated the same and for the Domus Scientiarium 53% confirm that same fact, it can be concluded that this was the greatest factor which influenced their good impression and acceptance of the Archaeological Park of Viminacium. At the end, the final question related to their general impression of the site and the Viminacium Archaeological Park, when 40% of the examinees stated that their impression was based on the site itself, while a further 40% stated that it was based on the guide's explanations (Chart 25). It seems that the guide is an ambassador or a direct reflection of the Archaeological Park, and it is, therefore, most certainly important to have well-educated and motivated people for this position.

Also, considering everything said in the comments, although many of them think that a great job is being done at the Viminacium Archaeological Park, the work is not yet finished. It is like a living organism which has to evolve together with the visitors and their needs and requests. That is why it is important to hear the public's voice in order to improve the general and specific activities of the Archaeological Park. It is also important to specify two different approaches, for domestic and foreign visitors, since they react in diverse ways. That is why this questionnaire and the analyses were completed.

The dialogue with the public is the most secure way of understanding specific needs, requests and demands, in order to apply them in the touristic itinerary of the Viminacium Archaeological Park. This is of special importance, if we bear in mind that Viminacium and Serbia, with its great number of ancient sites, are becoming part of the European and World heritage and Archaeological tourism through new projects, such as Itinerarium Romanum Serbie or Danube Limes Brand (Golubović and Korać 2013: 72).

Since the Viminacium Archaeological Park consists of objects, modern service facilities and communication that connects them, as well as cultural and entertainment shows for its presentation to the viewer i.e. visitor, the people and the area where the park is located are all of great importance. All of these are basic factors of emotional design in forming an Archaeological Park.[7] Also, this questionnaire, and the analyses performed on it, showed that visitors' emotions are one of the most important elements in developing Viminacium as an Archaeological Park, whose insufficient number of remains are supplemented by successful presentations, lectures and the atmosphere etc. The overall experience makes the perception and interpretation of the Park facilities equally important and accepted.

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REZIME

STARIJI POSETIOCI MLADALAČKOG DUHA: ANALIZA UPITNIKA POSETILACA

Ključne reči: Viminacijum, turisti, arheološki park, posete, analiza, upitnik.

Arheološki park Viminacijum razvija se poslednjih osam godina u turističku destinaciju, koju posećuju domaći i strani turisti. Pored ekskurzija, stručnih ili individualnih poseta, arheološki park Viminacijum posećuju i turisti sa brodova – kruzera koji plove Dunavom. Među ovim turistima, sa engleskog govornog područja, tokom 2012. godine sprovedeno je istraživanje putem upitnika. Rezultati dobijeni ovim ispitivanjem prezentovani su u radu u vidu analiza i tabela koji statistički odgovaraju dobijenim odgovorima. Cilj ovakvog istraživanja bio je da se na specifičnom primeru (stariji turisti, sa izvesnim iskustvom poseta arheološkim parkovima u svetu) stekne uvid u impresije, utiske, sugestije, komentare i slično, o arheološkim ostacima i pratećim elemetima koji čine da arheološki park Viminacijum jeste i bude prijemčiv ovoj vrsti posetilaca. Zaključak analize ovog upitnika pokazuje da prezentacija i interpretacija arheološkog parka Viminacijum odgovara emotivnoj reakciji posetilaca, ne samo na arheološke ostatke, već i na prateće elemente kao što su rimski duh i atmosfera tokom obilaska, prezentacije, animacije itd. Najveći utisak na ove turiste ostavili su obrazovani i elokventni vodiči, za koje oni smatraju da su podjednako važan faktor u prezentovanju arheološkog parka, koliko i sami arheološki ostaci. Sugestije i komentari dobijeni u ovoj analizi, pomoći će usavršavanje i unapređenje u organizaciji budućih poseta i života samog Viminacijuma kao turističke destinacije.

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DIGITAL ARCHAEOLOGY OF VOLATILE DATA
ON A LINUX PLATFORM

ABSTRACT

It is necessary to gather, analyse and store data on a "live" system in order to detect, in time, whether there is incident/illegal activity taking place. Since it is very important to collect volatile data, in this paper ways of collecting are described as well as tools which are related to them on a Linux platform. In the paper, the following volatile data are named which are gathered from compromised systems:

System time and date, the existing network connexions, open TCP and UDP ports, executive files which open TCP and UDP ports, processes and services started, opened files, internet routing and cache tables, read modules and the kernel, memory and memory process content and mounted system file.

Keywords: digital archaeology, forensic analysis, data collecting, Linux system, "live" collecting, volatile data, compromised system.

Linux is a free UNIX orientated open source operating system, originally created by Linus Torvaldsa with the assistance of programmers from all over the world. There are different Linux versions which are called distributions, with the most common ones being Red Hat, Centos, Fedora, Debian, Suse, Ubuntu, Kubuntu and Slackware. Each of them possesses advantages and disadvantages. These distributions differ from each other also according to their types. There are server, desktop and live distributions. Server distributions are primarily orientated towards the business environment (although they can be configured for home usage). Desktop distributions are more appropriate for home usage; which needs a graphical environment and a great number of applications. Live distributions need bootable versions of operating systems which are read directly into RAM memory and run independently from the existing computer operating system. What forensic investigators need to know is the way in which Linux boots its operating system. The Linux boot sequence starts by reading the kernel. By default, the kernel image is usually situated in the boot directory. Further on, the link to the kernel image is situated in the boot directory and is referenced from the file of the Linux loader, LILO (/etc/lilo) or GRUB (/etc/grub.conf). The last step is initialisation. Files controlling initialisation are situated in the /etc/inittab file. The file responsible for starting the process is /sbin/init. After that, the run level is initialised and the start up scripts are controlled by the terminal process. When it comes to the Linux file system, it is necessary to highlight that Linux treats all the devices as files and stores them in folder/dev (Nelson, Phillips and Steuart 2010). For forensic inves-

tigators it is important to know that most of the Linux distributions possess organised files with similar directory structures:

/bin	Common executive commands at system level
/boot	Files necessary for booting systems including kernel images together with links indicating them defined in LILO or GRUB
/usr	Local programs, libraries, games
/var	Logs and other variable files
/dev	Interface files which enable the kernel to communicate with hardware and the file system
/home	Directories of all of the users on the system with personal user and configuration files
/mnt	Mount points for external, remote and portable file systems
/etc	Configuration files and scripts for administration
/root	Directory of the root user
/sbin	Administrative executive commands which should be accessible only to root, i.e. administrator
/lib	Basic system libraries
/opt	Optional and other programs

Table 1 Linux directory structure

Basic commands which can be of assistance to forensic investigators for gaining basic information about the investigated system are as follows:

#uname - a – shows the name of the computer and the Linux version
#ls – shows the file list
#ls -l – shows the file list with their permissions
#ls -ul file name – gives the time of access to the file
#cp – copies files
#mv – moves files
#chmod – permission changes of files
#ps – shows started processes
#netstat -s – shows information and protocols

#ifconfig – shows information about network devices on the system
#find – for searching for information on the system
#grep – for searching for files or searching with key words
#less – lists file content
#more - lists file content
#cat – also lists file content
#diff – compares two files
#df – shows mounted file systems

In order to use file systems on Linux, it needs to be mounted on a system. All of the file systems on partitions which are defined during installing Linux operating system will be automatically mounted during each system boot. Forensic investigators need to know that data can be written to the device even though the device itself is not mounted. Periphery devices for data storage are recognized as SCSI devices (Nelson, Phillips and Steuart 2010). If an IDE disc is used on the primary controller as the master, the system will name it "hda", but if it is mounted as a slave, it will be named "hdb". On the secondary controller, it will be "hdc" or "hdd". In order to see the complete list of partitions available on a system, the following command is used:

#fdisk -l /dev/hda

Each partition has its ascribed Linux name. The "*" mark means that it is a bootable partition. Exit of the fdisc command also includes information about the initial and last cylinder of each partition, as well as the number of blocks they contain, the ID of the partition and the type of file system.

During an investigation, forensic investigators need to ascertain the certain precautionary measures, such as:

- avoiding program initiation on a compromised computer system
- not initialising programs which can change metadata about files and directories
- document all of the activities undertaken and results gained during the investigation
- calculating hash data values in order to secure data integrity

In order to preserve data in a "live" system, it is often necessary to establish whether there is an incidental/illegal action. Malicious programs can, for example, endanger the security of a system itself as well as the security of any system to which it is connected. Due to the importance of gathering volatile data, further on in this paper the methods and tools will be described which deal with this process on a Linux platform. Just like forensic investigations of a Windows system, for a forensic investigator it is necessary to possess his/her own "set" of tools for the collection of volatile data from a compromised system. The reason is that certain commands on a compromised system can also be endangered and, therefore, they cannot be treated as reliable and, as a result, interaction with the system being investigated is reduced to minimum. By using personal tools, it is possible to discover valuable data which are hidden by certain malicious programs (rootkit for example). Certainly, in some cases when one is dealing with a rootkit which is read as a loadable kernel module (LKM), these tools will not give the expected results and it will be necessary to perform a forensic investigation of the memory and the file system. This chapter offers a general methodology for preserving volatile data on a Linux platform in a correct forensic way, by giving certain practical examples and pointing out the advantages and disadvantages of collected data, as well as its influence on system security.

Linux possesses a suitable tool which can record started commands and their exits, which makes it easy to document what was performed on a live system. The tool is called "Script" and it caches data in the memory and records all the information when it is interrupted in file typescript. If it is required to record after each command, then the script tool is used with an "-f" switch.

