No. 14 (2018)

ARHEOLOGIJA I PRIRODNE NAUKE
ARCHAEOLOGY AND SCIENCE

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14

2018

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CHRISTY EMILIO IOANNIDOU
The Association of Historical
Studies KORYVANTES
Athens, Greece
E-mail: perialos1@gmail.com

HELLENIC MARINE FORCES IN LATE BRONZE AGE GREECE

ABSTRACT

Bronze Age excavation finds offer a great number of information relating the naval architecture of Greek ships. Unfortunately depictions with war character are quite limited. In addition, the paucity of naval battles on illustrations and texts raise many difficulties to the study of naval warfare. Warriors on board, who consisted a primitive type of marine corps of Late Bronze Age Greece, offers an obstructive but very exiting area for research.

MARINES, *EPIBATAI* ('ΕΠΙΒΑΤΑΙ)

The archaeological evidence on the Bronze Age Naval Warfare provides us specific information on the nature of the sea-conflicts. The campaigns of Attarsiya (1400-1220 BC), as well as his conflict with Madduwatta, the Hittite vassal, represent the first recorded Mycenaean Greek military activity on the Anatolian mainland (Kelder 2005, 154). The already six recorded military activities of the Mycenaeans in Anatolia, presume extremely strong naval powers which would dominate in the Aegean sea and able to disembark numerous warriors for such land-campaigns. Although the already recorded Ahhiyawan enterprises in Anatolia do not provide us information on any naval battle, it is a strong indication that the Mycenaeans were already familiar with naval raid-operations and naval warfare. Based on the limited Aegean potteries and frescoes, but mostly on the Medinet Habu monument (Nelson 1943) we can see that the typical naval battle of those times in Eastern Mediteranean basin included close-quarters fights on decks and the use of missile weapons (Johnston 1985, 16). So, the role of ship commander and his manoeuvres, as we know from the glorious era of trireme (Ioannidou 2016), was set apart. The on-board warriors were the ones who would attack on the enemy ship, trying to kill the enemy crew and capture the enemy boat, which would be considered as an extremely expensive and valuable trophy. These men could achieve strong and far range shots (Bakas, 2014, 10-19) against mobile targets (crew and sails). When the ships would get touch each other they would use small range weapons, as close-quarters fights were taking place on decks.

Leaving apart the occasions of land-fighter who used ships to engage in the battle field, we realize how difficult could be a task for a marine. At least a rudimentary training or a simple range practice on a deck could existed but there no documents or depictions to prove this. Contrary to Homer's lack of information about naval battles, we find several descriptions in his epics of warriors taking part on sea conflicts and landing operations. But concerning marines' training, the information we have are much later (Thucydides,

7.63, 7.67, Polyainos, Strategemata, 2.7, Arrian, Alexander Anabasis, 7.23). We can assume with reasonably certainty that a similar training of Classical period (Ioannidou 2016, 52-54, 59-63, 69-72 and Charles 1948, 181-188) could exist in Late Bronze Age too.

One may understand the difficulty of a land-fighter to stand on a tossed and unstable ship during a naval battle, to maintain his balance, to shoot from a distance and to locate his target simultaneously. If one of these warriors slips on the deck he will lose the target, maximize ship's instability and may injure himself and others as well. Due to lack of descriptions, "marine" of that period is common defined as a land-fighter on shipboard who knows also how to use the oars. Thucydides (7, 67), much later, will define how dangerous will be to use land-fighters as marines. Was really possible for the Late Bronge Age warriors to ignore the importance of training?

Ship warriors had the term *epibatai* («ἐπιβάται» from the ancient Greek verb *epibaino* ἐπιβαίνω = board a ship, Ioannidou 2014) though they were not "passengers" like the modern Greek term means. We find the verb *epibaino* from the Homeric Epics (Hom. Il, 8, 512 [boarding on a ship] and Hom. Od, 12, 434 [standing on the ship]) but the word *epibatai* is a term of classic Greece. Hesychius describes the term:

he who is not an oarsmen but who fights on board

«ὁ μὴ κωπηλάτης, ἀλλὰ πλέων μαχητής» (Hesychius, ἐπιβάτης).

Therefore, it is not dairy to conclude that ancient Greek *epibatai* were like today marines. They consisted, in a way, a primitive brunch of Army Forces of a city or country who intended for amphibious operations with the use of infantry and ships. Because of their naval training we could say that they are not always land-fighters who happened to be on warships but many times consisted a part of the total naval establishment of the nation.