#script or #script -f

Before starting any of the commands on an investigated Linux system from a reliable command shell[1] , the script tool is started (previously compiled in a reliable environment). On a forensic system (which can be either a Linux or Windows working station) netcat actually cryptcat command[2] can be started (a tool which can collect data from a network and recommended by many experts) in the following way:

#netcat -v -l -p 9898 > exit_commands_ from_compromised_computer.txt

Data sent over the 9898 port onto a forensic station will be saved in the file exit_commands_from_compromised_computer.txt.   On an investigated computer (Linux), commands will be started with which data of importance for forensic investigation will be collected and their exits will be sent to a forensic working station over the 9898 port:

#/mnt/cdrom/command | /mnt/cdrom/netcat ip_address_of_forensic_working_station 9898

With the CTRL-C command, the netcat session is interrupted.

What needs to be done next is to generate the hash value over the obtained data (MD5, SHA-1 or SHA-256).

Further on in the paper, it will be shown how volatile data are collected which are of extreme importance for a forensic investigation. Volatile data includes:

a. System time and date
b. Existing network connections
c. Opened TCP and UDP ports
d. Executive files that open TCP and UDP ports
e. Initiated processes
f. Opened files
g. Internet routing table
h. loadable kernel module LKM
i. mounted file systems

---

1   Shell represents an interface between the core of an operating system and the user. It possesses a great number of functions, among which the interpreting command line, starting programs, in- and output direction, pipe and shell programming stand out. The most famous shell command interpreters are Bourne shell (sh), C shell (csh), Bourne-again shell (bash), Korn shell (ksh)

2   If it is desired to send data from the investigated computer to a forensic working station, Netcat can be used with an encrypt called cryptcat. Cryptcat uses an improved version of the Twofish blockcoded encrypt with a symetric key. More about this king of encrypt can be found on the Schneier website: http://www.schneier.com/twofish.html

**Important volatile data on Linux -
System time and date**

The system time and date can be obtained by using a command which also marks the beginning of forensic time collecting:

#date

an exit from this command is: Sun Feb 3 13:54:31 CET 2013

By using the forensic netcat command, it is done as follows:

#netcat -v -l -p 9898 > date_of_compromised_computer

Important volatile data on Linux – Exist ing network connections

These data are important activity indicators on an investigated system. According to these obtained data, forensic investigators can find out whether a malicious user is still connected to the system used by the port. It is also possible to find out the initial point of interruption, the enabled vulnerable services on the system which could have been compromised and intruded into the system. A command which can list the existing network connections is the netstat command shown on figure 1.

Fig. 1 Image of the exiting command netstat -an

#/mnt/cdrom/date -u | /mnt/cdrom/netcat ip_address_of_forensic_working_station 9898

#sh256sum date_of_compromised_computer > date_of_compromised_computer.md5

After finishing the forensic collecting, it is recommended also to mark the time of finishing data collecting from the compromised computer.

#netcat -v -l -p 9898 > time_end_of_compromised_computer

#/mnt/cdrom/date -u | /mnt/cdrom/netcat ip_address_of_forensic_working_station 9898

#sh256sum time_end_of_compromised_computer > time_end_of_compromised_computer.md5

#netstat -an

**Important volatile data on Linux -
Opened TCP and UDP ports**

The forensic investigation of the opened ports (TCP and UDP[3]) on a system is focused on detecting vulnerable ports or backdoors established on a system which make incident/illegal actions possible. In figure 2 a command is shown which depicts not only the ports of IP addresses but also the names of processes and their Ids which are responsible for the opening of a certain port (Prosise and Mandia 2001):

#netstat -plant

3 It can be expected that on a system, next to the TCP and UDP ports there can also be a RAW port. It is necessary to know that it is related to the Linux kernel

```
root@ubunt1104srvx86:~# netstat -plant
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State
PID/Program name
tcp        0      0 0.0.0.0:993             0.0.0.0:*               LISTEN
619/dovecot
tcp        0      0 0.0.0.0:995             0.0.0.0:*               LISTEN
619/dovecot
tcp        0      0 127.0.0.1:3306          0.0.0.0:*               LISTEN
733/mysqld
tcp        0      0 0.0.0.0:110             0.0.0.0:*               LISTEN
619/dovecot
tcp        0      0 0.0.0.0:143             0.0.0.0:*               LISTEN
619/dovecot
tcp        0      0 0.0.0.0:80              0.0.0.0:*               LISTEN
1185/apache2
tcp        0      0 0.0.0.0:21              0.0.0.0:*               LISTEN
941/vsftpd
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN
892/sshd
tcp        0      0 127.0.0.1:631           0.0.0.0:*               LISTEN
743/cupsd
```

Fig. 2 Image of the exiting netstat –plant command

By using netcat, forensic investigators can collect this information on a "live" system in the following manner [Kruse and Heiser 2010]:

#netcat -v -l -p 9898 > open_port_TCP_UDP_of_compromised_computer

#/mnt/cdrom/netstat -plant | /mnt/cdrom/netcat ip_address_of_forensic_working_station 9898

#sh256sum open_port_TCP_UDP_of_compromised_computer > open_port_TCP_UDP_of_compromised_computer.sh256

The best form of protection from opened ports (since they bear potential risks of intrusion into the system) is to open only the ports which are necessary for correct system function. It is also recommended to exclude services that work on unnecessary ports in order to increase the security of the system.

Important volatile data on Linux – Executive files that open TCP and UDP ports

It is a Linux tool which can link the opened port with the started process lsof[4] (List Open Files), giving the list of active processes. One of the fea-

4 Available at Purdue University: http://ftp.cerias.purdue.edu/pub/tools/unix/sysutils/lsof/

tures of this tool is that it not only shows the process which opens a certain port, but it also shows the files which initiate certain processes. In cases when a malicious user compromised the system and transferred certain malicious files, he/she will try to hide these files from the system by marking them as hidden. Also, the malicious user will try to create a process which, after opening the file, disconnects the link with the file (unlinks), while the process continues to perform malicious activities.

Programs of the "ls" type will not display this information about the file and the process, since they are hidden from the administrator. It is therefore very important that the forensic investigator or administrator knows the limits of the programs they are using. Lsof is a program that offers detailed information about files, including also files with disconnected bonds. What needs to be highlighted is that knowing the available tools and choosing the right one is of utmost importance for forensic investigation as well as for establishing a safe system.

It can be used as:

#lsof -n , giving a detailed image of the files, processes and ports on the system, but the investigation can be reduced to the processes that are related to TCP and UDP internet sockets shown on figure 3 with the command "#lsof -i".

By using this command in a forensically correct way, all information about all of the processes on the system, opened ports and files can be collected. It is as follows:

#netcat -v -l -p 9898 > lsof_of_compromised_computer

#/mnt/cdrom/**lsof -n -P -l** | /mnt/cdrom/netcat ip_addressa_of_forensic_working_station 9898

#sh256sum lsof_of_compromised_computer > lsof_of_compromised_computer.sh256

INETD is a process that steers standard Internet services on a system. It starts when a system is booted and it uses a configuration file in which it is defined which service will make it run. The main configuration file inetd uses /etc/inetd.conf (place and name depend on the Linux distribution type). For a secure system it is important to understand the way inetd works and which information in the configuration file it contains (Cole 2002).

The second way is to start the "top" command:

```
root@ubunt1104srvx86:~# lsof -i
COMMAND     PID    USER    FD    TYPE DEVICE SIZE/OFF NODE NAME
avahi-dae   385    avahi   13u   IPv4  6655      0t0  UDP *:mdns
avahi-dae   385    avahi   14u   IPv6  6656      0t0  UDP *:mdns
avahi-dae   385    avahi   15u   IPv4  6657      0t0  UDP *:44263
avahi-dae   385    avahi   16u   IPv6  6658      0t0  UDP *:38650
smbd        476    root    24u   IPv6  7615      0t0  TCP *:microsoft-ds (LISTEN)
smbd        476    root    25u   IPv6  7617      0t0  TCP *:netbios-ssn (LISTEN)
dovecot     592    root     6u   IPv4  7673      0t0  TCP *:imap2 (LISTEN)
dovecot     592    root     7u   IPv4  7674      0t0  TCP *:imaps (LISTEN)
dovecot     592    root     8u   IPv4  7675      0t0  TCP *:pop3 (LISTEN)
dovecot     592    root     9u   IPv4  7676      0t0  TCP *:pop3s (LISTEN)
mysqld      703    mysql   10u   IPv4  7979      0t0  TCP localhost:mysql (LISTEN)
cupsd       741    root     5u   IPv6  7943      0t0  TCP ip6-localhost:ipp (LISTEN)
cupsd       741    root     6u   IPv4  7944      0t0  TCP localhost:ipp (LISTEN)
```

Fig. 3 Image of the exiting command lsof -i

It should be highlighted that data obtained with netstat and lsof commands should be compared to each other, because only in their differences can a forensic investigator find hidden processes from the kernel with a LKM. This paper will not go into details about LKM, since it forms a separate field of investigation and can be discussed in other papers. Spotting suspicious ports by using a digital forensic investigator can offer additional data about incident/illegal activity, while by using the administrator it is possible to stop further damage to the system.

Important volatile data on Linux - Initiated processes and services

In order to keep the system safe, one needs to know which processes and services are initiated on it. In Linux, initiated processes can be detected in several ways. One of them is the usage of the "Ps" command (Prosise and Mandia 2003):

#ps -auxwww, lists all the processes on the system and the users who started them.

#top

The top program will generate the whole screen with a list of existing processes which are permanently updated according to the degree of usage of the CPU. On top of the list there are data about time during which the operating system has been running, the number of processes run on the system and statistics about the available memory and swap space. The image can be formed in different ways with the "SHIFT+o" buttons, so that processes can be sorted according to their CPU (SHIFT+p) space, memory (SHIFT+m) and swap and the id of the process etc. In order to mark the activated process more easily, the "z" button is used, which colours all the processes red, while the most intense process, according to given parameters, is marked white (Figure 4). It is also possible to show started processes by a specific user:

#top -u of suspicious_user

What is of importance to a forensic investigator is the image of the absolute paths of running processes, which is performed with the "c" button after running the top command. There was an actual case of this. The http server of an organisation suddenly stopped working. After analysing data on the server it was realised that there were no attacks, but the Zope server was updated

exploits and other malicious programs which use resources of the server itself to act against either users of the system or against other systems for the distribution or hosting of forbidden content, the distribution of content protected by copyright and many other kinds of highly technological crimes.

Commands which can be of use to a forensic investigator are as follows:


```
top - 16:18:33 up  1:10,  2 users,  load average: 0.00, 0.01, 0.05
Tasks: 101 total,   1 running, 100 sleeping,   0 stopped,   0 zombie
Cpu(s):  0.0%us,  0.0%sy,  0.0%ni,100.0%id,  0.0%wa,  0.0%hi,  0.0%si,  0.0%st
Mem:    507744k total,   257924k used,   249820k free,    24232k buffers
Swap:   522236k total,        0k used,   522236k free,   135152k cached

  PID USER      PR  NI  VIRT  RES  SHR S %CPU %MEM    TIME+  COMMAND
  888 root      20   0  6156 2952 2320 S  0.3  0.6   0:03.22 /usr/sbin/vmtoolsd
 1088 root      20   0 29968 6684 3560 S  0.3  1.3   0:00.20 /usr/sbin/apache2 -k start
 2137 root      20   0  2656 1224  948 R  0.3  0.2   0:01.17 top
    1 root      20   0  3076 1824 1268 S  0.0  0.4   0:01.35 /sbin/init
    2 root      20   0     0    0    0 S  0.0  0.0   0:00.00 [kthreadd]
    3 root      20   0     0    0    0 S  0.0  0.0   0:00.08 [ksoftirqd/0]
    6 root      RT   0     0    0    0 S  0.0  0.0   0:00.00 [migration/0]
    7 root       0 -20     0    0    0 S  0.0  0.0   0:00.00 [cpuset]
```

Fig. 4 Image of exiting top command

with bugged files and it generated a great amount of log files which occupied 100% of the disc space. After analysing the top command, a process was enabled which generated malfunctions and also the file which wrote these malfunctions. After stopping this process, deleting the overloaded log file and correcting the bugged files, the Zope http server was successfully restarted and the problem was solved.

Services run on a system can also be identified with the command:

#service --status-all

#ps -A

Important volatile data on Linux – Opened files

By using the lsof tool, a list of opened files on a system can be obtained. These can represent valuable data for a forensic investigation. For example, hidden files can be revealed, such as malicious tools which can be password crackers,

#lsof -u root shows all of the opened processes and files opened by the root user

#lsof -p 3333 shows all of the opened files by the process with ID 3333

#lsof /var/log/auth.log shows processes which are opened with a certain file as shown in Fig. 5.

#lsof /home can figure as very useful information if a system shows devices or resources as busy, since it can show which processes are responsible for mounting the spot /home on a system.

Important volatile data on Linux - Internet routing table and cache tables

In order to enable an administrator or a forensic investigator to realise whether the routing table was changed, a netstat command (or route command) is used, due to the same reasons as described in the chapter describing volatile data on Windows. It is shown in Fig. 6:


```
root@ubunt1104srvx86:/var/log# lsof /var/log/auth.log
COMMAND    PID   USER    FD    TYPE DEVICE SIZE/OFF   NODE NAME
rsyslogd   366 syslog    1w     REG    8,1     7300 665417 /var/log/auth.log
root@ubunt1104srvx86:/var/log#
```

Fig. 5 Image of an exit of the lsof command over the file /var/log/auth.log

#route
or
#netstat -nr

Address Resolution Protocol, or ARP, is a TCP/IP protocol used to turn an IP address into a physical address, actually a MAC address. For a digital investigator it is of importance to examine the ARP cache of the examined computer, since it is possible to identify other systems which are currently making or recently made a connection to an examined computer. According to that, informa-

#sh256sumARPcache_of_compromised_ computer>ARPcache_of_compromised_comput-er.sh256

Currently active routes on a system are kept at the so-called routing cache, i.e. the kernel route cache table. It should be mentioned that the route cache table is different from a route table. The kernel route cache table shows currently active (connected) routes on a system. The route table is used for making decisions about routing, while the kernel route cache table displays routes which are connected. Ex-

```
root@ubunt1104srvx86:~# netstat -rn
Kernel IP routing table
Destination     Gateway         Genmask         Flags   MSS Window  irtt Iface
192.168.1.0     0.0.0.0         255.255.255.0   U         0 0          0 eth0
0.0.0.0         192.168.1.1     0.0.0.0         UG        0 0          0 eth0
```

Fig. 6 Image of the exit command netstat -rn

tion gathered via the ARP cache is used to discover additional computers on the network which could be compromised as a result of incident/illegal activities. From the security point of view, examining the ARP cache is used to identify suspicious computer systems on the network which can be used for initiating internet attacks on the network. In order to display the content of an ARP cache on a system, the "arp" command is used (Fig. 7):

#/mnt/cdrom/arp

This command will display all IPs which are connected or were connected to the examined computer.

By using netcat, forensic investigators can collect these data on a live system as follows:

#netcat -v -l -p 9898 > ARPcache_of_com-promised_computer
#/mnt/cdrom/arp | /mnt/cdrom/netcat ip_ad-dress_of_forensic_work_station 9898

actly this can be of great importance to a forensic investigator, since collecting data for a kernel route cache table can help discover computers on the network which could be compromised, but also computers from which an incident/illegal activity was performed. From a security point of view, collecting information from the route cache table can be used for identifying suspicious computer systems on the network which can be used to initiate attacks within the network. The kernel route cache table shows sources and destinations, the gateway and the interface which is used to make the connection.

On Linux systems, examination of the kernel route cache can be achieved with the "route" command (Fig. 8):

#route -Cn

By using netcat, a forensic investigator can collect information on a live system as follows:

#netcat -v -l -p 9898 > routing_cache_table_ of_compromised_computer

```
[root@turing ~]# arp
Address                 HWtype  HWaddress           Flags Mask              Iface
147.91.96.190           ether   a0:f3:c1:a2:0c:05   C                       eth0
147.91.96.208           ether   a0:f3:c1:a2:41:b3   C                       eth0
147.91.96.148           ether   00:19:99:d3:90:33   C                       eth0
147.91.96.149           ether   00:19:99:e4:cf:d6   C                       eth0
147.91.96.146           ether   50:26:90:a1:46:f6   C                       eth0
```

Fig. 7 Display of the ARP cache with an arp command

Fig. 8 Image of the content of a kernel route cache table

Fig. 9 Image of modules currently read into the kernel with the lsmod command

#/mnt/cdrom/route -Cn | /mnt/cdrom/netcat ip_address_of_forensic_working_station 9898

#sh256sumrouting_cache_table_of_compromised_computer>routing_cache_table_of_compromised_computer.sh256

Important volatile data on Linux - Modules read into LKM

If a forensic investigator has reasonable suspicions that the existing kernel of an investigated computer is compromised with a certain rootkit i.e. Trojan, it would be necessary to list modules read into the kernel. This can be done in the following ways:

#netcat -v -l -p 9898 > modules_of_compromised_computer

#/mnt/cdrom/cat /proc/modules | /mnt/cdrom/netcat ip_address_of_forensic_working_station 9898

#sh256sum modules_of_compromised_computer > modules_of_compromised_computer.sh256

or with an approved command lsmod:

#netcat -v -l -p 9898 > modules_of_compromised_computer

#/mnt/cdrom/lsmod | /mnt/cdrom/netcat ip_address_of_forensic_working_station 9898

#sh256sum modules_of_compromised_computer > modules_of_compromised_computer.sh256

Exit of the lsmod command is shown in Fig. 9:

What a forensic investigator has to bear in mind is that there are practical techniques which allow malicious modules to be read into the kernel and hide it afterwards. One such rootkit is called Knark[5] (more information about Knark can be found on the SANS[6] website). After hiding the read module, there is no possibility to discover it with a "live" forensic investigation.

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5   Available at http://www.sans.org/security-resources/idfaq/knark.php

6   http://www.sans.org/

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Important volatile data on Linux - Dump memory and memory processes

In order to analyse the memory of a compromised computer, a forensic investigator needs to capture it physically. One should bear in mind that when a memory dump is performed, the current state of the memory is disturbed by initiating programs and reading data. An additional problem exists with the writing of a file with the captured state of the physical memory. It means that any exiting file will be cached in memory, possibly replacing very important information which might be valuable for further digital investigation. This is why using a forensic computer is the best way to save data with minimum influence on memory. Actually, when it comes to capturing memory, a forensic investigator faces a dilemma: the aim is to preserve as much very changeable data as possible, but by collecting it, additional proof can be destroyed. The decision n investigator faces requires him to ascertain whether the importance of the collected data is greater than the importance of data that will be lost. This decision relies greatly on the experience of the forensic investigator.