EQUIPMENT

The typical marine armor equipment should have followed the needs of the naval warfare pattern of the deck-assault: Helmets, body armor, shields, javelins, swords, spears. Various depictions show marines wearing heavy armament (for example Fig. 3) which for such battlefield (for example tossed and slipping deck) should be not functional but dangerous. A jump into the sea of such a warrior would cause his drown. Even in land battles, large shields approved malfunctioned as vividly describes Homer (Hom. Il, 6, 118 Hector's shield and 15, 645 the shield of Perifetes of Mycenae). Perhaps this emblematic armament was for leaders, high range officers or the artist wanted to emphasize the war element. It is more logical a marine of LH period to prefer the absence or the use of light armament (Ioannidou 2016, 52-54). After all there are plenty of these examples in depictions. We can assume that the marine would use a slash cut sword rather than a rapier sword. As Tarlea notes, the rapiers, through their shape and qualities, indicate a very special kind of combat where a lot of space was needed. The narrow cutting-edges and the high midrib make them totally unsuited for lateral blows, which would have only a negligible effect. Even more, the attempt of hitting laterally could prove risky, because it is almost certain that the sword wouldn't survive the shock. The ample lateral blows of the slashing swords. We can assume that the fighting with a rapier is closer to the contemporary idea of a duel than the fight with a slashing sword. The opponents must show aptitudes and abilities most probably gained after years of trainings and successful fights. Very possibly exactly these duelist qualities are in the foreground. The ability proved by the fighter when he manages to send a fatal blow to the enemy must be doubled by the ability of protecting himself in front of his counterstrikes (Tarlea 2005, 132). A slashing sword would be more suitable in this kind of warfare as the marine would need to perform quick front and lateral cuts in an unstable plat-

form. The slashing swords, through their nature, tend to have no or very low midrib and to be stouter and heavier. Only the cutting-edges being used, it is expected the blows come mostly from the lateral. On the one hand, this leads to the placement of the balance point to the sword's tip, in order to increase the force of the blow.

The purpose of the use of bow, in tactical level, was to disturb the enemy's crew from a distance and to support the heavy armoured fighters during their engage with the enemies on board. Its presence should be necessary in every recruit of naval missions. Philoctetes' ships were manned by fifty oarsmen well trained in bow (Hom. Il, 2, 720). Archers are mentioned using poisoned arrows, common in ancient history, which would increase the effectiveness of archery at sea as much as on land (Wood 2012, 39 & Mayor 2006, 62-80). Despite the numerous depictions of archers in the land there are no figures of archers on a warship except those of Geometrical period and after. That, of course, could not support the opinion of the absence of such important corp. However on a shred of LH IIIC founded in ancient Kynos (Fig. 5) there is a warrior who his body posture looks like an archer (Wachsmann 2009, 137). He is standing in the ship's bow with one hand stretched and the other bended as archers doing when they bend their composite bow which was in use in LH period (Brecoulaki 2008, 376 & Bakas 2016, 9-15). But at this point the shred is broken and ship's stem is in front of the stretched hand. As a result ship's stem and broken part cover hand, bow and arrow. This not allow us to have a clear picture of an archer on a ship even if a small mark looks like the tip of a bow. Hoping that someday the piece of that shred will be find we will be in such a pleasure position to have the first archer/marine depiction on ship of LH period. However the Medinet Habu monument portrays a large number of Egyptian archers on board shooting on the Sea – people crew (Nelson 1943, 46-47). Even the fact that the monument describes a conflict that can be indirectly been associated with Aege-

an cultures (Kramer-Hajos 2016, 159), it can be a strong argument that the contemporary Egyptians were using mass numbers of archers on their ships and this could be a common battle tactic among the east mediteranean Bronze age cultures.

Concerning the slingers, their presence was often in all Helladic territory from the Early Helladic but only for hunting of for protection, as far. As an organized corps unit we find them at Middle Helladic (2100-1600 BC) (Everson 2006, 52 and Grguric 2005, 6).

Slingshots were made of shaped stone or unfired claim. From 1300 BC slingshots were made from lead. Characteristic samples are founded in Knossos and Cyprus. There are not any depictions of slingers on ships until now. Although Vutiropoulos (Vutiropulos 1991, 283) believe that the first depictions of wrecked slingers are in the north Miniature Frieze from Akrotiri, Thera (Fig.6), opinion which could be seriously supported. If these bodies are slingers then the black objects floating in the water (a rectangular object with strap and an amorphous blob) could be leather bags for carrying slings and slingshots.