Since it is obligatory to document the entire procedure, it is recommended to collect basic data about the memory. The file containing this data is /proc/meminfo. This is done as follows:

#netcat -v -l -p 9898 > mem_info_of_compromised_computer

#/mnt/cdrom/cat < /proc/meminfo | /mnt/cdrom/netcat   ip_address_of_forensic_working_station 9898

#sh256sum mem_info_of_compromised_computer>mem_info_of_compromised_computer.sh256

The simplest way, although not universal, for capturing the complete physical memory on Linux systems is to initiate the approved static compiled dd command.[7]

#netcat -v -l -p 9898 > fiz_mem_of_compromised_computer

#/mnt/cdrom/dcfldd < /dev/mem | /mnt/cdrom/netcat   ip_addess_of_forensic_working_station 9898

#sh256sum fiz_mem_of_compromised_computer > fiz_mem_of_compromised_computer.sh256

---

7 http://dcfldd.sourceforge.net/

This process functions on Linux systems, but some Unix systems (for example FreeBSD, Solaris) treat physical memory in a different manner, which can result in incomplete content of physical memory (Farmer and Venema 2008). There is a "memdump" tool within The Coroner's Toolkit-a (TCT)[8] which successfully solves the mentioned problem using minimum memory with minimum influence on it. The correct way of applying this program is as follows:

#netcat -v -l -p 9898 > fiz_mem_of_compromised_computer

#/mnt/cdrom/memdump | /mnt/cdrom/netcat ip_address_of_forensic_working_station 9898

#sh256sum   fiz_mem_of_compromised_computer > fiz_mem_of_compromised_computer.sh256

The content of physical memory can also be accessed from file /proc/kcore. This file contains data from the physical memory which are in the ELF[9] core file format. There is an accepted opinion that it is highly recommended to collect the content of this file along with raw format data from the memory. The reason is that this format can be examined with the GNU debugger, the so-called GDB[10] with the help of the "System map" file and kernel image from the /boot directory. This process was described by Mariusz Burdach in one of his papers[11] (Burdach 2004).[12]

When it comes to memory, swap space in a system is also of forensic importance. Swap space represents space in which pages are temporarily stored in cases where the freeing up part of the RAM memory is needed[13] (or the system needs more memory than available in the existing RAM). The total

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8 The Coroner's Toolkit (TCT) represents a collection of forensic tools whose authors are Wietse Venema and Dan Farmer, available at http://www.porcupine.org/forensics/tct.html , 05.04.2013

9 ELF - Executable and Linking Format

10 https://access.redhat.com/knowledge/docs/en-US/Red_Hat_Enterprise_Linux/5/html/Deployment_Guide/s2-proc-kcore.html

11 http://www.symantec.com/connect/articles/detecting-root-kits-and-kernel-level-compromises-linux

12 http://www.symantec.com/connect/articles/forensic-analysis-live-linux-system-pt-2

13 Kernel can move onto the swap space those parts of memory which are used less (inactive) and to ascribe the free memory to a current program i.e. process which needs memory

```
root@ubunt1104srvx86:~# df
Filesystem            1K-blocks     Used Available Use% Mounted on
/dev/sda1              20125340  2225092  16877940  12% /
none                    247256      200    247056   1% /dev
none                    253872        0    253872   0% /dev/shm
none                    253872      444    253428   1% /var/run
none                    253872        0    253872   0% /var/lock
```

Fig. 10 Exit of the df command displaying mounted devices

of RAM memory and swap memory represents the total of virtual memory on a system. Swap space can exist in the form of a swap partition (recommended), a swap file or a combination of both a swap file and a partition (Volonino, Anzaldua and Godwin 2007). This space can contain important information for a forensic investigation (although the system rarely swaps). This space can simply be copied by using the "dd" or "cat" tools over the swap partition or file with the help of the "netcat" tool and later be searched with tools looking for certain strings (for example hexdump[14]).

A memory dump of initiated processes can be done by using the tool pcat which is in the already mentioned The Coroner's Toolkit-a (TCT)[15] The forensically correct usage of this command is:

#netcat -v -l -p 9898 > pcat_of_compromised_computer

#/mnt/cdrom/pcat proc_id | /mnt/cdrom/netcat ip_address_of_forensic_working_station 9898

#sh256sum pcat_of_compromised_computer > pcat_of_compromised_computer.sh256

For the analysis of the memory itself, it is of great importance to know the way the system uses memory (caching files and virtual memory pages, which aim to improve computer performance). From all that was said above it is clear that important memory parts can be found and identified on a system, which can be of great use for digital investigation.

Important volatile data on Linux – Mounted file systems

For a forensic investigation it is important to find out which file systems were mounted in

the examined operating system. There are certain commands which enable this. The first one is the mount command:

#mount whose exit displays devices (the hard disc for example), mounting spot and the type of file system.

The second one is the df command:

#df whose exit displays mounted devices (Fig. 10), the mounting spot, the size and available capacities and how much is occupied.

The previous two commands cannot identify network file systems or the NFS. The command which is able to display NFS shared resource is "showmount":

#showmount -a localhost or showmount which displays exported systems

#showmount -a localhost
All mount points on localhost:
192.168.1.104:/nfs/images
192.168.1.101:/nfs/films

It shows a list of computer systems which are connected on a local system and their access points.

This command can enable forensic investigators to collect valuable data from an examined operating system, especially when it comes to the unauthorised distribution of copyrights or forbidden pornographic content.

Final discussion

The essence of digital archaeology of volatile data is collecting data (potential proof) which will confirm or deny the existence of certain incident or illegal activity. In cases of incident or illegal activity, a decision needs to be made whether to turn off and remove the computer from the network and only then collect potential proof or if digital forensics will be performed on a live system. Such a decision does not only de-

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14 http://linux.about.com/library/cmd/blcmdl1_hexdump.htm

15 http://www.porcupine.org/forensics/tct.html

pend on incident or illegal action or activity, but also on the types of systems themselves, for example, complex critical systems of banks or electronic management. Conditions in which there is a need for a "live" investigation appear more and more often. The "live" investigation of a computer system needs to be structured in such a way that it is focused and performed quickly and efficiently by experts. Since there is great importance attached to the collection of volatile data, the methods of collection and the tools used are described in the paper related to collecting on a Linux platform. The following volatile data were collected: system time and date, the existing network connections, open TCP and UDP ports, executive files which open TCP and UDP ports, processes and services started, opened files, internet routing and cache tables, read modules and the kernel, memory and memory process content and mounted system file. In accordance with the named goal, this paper is orientated to collecting data on a "live" Linux system from exactly determined spots on a system. Potential proof can be found on these spots which can, on one hand, indicate forensically relevant actions which influence system security and, on the other hand, confirm or deny the existence of certain incidents i.e. illegal activity.

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REZIME

DIGITALNA ARHEOLOGIJA "LAKO IZMENJIVIH" PODATAKA ZA LINUX OKRUZENJE

Ključne reči: digitalna arheologija, forenzička analiza, prikupljanja podataka, Linux sistem, prikupljanje "uživo", volatile data, kompromitovani sistem.

Prikupljanje, analiza i očuvanje podataka na "živom" sistemu jeste neophodnost da bi se blagovremeno utvrdilo da li postoji određena incidentna/protivpravna aktivnost. S obzirom na značaj prikupljanja podataka onih sa privremenim karakterom (eng. volatile data) u tekstu su opisani načini prikupljanja i alati koji se odnose na njihovo prikupljanje na Linux platformi. U radu su navedeni sledeći podaci privremenog karaktera koji se prikupljaju sa kompromitovanih sistema: sistemsko vreme i datum, postojeće mrežne konekcije, otvoreni TCP i UDP portovi, izvršni fajlovi koji otvaraju TCP i UDP portove, pokrenuti procesi i servisi, otvoreni fajlovi, interne tabele rutiranja i keš tabele, učitani moduli u kernel, sadržaj memorije i memorijskog procesa, montirani fajl sistema. U skladu sa navedenim ciljem ovaj rad je orijentisan na prikupljanje podataka iz "živog" Linux sistema sa tačno određenih mesta na sistemu. Na

tim mestima mogu se pronaći potencijalni dokazi koji mogu ukazati sa jedne strane na one forenzičke relevantne događaje koji utiču na bezbednost sistema, a sa druge mogu da potvrde ili ospore postojanje određene incidentne, odnosno protivpravne aktivnosti.

KRITIKE I PRILAZI

Joan P. Alcock, FOOD IN ROMAN BRITAIN, izdanje Tempus Publishing 2014.
Knjiga sadrži 192 strane teksta, 128 crteža i fotografija.

Knjigu Food in Roman Britain napisala je Joana Pilsbury Alcock koja u svom bibliografskom opusu ima i druge naslove na sličnu temu, a pre svih to su Food in the Ancient World, Life in Ancient Rome, Life in Roman Britain i Daily Life of the Pagan Celts, čime se svakako može svrstati u vrsne poznavaoce teme o kojoj piše. Višegodišnje iskustvo kao predavača na South Bank Univerzitetu na predmetima istorije i istorije hrane upotpunjavala je putovanjima po Evropi i Dalekom Istoku što joj je pružilo obilje materijala za ovu knjigu. U njoj je želela da predstavi ishranu, pripremu hrane i njeno serviranje kao i navike ljudi koji su naseljavali Rimsku Britaniju, praveći poređenja sa hranom i ishranom u drugim delovima Rimskog Carstva. Knjiga se sastoji od 192 strane, 128 crteža i fotografija, 222 bibliografske jedinice i spiska od 39 antičkih izvora spomenutih u tekstu. Iako je ova knjiga prvi put štampana još 2001. godine (u izdanju Tempus Publishing-a) njen kvalitet i zanimljiva tema uticali se da se tiraž rasproda i da se knjiga ponovo štampa 2010. i 2014. godine. Ova publikacija je prvenstveno namenjena arheolozima koji se bave temom ishrane u rimskom periodu, ali je napisana stilom koji je dostupan i običnom čitaocu zainteresovanom za ovaj period i temu. Hrana, kao i proces njene pripreme uvek su zanimljivi za proučavanje, jer čine veliki deo čovekovog života, a ova knjiga na aktuelnosti dobija i time što je sve više ljudi zainteresovano za antičke recepte i pripremu hrane, bilo prema originalu ili adaptirane da bi se prilagodile današnjem ukusu.

Sam naslov knjige odražava i njen sadržaj, pri čijoj analizi su korišćene odgovarajuće naučne metode. Knjiga počinje sadržajem, sledi spisak ilustracija, te prelazi na izraze zahvalnosti institucijama i pojedincima koji su pomogli stvaranje dela, kako svojim stručnim komentarima tako i ustupanjem fotografija za knjigu.

Prvo poglavlje odnosi se na dosadašnja istraživanja i radove na ovu temu. Ovde autorka dobro primećuje da se Apicijev kuvar najčešće citira, i to mnogo više nego što se čita. Upoznaje nas i sa autorima koji su preuzeli originalne klasične recepte, kao i sa onima koji su te recepte prilagodili savremenim britanskim ukusima. Iznosi problem nedostatka informacija o tome koje su tačno recepte koristili Rimljani u Britaniji. Naime, nema dokaza da su u Britaniji koristili recepte sadržane u Apicijevom kuvaru i to pre svega zbog drugačije klime koja je sprečavala da se takvi recepti u originalu isprate, pa i do toga da je na početku rimske vladavine u Britaniji dosta biljnih kultura bilo nepoznato, kao i neke od životinjskih vrsta. Sa druge strane, ne može se isključiti mišljenje da je deo stanovništa koje je prihvatilo rimski stil života prihvatio i kulinarske poslastice. Za to su bile potrebne namirnice koje počinju da se uvoze, pre svih grožđe (za pravljenje vina, umaka i sirćeta), začinsko bilje i perad. Tu autorka iznosi spisak mesta odakle se ta distribucija mogla vršiti. Sa juga Britanije dovozili su vino, a manjak su dopunjavali uvozom iz drugih Provincija. Uzgajališta začinskog bilja, koje se uglavnom koristilo za poboljšavanje ukusa sosevima, pojavljuju se u blizini sela i prodaju se po gradovima. Na trpezi odjednom počinju da se nalaze i fazani, paunovi i morke. Obalna područja Britanije bila su bogata morskim plodovima, velikim zalihama školjki i kamenica tako da su ta područja bila poznata po kvalitetu i u Rimu. Pre njihovog dolaska morski plodovi su se slabo koristili.

Da bi se nove kulture održale bilo je potrebno primeniti i neke nove agrarne veštine o kojima je pisao Libanius u četvrtom veku, kao i grčki istoričar Zosimus u šestom.

U istom poglavlju iznosi i četiri problema

koja se odnose na proučavanje ishrane. Prvi je da arheološki dokazi mogu biti različito datovani, da pronađeni botanički ostatak u jednoj posudi ne može biti datovan proizvodnjom te posude. Drugi, da je rimski period u Britaniji trajao skoro četiri veka i da je tim prostorom prošlo puno osvajača koji su ostavili tragove kako u samom ukusu tako i u načinu pripremanja hrane, gde paralele povlači sa savremenim prostorima Indije. Treći, da prezentovani materijal o potrošnji neke robe može delovati značajan, a opet u celini ne mora prikazivati pravu sliku stvari, tu daje primer odnosa proizvodnje i potrošnje ribe gde je potrebno obratiti više pažnje na ostatke amfora nego na osteološke ostatke. I četvrti, kako pojedinci doživljavaju tu proizvodnju, da li ostaju verni tradiciji ili prihvataju nove tokove. Tome je potrebno dodati i pitanje statusa i religije, zatim različitu klimu i zemljište, a sve to dovodi do toga da je bilo neophodno modifikovati dosadašnje uvreženo mišljenje o rimskom britanskom ukusu. Ova knjiga pruža dokaze o vrstama hrane koju su koristili i vojska i civilno stanovništvo. Ona se ne bavi poljoprivrednom praksom i trgovinom hrane. Autorka je pokušala je da da procenu kakva je hrana bila na raspolaganju u rimskoj Britaniji, kakva su bili ishrana i način pripreme hrane kao i navike ljudi koji su naseljavali ovu provinciju. Takođe, razmatra i efekte hranljivosti na različite populacije jer je rimska Britanija bila vrlo nehomogena celina. Bila je dom velikom broju različitih ljudi koji žive u različitim uslovima, jednih koji su željni da usvoje i prilagode se novim idejama, dok su drugi bili zadovoljni i težili da zadrže svoju tradiciju. Klimatski uslovi, stanište, kao i bogatstvo, imalo je velikog udela u svemu tome.

U nastavku iznosi šta želi postići ovom knjigom, a to je da pruži dokaze da stanovništvo rimske Britanije nije imalo baš tako gurmanske obroke kakvo je uvreženo mišljenje i da se nisu svi u Provinciji hranili po Apicijevom kuvaru. Pregled ishrane dat je kroz poglavlja koja obuhvataju žitarice, meso, mlečne proizvode, povrće i voće sa začinskim biljem i medom, ulje, vino i druga pića, izgled kuhinje i trpezarije, prodaju robe, ishranu vojske i uopšte, ishranu.

Žitarice su bile najvažniji tip biljne ishrane, bilo da su korišćene za ljudsku ishranu ili kao hrana za životinje. Biljni ostaci otkriveni prilikom iskopavanja na različitim lokacijama širom Britanije pokazali su koje su sorte bile najčešće u upotrebi. Autorka daje zanimljive primere iz antičkih izvora koji govore o tome:

-kako zrna treba zaštititi posipanjem mešavina maslinovog taloga za sprečavanje zaraze Kato (*Cato*),

- kako treba skladištiti žito Varo (*Varro*),

- koliko je potrebno vremena da se obradi juger zemlje Kolumela (*Collumella*).

Sve je to ilustrovano fotografijama. Iako iz rimskog perioda nema organskih ostataka hleba na prostoru Britanije, karbonizovani su nađeni u stambenom naselju iz gvozdenog doba. Izlaže Katov recept za mešenje hleba koji je praktikovan u većem delu Evrope u to doba. Autorka dobro povezuje različite izvore koji govore o istoj temi pa na jednom mestu daje prikaz svih vrsta brašna kojima su raspolagali i proizvode koje su od njih dobijali, a zatim daje i spisak lokacija na kojima su otkrivene "pekare" sa proizvodima koji bi se mogli smatrati "brzom hranom".

Noviji arheološki nalazi dokumentuju da se u trećem i četvrtom veku kvalitet ishrane vojnika i civila popravio. I pored te činjenice meso se na vojnoj trpezi retko javljalo. Na najvećem broju lokaliteta koji se povezuju sa boravkom vojske, manje više i u ostavama vila, najčešći su ostaci stoke i to pre svega ovaca. To ne iznenađuje jer su ovce pored vune, mleka i mesa bile u potpunosti iskorišćavane. Koza koja je pripitomljena u gvozdenom dobu kontinuirano se uzgaja i tokom rimskog perioda kako zbog kože tako i zbog mesa i mleka. Prasetina je isto bila na ceni iako osteološki materijal pokazuje da je najveći broj svinja doživeo bar dve ili tri godine.

Lov je bio široko rasprostranjen u Britaniji i pre dolaska Rimljana. Autorka navodi više klasičnih izvora, citira Strabona o uzgoju posebne pasmine za lov, kao i Apijana koji daje recepte za pojačanu ishranu vojnika koji uključuju kuvanog zeca. Potvrdu nam pruža kroz prikaze na mozaicima na kojima se može videti lov na zeca sa psom ili predstava zime koja u desnoj ruci nosi zeca. Jedna od neobičnih životinja koju su Rimljani uveli na britansku trpezu je i puh. Tadašnji su bili krupniji od današnjih pa su se nalazili često na repertoaru gozbi koje su priređivane. Kosti žabe su pronađene u York-u i Silchester-u tako da su potvrdile mišljenja da je i britansko stanovništvo prihvatilo egzotične ukuse. Puževi su uzgajani i gojeni u mleku, a njihove ljušture su u velikom broju pronađene prilikom iskopavanja kao i specijalne kašike koje su korišćene za njihovo konzumiranje. Iako je Cezar tvrdio da Britanci ptice

i guske uzgajaju za zadovoljstvo i zabavu, osteo-loški materijal koji je autorka preuzela pokazuje da su ih oni i jeli u velikim količinama. U Apicije-vom kuvaru može se naći 15 različitih načina pri-preme piletine dodavanjem različiti soseva. Isto tako tragovi *columbaria* pokazuju da su uzgajali i golubove, a Kolumela iznosi probleme odgajanja gusaka u zatočeništvu.