SOME WORDS ABOUT THE DECK ON LATE BRONZE AGE SHIPS

Even if warships are out of scope of this paper we should see briefly an issue that pops out when examining depictions from this period. If we focus on ship decks and the way that marines postured upon them we realize that most of warships of that era were not undecked but they do had a deck. Not fully decked like Cimon's triremes (Plut. Cim. 12, 2) but a partly deck existed and protected oarsmen's head (Dakoronia 1999, 123; Wedde 1999, 515; Kirk 1949, 117, 127; Marinatos 1933, 220; Wachsmann 2009, 142). As Dakoronia correctly wrote about marines on Kynos fleet: "*It would not be possible for them to fight from the hull of the ship, among banks for the oarsmen, mast, sail and other provisions. Only the helmsman stands*
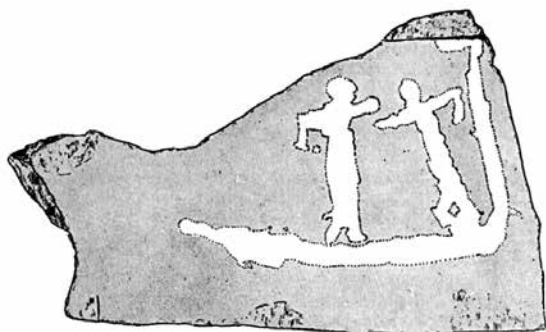
Fig. 1 Stone from Naxos (2300-2100/2000 BC). (Doumas, Κορφή τ' Αρωνιού 1965, Αρχαιολογικόν Δελτίον 20: 53).

Fig. 2 Shred of Kolona, Aegina from Middle Helladic period (1700 BC)

somewhere deeper and this supports the theory that along both sides of the ships ran side decks, joining bow and stern, which were supported on struts or stanchions, also used us thole-pins" (Dakoronia 1999, 123). Maybe this current fallacy about the un-decked warships arose from a rough translation of Thucydides text.

«Οὐδ᾽ αὖ τὰ πλοῖα κατάφαρκτα ἔχοντας» (Thuc.1, 10) which means that their ships were not fully decked (*katafrakta* «κατάφαρκτα»). The word «κατάφρακτος» derives from the verb *katafrasso* «καταφράσσω» (κατὰ + φράσσω) which means to cover, to close. So, warships of Bronze Age were not «κατάφρακτα». Neither were *afrakta* «ἄφρακτα» (ἄ στερητικό + φράσσω) without any deck. In Greek grammar "ἄ" is a negative prefix like "un" in English grammar (un-decked ship). So if a ship is not fully decked *katafrakto* does not mean that is without deck *afrakto* but partly or semi-deck. Thucydides, after all, used specific words to describe precisely the exact meaning of every term, even in past, unknown times for him like LH period.

LOOKING ON DEPICTIONS

Searching the first depiction from finds with figures of marines we should close off from our research those who present men without weapons or people that their attitude is not clear if they are fighting or not. For example on a piece of a hammered rock-carving stone (Fig. 1) from Korfi Aroniou in Naxos island, (Early Cycladic III), there are two figures of men, who stands on a ship and looks like they are violently involved. No weapons are visible1 and that raise doubts if the scene depicts a military act or a duel between crewmembers. According to Doumas the scene presents works on a ship and if we see a duel then this could have as reason an ownership matter or a simple quarrel that happened quite enough between crewmembers, especially during bored, long distance trips (Doumas 1965, 53).

Considering above perhaps the first depiction of marines is the one on a shred of Kolona, Aegina (Fig. 2) from Middle Helladic period. In this we can see clearly the crew (oarsmen or marines) that they are holding long spears and the helmsman who works a single quarter rudder. The appearance of helmsman testifies that the ship is on the sea and either is approaching another ship or a coast with marines ready for landing. Others suggest that this concern a pirate action (Basch 1991, 48).