Sledeća grupa namirnica kojom se autorka pozabavila odnosi se na ribu, morske plodove i rakove. U ovom poglavlju iznosi kontradiktornost oko nalaza kostiju riba na više istraživanih loka-cija u Britaniji. Naime, ukazuje na to da je riba bila vrlo zastupljena na ondašnjoj trpezi, a to se kosi sa stavovima drugog autora koje on iznosi u rezultatima svog proučavanja iste teme (Gallant, A Fisherman's Tale, 1985.). Dotiče se problema pitanja transporta ribe i njenog održavanja u sve-žem stanju kao i gubitaka koji se pri tome deša-vaju i rešenja koja su za to iznalazili. Dobro je upoznata sa istraživanjima pri kojima su otkriveni ostaci rečnih i morskih riba tako da je priložen či-tav spisak vrsta i njihova zastupljenost. Potom ko-risti izvore koji daju uputstva o tome kako održati ribu svežu, bilo korišćenjem slane vode, žitarica ili voća. Izlaže i cenovnik klasifikovane ribe po Dioklecijanovom ediktu, a daje i spisak lokaliteta koje smatra ekonomskim bazama za njenu eksplo-ataciju i distribuciju. Raspravlja o problemu samo jednog nalaza ostatka raka u Britaniji (u York-u) i iznosi pisanje Juvenala o tome kako su se britan-skim ostrigama hranili vojnici i da im se ne može osporiti medicinska i afrodizijačka reputacija, te da su kao takve sigurno bile više zastupljene na trpezi nego što nalazi na to ukazuju.

Bitan deo ishrane svakako su zauzimali mleko i mlečni proizvodi. Neka ranija uvrežena mišljenja o kvalitetu tih britanskih proizvoda au-torka ovde revidira. Poziva se na izvore koji pišu o količinama proizvedenog mleka, broju ovaca i krava, kao i o čitavom spisku koji govori o vr-stama pića koja se dobijaju od mleka. Pozabavila se sirevima, njihovim izgledom, izradom, kalorij-skom vrednošću kao i oblicima posuda koje su se koristile u njihovoj pripremi. Iznosi tri različite forme cediljki kao i spisak lokaliteta na kojim su otkrivene.

U poglavlju o povrću, autorka je iznela po-datke o vrstama koje nisu rasle na tlu Britanije i koje su dolaskom Rimljana mnogo doprinele da trpeza postane bogatija, a na tom spisku se nalaze: kupus, luk, poriluk, endivija, atričoke, krastavci,

dinje, špargle, peršun, repa, rotkvice, celer i sala-ta, bolja vrsta šargarepe. Svim kulturama britan-ska zima je odlično pogodovala, tako da su brojni lokaliteti na kojima su evidentirani ostaci. Isto tako brojne su i voćne kulture koje zaživljavaju tek dolaskom Rimljana (pre svih orasi, kesten, šljive, trešnje). Autorka se povodi za Plinijevim pisanjem o medicinskim pićima koja se prave od voća i cveća, a koje je verovatno raslo u baštama Silčestera jer je vrlo osetljivo za transport i uvoz. Ostaci karbonizovanih šljiva i urmi nađeni su na više lokacija. Ovde navodi i važne nalaze amfora na kojima su kurzivom ispisane informacije šta sadrže u sebi. Stari pisci (*Cato, Pliny, Varro, Co-lumella*) pružaju dokaze da je divlja jabuka posto-jala u Britaniji i da su na nju kalemljene uvežene druge sorte. A preko Rimljana su im stigli i špan-ski kesten i orah. Pronađeni karbonizovani ostaci pinjola i badema u Vinčesteru možda čak ukazuju i na njihovo gajenje.

Važan odeljak odnosi se na biljke, razne trave i začine jer su one bile vrlo značajne u po-boljšavanju ukusa hrane i njenom održavanju u ispravnom stanju. Tu autorka kombinuje recepte Apicija i Kolumele sa spiskom trava koje i danas rastu u divljini širom Britanije i iznosi rezultate savremenih istraživanja komentarišući njihove zaključke.

Na ovom prostoru bila je značajna i proi-zvodnja soli koja je imala svoju ekspanziju za vreme cara Hadrijana. Koristila se ne samo za ljudsku i životinjsku ishranu nego je odigrala i veliku ulogu u konzerviranju namirnica. Autorka iznosi podatke o nalazima kocki soli koje su bile deponovane na mestu odakle su čekale da budu transportovane rekom. Med se koristio na prosto-rima Britanije još u praistorijsko vreme, a u vreme Rimljana najviše se koristi kao zamena za šećer. Rimljani su premazivali medom razne vrste mesa za konzerviranje, ali i prilikom pečenja, da bi do-bili posebne ukuse. Dodavanjem raznog voća u med menjali su mu osnovni ukus, a mešali su ga i sa vinom i pivom.

Nalazi amfora širom Britanije pokazuju odakle su masline, maslinovo ulje, garum i vino najčešće dopremani. Najzastupljenije su sa Rodo-sa, zatim severnoafričke, španske i galske amfore. Izvori koji se bave Keltima ukazuju na činjenicu da oni nisu voleli ukus maslina, ali tome se protivi veliki broj pronađenih tipova amfora za masline datovanih u period pre prvog veka. To opet možda ukazuje na činjenicu da se ukus može vrlo brzo i

lako promeniti. Autorka iznosi podatak da je širom Britanije otkriveno više tipova amfora se sve nazivima proizvođača. Vrlo su značajni i nalazi amfora u vojnim i urbanim mestima, dok pronalazak ostataka u ruralnim naseljima ukazuje na to da su ovi proizvodi našli svoj put do celog stanovništva. Druga bitna stvar koja se pored maslina i njenog ulja uvozila u Britaniju je garum sa likvamenom i alekom. Radi se o proizvodima od ribe i soli koji su korišćeni kao dodaci jelu. Autorka daje recepte za njihovo pravljanje koji su odgovarali rimskom ukusu, a koji imaju vrlo sličnu osnovu današnjem u vorčester sosu.

Najobimnije poglavlje knjige odnosi se na pića, na vino, pivo i vodu. Vino su koristili ne samo kao piće nego i za kuvanje. Kao što je slučaj sa tipovima amfora za masline i ulje i vinske amfore su pronađene širom Britanije. Najviše prostora autorka je posvetila pronađenim natpisima na amforama, kao i njihovim mernim vrednostima. Sve je propraćeno velikim brojem epigrafskih spomenika na kojima se vidi vinova loza. Što se tiče piva već su stanovnici praistorijske Britanije znali za njega. Dodavajući med u vodu sa žitaricama i ostavljajući ga duže vreme da odstoji dolazilo je do fermentacije i dobijanja alkoholnog pića kojem su potom dodavali razne biljke i voće zbog ukusa. Koristili su i pšenicu, ovas i raž, ali najviše ječam. Autorka se pozabavila prenošenjem delova izvora koji pišu o uticaju potrošnje piva i njegovom delovanju na organizam, te da im se njegov ukus ne dopada koliko vino. Na jednom lokalitetu otkriven je i spisak priloga bogovima koji sadrži i 40 litara piva. Još jedno alkoholno piće bilo je u upotrebi, a tragovi njegovog korišćenja otkriveni su u Donkasteru. U pitanju je cider, piće od fermentisanih jabuka, a kako ima tragova kultivacije novih vrste jabuka u Britaniji ne može se isključiti mogućnost da im se ovo piće dopadalo. Rimljani su bili stručnjaci za izgradnju vodovoda, naravno zbog potrebe za svežom vodom tako da se u raznim izvorima nalaze uputstva kako se voda dovodi do grada i krajnjih potrošača. Osvajanjem Britanije preneli su i ta inžinjerska rešenja tako da su ostaci više vodovoda otkriveni u Britaniji. Po njihovoj veličini i ostacima može se utvrditi koliki im je bio kapacitet, kao i to kakvu su vodu koristili. Autorka iznosi podatke o nađenim vodovodima i njihovim delovima kao i pisane izvore o očuvanju kvaliteta vode (Vitruvije).

Svakako najzanimljiviji deo knjige odnosi se na sam izgled kuhinje. Nije se svaki deo Britanije odmah adaptirao na nove uslove, ali ono na čemu savremene kuhinje mogu da zahvale Rimljanima, jeste odvajanje kuhinje u zasebnu prostoriju. Oni su to radili iz praktičnih razloga, prvenstveno kao zaštitu od požara i protiv širenja mirisa pripreme hrane po celoj kući. Autorka iznosi detaljne rekonstrukcije rimskih kuhinja praveći paralele sa ostacima pronađenim na lokalitetima u Britaniji, gde tragovi gorenja pokazuju da je i pored svog opreza dolazilo do požara u kojima bi stradali celi delovi kuća. Opisuje i delove kuhinjskog nameštaja koji su pronađeni u Kolčesteru za koji paralele nalazi u kući Vetija u Pompejima. Zanimljiv je deo sa eksperimentima koji su sprovedeni na nekoliko lokacija gde su rađene rekonstrukcije peći i mereno vreme za postizanje temperature ključanja velike količine vode. Sav posao oko kuvanja u bogatim kućama završavali su kuvari koji su poreklom bili ili Grci ili su zanat izučili u Rimu. Oni slabije platežne moći imali su robove koji su teško radili, u ne baš čistim kuhinjama. Iako autorka opsežno iznosi podatke sa raznih istraživanih lokacija, prilozi u vidu fotografija i crteža uglavnom su sa drugih prostora, a ne iz Britanije, a tu su i rekonstrukcije kuća koje ne pripadaju ovom periodu. Povezuje ih doduše sa ruralnim prostorom rimske Britanije, ali u njima nisu nađeni tragovi za tvrdnje koje iznosi. Iznosi mišljenje da odvojene kuhinje i rimski stil kuvanja nisu zaživeli iako je moralo postojati mesto na kome se kuvalo. Pred kraj rimskog perioda tragovi gorenja na spratovima vila ukazuju da se rimski način života nije ukorenio, a opet to mogu biti i tragovi koje su ostavili oni koji su kasnije zaposeli te vile. Prikazi materijala: tave, tepsije, lance koji su pridržavali kotlove, noževi i terazije, opet su sa različitih mesta koja nisu sva u Britaniji. Korišćen je veliki broj oblika i posuda od gline u kojima je pripremana hrana. Autorka izdvaja dve vrste izrade posuda koje razdvaja i hronološki i tehnikom izrade i ovde je bilo prostora za detaljnije izlaganje. U svakom slučaju lokalna proizvodnja je dominirala bilo da su rađene po uzoru (najviše na severnoafričke oblike) ili ne. Jedan od oblika koji nije postojao pre rimskog osvajanja jeste i mortarijum, koji se inače uglavnom vezuje za vojsku.