A very interesting depiction came from Mycenaean Late Helladic IIIB krater from Enkomi (Fig. 3) shows men standing in the same manner, facing each other in pairs (Wachsmann 2009, 141). Five

1 Except in other pieces of the same excavation where we can see scenes of hunting animals.
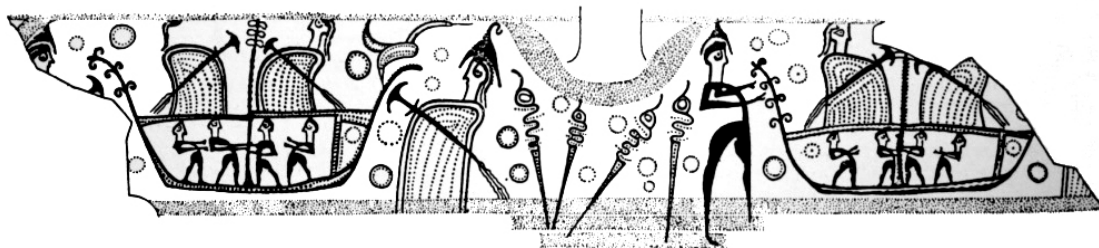
Fig. 3 Scene on a Mycenaean krater of Enkomi (Cyprus) tomb 3. Late Helladic IIIB (1300-1200 π.Χ.).
(Sjogvist 1940: fig. 20. 3).

and half men are heavy armed while the rest 8 are naked or light armed.

Heavy armed warriors are wearing helmets and holding tower shields which their riveting suggests that these shields were curved like half cylinder "in order to protect the warrior as much as possible" (Lorimer 1950, 140, fig. 2). This type of shield is similar to Homeric "sakos" (Ajax's shield) (Hom. II, 7.219-225, 7.232-247) but laden with ornaments. A so valuable shield, as it appears, perhaps corresponded to high rank officers.

They also carry swords in scabbards which their ends have wavy lines. Similarities with the warriors of Miniature Frieze, appeared as well.

The vessels seem like being fully decked (Wachsmann 2009, 142), while under decks men are fighting each other.

An obvious proof and scenes of naval battle from Mycenaean period, or the oldest depiction of sea conflict in the Aegean area maybe appears in a LH IIIC Middle krater from Pyrgos Livanaton, the Homeric Kynos (Dakoronia, 1999, 121) (Fig. 4). Men figures are clearly marines. They are holding shield and spear and looks ready for an assault or a close-in combat on decks. According to Basch maybe this is a depiction of a piracy act (Basch, 1996, 32-33). The ships are of the same type.

The figure of the helmsman testifies the sea-conflict while the dead body suggests the human loss which follows after naval battle.

All marines wear "hedgehog type" helmet. This, less known construction, helmet is quite common in that period. It is believed that was made from hide of goat, ox or from actual hedge-

Fig. 4 LH IIIC Middle krater from Pyrgos Livanaton (Kynos) featuring a scene of warfare between hedgehog-helmed warriors. (Dakaronia & Mpougia 1999, 23).
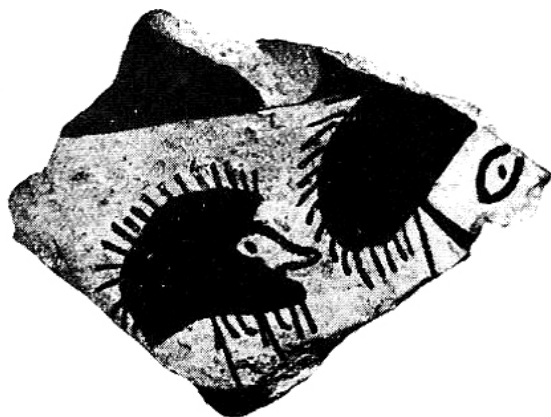
Fig. 4a Fragment of a LH IIIC Middle krater from Mycenae showing a hedgehog–helmed warrior and what may be an actual hedgehog. (Vermeule & Karageorghis, 1982, pl. XI, 45).

Fig. 5 LH IIIC Middle krater from Pyrgos Livanaton (Kynos). (Dakaronia 1996, 171).

hog (Dakoronia 1990, 119). A fragment of a LH IIIC Middle krater from Mycenae (fig. 4a) shows the similarity between hedgehog and helmet of that type and perhaps that piece suggests that this animal consist raw material for the construction of the specific type of helmet (Furumark 1941, 237-42; Emanuel 2015, 63-65).

On another shred of Late Helladic lllC from Kynos (Fig. 5) marines were light armed. They are holding two types of shields and javelins or swords as could be used at close-in combats on decks. Their helmets are of different type and, as we have mentioned above, its quite possible to have the first depiction of an archer on board.

CONCLUSIONS

From the limited finds above we understand that Bronze Age Greek marines played a decisive role in naval battles and landing operations. Except the cases of land warriors who used warships as transportation in order to move to theatre/ area of operations, marines should be trained to achieve their task as posteriors did so. The equipment of marines looks like following the typical hoplite armament: helmets, shields, spears, rapiers while there are also depictions with nude marines or with light armament. It raised also the issue of a marine's rudimentary training.

From the available excavation finds the first depiction of marines could be from Middle Helladic period, around 1700BC, while first archers (Late Helladic IIIC) and slingers (Middle Helladic period) still leave space for more research.

Last but not least, the visual sources underline also the fact that warships do had deck (semi-decked or partly decked) and were not undecked as has been misunderstood from Thucydides text.

* * *

Fig. 6 Scene in the north Miniature Frieze (Middle Helladic period).

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REZIME
HELENSKE POMORSKE SNAGE U KASNOBRONZANOM PERIODU U GRČKOJ

KEYWORDS: GRČKI BRODOVI, POMORSKE SNAGE, KASNO BRONZANI PERIOD GRČKE.

Arheološki nalazi iz perioda bronzanog doba pružaju veliki broj informacija koje se odnose na konstrukciju grčkih brodova. Nažalost, opisi ratnih brodova su vrlo retki. Pored toga, nedostatak prikaza pomorskih bitaka na ilustracijama i u istorijskim izvorima, stvara poteškoće u proučavanju pomorskih borbi. Ratnici na brodu, koji su činili jedan primitivan oblik pomorskog korpusa iz poznog bronzanog doba Grčke, pružaju otežavajuću, ali vrlo zanimljivu oblast za arheološka i istorijska istraživanja pomorskih bitaka iz perioda koji je prethodio formiranju antičke Helade.

SNEŽANA NIKOLIĆ
Institute of Archaeology
Belgrade, Serbia
E-mail: snenik@gmail.com

GORAN STOJIĆ
Centre for New Technologies
Viminacium
Belgrade, Serbia

A REVIEW OF SEVERAL GRAVES BETWEEN THE CITY AND THE MILITARY CAMP

ABSTRACT

During exploration of the area east of the amphitheatre, four brick built graves were discovered. One structure with a saddle roof stands out among them. An adult female with an artificially deformed skull was buried there. The graves are located between the amphitheatre and the military camp and dated to the Late Antiquity period.

Recent archaeological excavations of Viminacium, apart from the exploration of the necropolises and suburban settlements, were mainly focused on the northeastern part of the city (thermae, amphitheatre and surrounding area) as well as on the northwestern segment of the military camp.[1]

During the ten year excavation of the amphitheatre,[2] besides the structure and units related to its function, several structures built and used in different periods were found in the area around the amphitheatre. In addition to several structures with different architectural contexts and purposes, parts of the city fortification – sections of the northern and eastern rampart, with defensive trenches, the eastern city gate, and the street that led from the gate to the west - were also explored. Two structures with apses, oriented northeast-southwest, built east of the amphitheatre – *extra muros*, parallel to the eastern city rampart, which forms part of a wall of the amphitheatre, are significant for this paper. The structures are built in the same area (the older is located inside the younger one), with a similar base, but they belong to different periods – the older one dating back to the 2nd century, and the younger to the third quarter of the 3rd century. According to their location and the distance from the amphitheatre, as well as the time of their use, we can conclude that they had the same function and that rituals performed there were associated with events in the amphitheatre.[3] (Fig. 1).

Above the amphitheatre, after the cessation of its use for spectacles, a late antique necropolis was formed. Over 60 skeletal inhumations have been explored there. Most of the graves were concentrated above the southwestern part of the

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2 Systematic research in the amphitheatre area was carried out from the end of 2007, until mid 2017.

3 Nikolić *et al*. 2015, 64 - 65.

Fig. 1 The position of the graves between the city and the military camp.

stands, then above the northern part of the stands and arena, while only a few were in the area above the eastern part of the amphitheatre.

Southeast of the amphitheatre, at a distance of about 60 m, there is a military camp. During 2002 and 2003, the camp's north gate was explored, and since 2016 its northwestern corner has been explored. Over the course of the excavations of the western rampart, 30 graves have been discovered so far, located along the rampart. Most of them are brick built graves in which children were buried. The graves are dated to the Late Antiquity period.