Nedostatak dokaza u velikoj meri otežava iznošenje tvrdnji u kojoj meri su prehrambene navike Rimljana prihvaćene. Pošto su Rimljani kopirali grčke navike tako su i njihove preuzimane, po pitanju izgleda triklinijuma i rasporeda sedenja. U ovom delu autorka se od izvora poziva na Kata i Lukijana. Rimske prehrambene navike u celini su bile umerene, tako se i u Apicijevom kuvaru nalaze različita jela tipa omleta. Uglavnom su jeli tri puta dnevno i glavni obrok im je bio uveče. Kao prilog u ovom delu nalaze se fotografije i crteži sa prikazima gozbi sa epigrafskih spomenika. Ono što je u ovom delu posebno zanimljivo je trpezno posuđe koje je izuzetnog kvaliteta i lepote izrade. Tu ima i importovanog posuđa iz južne Galije, odnosno reljefnih posuda sa raznim mitološkim scenama. U pitanju su najpoznatije radionice za izradu luksuznog posuđa, ali i radionica u Londonu je izrađivala imitacije tih oblika samo u drugim bojama pečenja. Pehari ukrašeni barbotinom sa ispisanim raznim frazama nađeni su u grobovima sa kremacijom. Stakleno posuđe bilo je simbol bogatstva i prvo je, naravno, uvoženo. Nešto kasnije razvijaju i svoju proizvodnju staklenih posuda. U prvim vekovima najzastupljenije je staklo intenzivnih boja, a jedna od najreprezentativnijih je iz Kolčestera sa predstavom tribina i utrka koje nam autorka ovde predstavlja. Najdekorativnije su bronzane posude izrađivane od kositra jer je dekorativan i lak za obradu.

Vojska je bila važan činilac u prenošenju rimskog načina života u druge provincije. Potražnja za vinom, uljem i garumom zahtevala je i da se Britanija uključi u tu proizvodnju. Ovde nam autorka iznosi najzanimljiviji deo koji se odnosi na popis namirnica potrebnih za osmodnevnu opskrbu. Ovaj popis iz Vindolande je jako važan jer su u njemu i cene dobavljača i spisak količine namirnica. Pred kraj rimskog perioda prehrana rimske vojske je znatno izmenjena. Regrutovanje većeg broja ljudi iz afričkih provincija imalo je za rezultat i to što je potrošnja vina smanjena u odnosu na količine piva i sala, što je opet dokaz da je svaka vojska imala sklonosti ka svojoj vrsti hrane.

Knjigu se završava odeljkom o kvalitetu hrane i tu se iznosi veliki broj rezultata antropoloških analiza izvršenih širom Britanije. Kvalitetna ishrana nije mogla biti zastupljena kod svih u rimskoj Britaniji. Dokazi proistekli iz osteoloških analiza ukazuju u kojoj su meri težak život, rad i robovanje ostavili tragove.

Ovu knjigu autorka je napisala stilski vrlo slično svojim drugim radovima, ali time je samo ostala dosledna kvalitetnom prezentovanju teme.

Angelina RAIČKOVIĆ SAVIĆ

Miša Rakocija, KONSTANTINOV GRAD STAROHRIŠĆANSKI NIŠ, Niš 2013.
Knjiga sadrži 363 strana teksta sa kolor i crno belim ilustracijama.

U izdanju izdavačke kuće „Grafika Galeb" iz Niša u 2013. godini izašla je monografija Miše Rakocija, *Konstantinov grad starohrišćanski Niš.* Knjiga je izdata pod pokroviteljstvom Njegove Svetosti Patrijarha srpskog Gospodina G. Irineja i pod blagoslovom Njegovog Preosveštenstva Episkopa niškog Gospodina Jovana. Autor knjige, Miša Rakocija, istoričar umetnosti, saradnik Niškog zavoda za zaštitu spomenika kulture, veliki je poznavalac ranohrišćanskih spomenika grada Niša i okoline, što je potvrdio u nekoliko prethodnih naučnih radova posvećenih ovoj temi. Takođe je i organizator zapaženog međunaroneg simpozijuma „Niš i Vizantija" koji se održava svake godine u Nišu od 2002. godine u kome učestvuje veliki broj istraživača iz zemlje i inostranstva.

M. Rakocija je u ovoj knjizi usmerio svoju pažnju ka starohrišćanskom Nišu, gradu sa izuzetno bogatim i raznolikim spomeničkim nasleđem, važnom za istoriju hrišćanstva naročito na teritoriji Balkana. Knjiga *Konstantinov grad starohrišćanski Niš* je dobro osmišljena sa jasnim i pregledno koncipiranim sadržajem što ukazuje na autorovo temeljno poznavanje ranohrišćanskih sepulkralnih građevina podignutih u Nišu i njegovoj okolini.

Pored uvodnog dela knjiga je podeljena u nekoliko poglavlja, a svako poglavlje obuhvata više odeljaka koje odgovaraju pojedinačnim problemima.

U uvodnom delu monografije autor nas upoznaje sa geografskim položajem i topografijom grada, kao i istorijskim podacima i počecima hristijanizacije antičkog *Naissus*-a. Značajan deo ovog poglavlja posvećen je predkonstantinovom Nišu i u okviru toga izgradnji luksuznog kompleksa na Medijani, predgrađu Naisusa, rezidenciji rimskih careva. Autor se posebno osvrće na Konstantina Velikog i događaje iz njegovog života koji su doveli do velikih promena u duhovnoj, ali i političkoj sferi Rimskog carstva.

Naredno poglavlje sadrži raspravu o hrišćanskom kultu i objektima namenjenim kultu. Prvi odeljak se odnosi na baptisterijalni kompleks na Medijani, drugi obrađuje ranohrišćanske crkvene građevine u Nišu i njegovom okruženju, a treći odeljak govori o starohrišćanskim grobnicama u Nišu.

Autor se posebno osvrće na Medijanu i na objekat za koji pretpostavlja da pripada paleohrišćanskom baptisterijalnom kompleksu. Iako postoje brojna neslaganja u nauci o nameni ovog objekta, autor iznosi dokaze koji potkrepljuju njegovu tvrdnju.

U drugom odeljku koji govori o hrišćanskom kultu, autor nam daje prikaz ranohrišćanskih crkvenih građevina u Nišu i njegovoj okolini. Najpre nas upoznaje sa crkvenim građevinama podignutim u okviru gradske nekropole u naselju Jagodin Mala. U drugom delu ovog odeljka prikazane su crkve u gradskom okruženju.

U trećem odeljku posvećenom kultnim objektima autor raspravlja o ranohrišćanskim grobnicama u Nišu. Nakon tipološke analize grobnica, poseban deo je posvećen oslikanoj grobnici sa figuralnim predstavama u gradskoj nekropoli, u Jagodin Mali, otkrivenoj još sredinom prošlog veka. U završnom delu ovog odeljka autor daje prikaz ranohrišćanskih grobnica sa šire teritorije grada Niša.

Pored toga, M. Rakocija u svojoj monografiji posvećenoj paleohrišćanskom Nišu, se osvrće i na epigrafske spomenike sa teritorije grada, koji nužno ne sadrže hrišćanske simbole, ali koji govore o jakom uticaju grčkog jezika i rasprostranjenosti grčkih imena, dovodeći do postepenog povlačenja latinske tradicije sa ovih prostora tokom perida od IV do VII veka.

Na kraju možemo reći da je knjiga Miše Rakocija, *Konstantinov grad starohrišćanski Niš*, izuzetno vredno i zanimljivo delo o istraživanjima ranohrišćanskog antičkog kulturnog nasleđa u oblasti Niša. U knjizi je na sveobuhvatan način prezentovan izuzetan materijal o ranohrišćanskim spomenicima antičkog Niša u periodu od IV do VII veka, čineći na taj način knjigu dragocenom i korisnom za sve sadašnje i buduće istraživače antičkog nasleđa na tlu Srbije. Istovremeno, knjiga može biti podsticaj za dalja proučavanja teritorije antičkog i ranohrišćanskog *Naissus*-a upotpunjujući na taj način arheološku mapu Srbije. Pominjući sva poglavlja u ovoj knjizi želeli smo

da istaknemo širinu i značaj publikacije koja se pojavila. Uprkos krupnijim i sitnijim zamerkama koje se mogu staviti za pojedine autorove stavove, knjiga *Konstantinov grad starohrišćanski Niš* će nesumnjivo biti nezaobilazan izvor o ovoj tematici i neophodan priručnik za svaki budući rad o ranom hrišćanstvu za istraživače ovog prostora, u prvom redu istoričare umetnosti i arheologe.

Olivera ILIĆ

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[1]* (Acta about editing scientific periodicals) proposed by the Ministry of Science and technological development of the Republic of Serbia. By applying these acta, complete editing of scientific periodicals is determined, quality of periodicals is promoted and their integration into the international system of exchanging academic information shall become more complete.

Papers submitted to the editorial staff of the periodical *ARHEOLOGIJA I PRIRODNE NAUKE* must be formed in a standard way. Each paper submitted has to contain: title; author's name; name of the institution (affiliation); abstract; key words; main text; resume; illustrations with captions; bibliography; contact address.

1. Titles need to be short and clear, describing content in the best possible way. Words used in titles should be apropriate for indexing and web-searching. If there are no such words withing titles, it is advised to add a subtitle. Titles are to be written in the fifth or sixth line, under the top margin, bold and with font size 14 (pts).

2. Author(s) should give their full name(s), including first name, surname and middle initial.

3. Autor(s) need to state official names and addresses of their employees, including names and addresses of employees which conducted

research that lead to the results published. With complex institutions, complete title is to be named (ex.: Belgrade University, Faculty of Philisophy, Archaeological Department, Belgrade).

4. Abstract, consisting of 100-250 words, describes shortly content of the paper. Within abstracts, it is advised to use terms convenient for indexing and web-searching. Abstracts should offer data about aims, methods, results and conclusions of the research. Abstracts should be bilingual (in Serbian, English or some other foreign language). Abstracts in foreign languages need to be adequatly lectured, i.e. posses correct grammar and spelling.

5. Key words need to be terms which describe paper's content in a best way, suitable for indexing and web-searching. They should be named according to a widely accepted international source (lists, indexes, dictionary, thesaurus), like list of key-words Web of Science. The number of 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

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1 Acta about editing scientific periodicals, proposed by the Ministry of Science and technological development of the Republic of Serbia, can be found at the following web-site: http://www.nauka.gov.rs/cir/images/stories/vesti/09-07-17/akt_o_uredjivanju-casopisa.pdf

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 Fortification, S. Perić (ed.), Cahiers des Portes de Fer, Monographies 6, Belgrade: Institute of Archaeology.

3. Edited books (instead of the author – editor, translator) - (ed., eds.), (trans.).

within main text: (Поповић 1994)

in bibliography:

Поповић, И. (ур.) 1994

Античко сребро у Србији, Београд: Народни музеј.

within main text: (Morris 2002)

in bibliography:

Morris, I. (ed.) 2002

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, Н. (prev.) 1960

Законик цара Стефана Душана 1349. и 1354., Београд: Српска академија наука и уметности.

4. Way of quoting books without author's name

within main text: (Anon. 1985)

in bibliography:

Anon. 1985

Anonymi Peri strategias, The Anonymous Byzantine Treatise on Strategy, *Three Byzantine Military Treatise* (trans. G.T. Dennis), Washington DC.

5. Simultaneous quoting of several books of the same author

a. written in different alphabets

within main text: (Поповић 2002, Popović 2006)

in bibliography:

Поповић, И. 2002

Накит са Јухора, остава или сакрални тезаурус, Археолошке монографије 14, Посебна издања 36, Београд: Народни музеј и Археолошки институт.

Popović, I. 2006

Roma Aeterna inter Savum et Danubium, Works of Roman Art from the Petrović-Vasić Collection, Belgrade: Archaeological Institute.

b. written in the same year

within main text: (Dawkins 1996a, Dawkins 1996b)

in bibliography:

Dawkins, R. 1996a

Climbing Mount Improbale, London: Viking.

Dawkins, R. 1996b

River out of Eden, London: Pfoenix.

6. Quoting chapters in books (acta)

within main text: (Петровић 1997: 87-90)

in bibliography:

Петровић, Б. 1997

Накит, у: *Античка бронза Сингидунума,* С. Крунић (ур.), Београд: Музеј града, 85-117.

within main text: (Samson 1970: 44-68)

in bibliography:

Samson, C. 1970

Problems of information studies in history, in: *Humanities information research*, S. Stone, (ed.), Sheffield: CRUS, 44-68.

7. Translated books

in bibliography:

Bajron, DŽ. G. 2005 (1812)

Čajld Harold, Z. Paunović (predgovor), N. Tučev (prevod), Beograd: Zavod za udžbenike i nastavna sredstva.

8. Books and articles published in electronic form

within main text: (Fishman 2005: 11)

in bibliography:

Fishman, R. 2005

The rise and fall of suburbia, [e-book], Chester: Casle Press. Available through Anglia Ruskin University Library. http://libweb.anglia.ac.uk>[pristupljeno 5 juna 2005].

II PAPERS PUBLISHED IN PERIODICALS, CONGRESS ACTA AND SIMILAR

within main text: (Vasić 2008: 69, fig.3)

in bibliography:

Surname, name's initial. Year

Title, *Title of the acta (italic)*, Name's initial. Surname, (ed.), Place of editing: Editor, page numbers.

Vasić, M. 2006. Stibadium in Romuliana and Mediana. *Felix Romvliana 50 years of archaeological excavations.* M**.** Vasić (ed.). October, 27-29 2003, Zaječar, Serbia. Belgrade: Institut of Arhcaeology, Committee on Archaeology of Serbian Academy of Sciences and Arts, and Zaječar: National Museum, 69-75.

Series' data are also needed:

Петровић, П. 1997

Римљани на Тимоку, у: *Археологија источне Србије* (Научни скуп Археологија источне Србије, Београд-Доњи Милановац, децембар 1995*)*, М. Лазић (ур.), Центар за археолошка истраживања 18, Београд: Филозофски факултет, 115-131.

III PERIODICALS

within main text: (Бајаловић-Хаџи-Пешић, 2001: 108)

Surname, Name's initial. Year

Title, *Name of the periodical (italic)* number of the periodical: page number.

Бајаловић-Хаџи-Пешић, М. 2001, Налази хабанске и постхабанске керамике у Србији, *Годишњак града Београда* 47-48 (2000-2001): 107–121.

- For periodicals with similar titles, behind the name of the periodical, place of publishing

should be stated in brackets:

Анђелковић, Б. 1988

Праисторијски налази са локалитета Јелица-Градина, *Зборник радова Народног музеја* (Чачак) 18: 81–85.

Анђелковић, Б. 1994

Први резултати анализе мумије из Народног музеја у Београду, *Зборник Народног музеја* (Београд) 15-1: 153–159.

- Depending on the year of publishing *Старинар* is named in its full title:

years 1884-1895 *Старинар Српског археолошког друштва*

years 1906-1914 [novog reda] *Старинар* (н.р.)

years 1922-1942 [treća serija] *Старинар* (т.с.)

years 1950-2010 [nova serija] *Старинар* (н.с.)

- If there is a difference between the year of actual printing and the year of publishing, the second is stated in brackets:

Жеравица, З., и Жеравица, Л. 1979, Средњовековно насеље у Поповици код Неготина, *Старинар* (н.с.) XXVIII-XXIX, (1977-1978): 201–211.

IV PAPER IN PRINT / FORTHCOMING

- (in print), within papers written in English (in print)

- (forthcoming), within papers written in English (forthcoming).

within main text: (Јовановић, in print)

in bibliography:

Јовановић, А. (in print)

Бор и околина у античком периоду, у: *Бор и околина у праисторији, антици и средњем веку*, ур. М. Лазић, Бор и Београд:

Музеј рударства и металургије и Филозофски факултет.

Papers overtaken from the internet, from electronic periodicals, are quoted in the same way as printed papers, only there is a full web-address written at the end with http://...

V DOCTORAL AND MASTER THESES

Instead of place of editing and editor, the full name of faculty/university is given, where the thesis was conducted.

within main text: (Ilić, 2005)

in bibliography:

Ilić, O. 2005

Ranohrišćanski pokretni nalazi na području dijeceze Dakije od IV do početka VII veka, Magistarska teza, Filozofski fakultet, Univerzitet u Beogradu.

within main text: (Patch, 1991)

in bibliography:

Patch, D. C. 1991

The Origin and Early Development of Urbanism in Ancient Egypt: A regional Study, Ph.D thesis, University of Pennsylvania.

VI ARTICLES FROM NEWSPAPERS

within main text: (Кашанин, 1929)

in bibliography:

Кашанин, М. 1929, Музеј савремене уметности, *Политика, 23. јул, 7-8.*

MAIN TEXT

Quoting bibliography in the main text according to the pattern (author's surname and year: page number, footnote, figure, table):

(Papazoglu 1969: 52, sl. 4/1, T. 18-4-6)

(Babović 1984: 68; Moritz 1978: 68, figs. 40-41; Tasić 1997: 84, sl. 21)

- Additional data within brackets can be written after a dash:

(Swoboda-Milanović 1958: 55, Taf. 18/24 – olovne pločice).

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- 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 referrences are listed after alphabetic order, if written in English or some other foreign language, initial's order withing author's surname or the initial letter within the quoted title (if the author or editor are not stated).

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