The aim of this paper is to present four brick built graves, found at 0.30/0.40 m below the arable layer. Based on results to this point, the graves cannot be associated with a necropolis built above the amphitheatre, nor with the graves discovered along the western rampart of the camp.

The graves were discovered east of the aforementioned structures with apses, and are oriented west - east, with smaller deviations of the western part toward the north. The grave structures are devastated to a greater or lesser degree,[4] and the

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4 Most of the graves were discovered during landscaping of collapsed soil from the eastern profile, and parts of some graves entered into the profile (G-63/2, G-64/5). Considering that the area east of the amphitheatre was explored within a square network of the amphitheatre, although the newly discovered graves do not belong to a necropolis formed by an amphitheatre, for technical reasons, they follow the numbering of this necropolis.
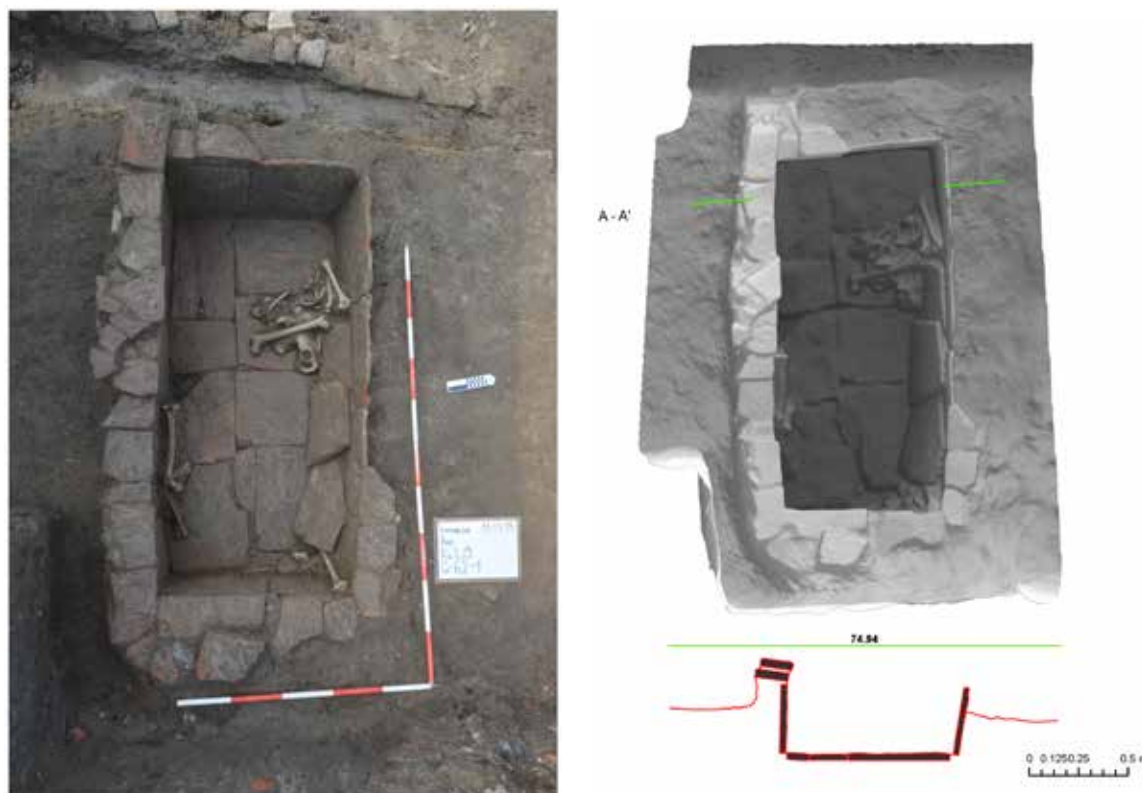
Fig. 2 Grave G-62/1 (digital model by Ž. Jovanović)

skeleton bones poorly preserved. Three graves in rectangular structures are parallel and directed vertically towards the structure. The fourth grave, with a saddle roof, was located in the eastern profile, northeast of the aforementioned graves. In the area between the southern part of the structure with an apse and the eastern profile, scattered human bones were found in the vicinity of the graves, as were several segments with horizontally or vertically laid bricks and tegulae, probably the remains of the destroyed grave constructions. We can therefore assume that there were more graves in this area.

Grave G-62/1 is oriented west-east, with a deviation of 23° of the western end towards the north. The construction of the grave has the following dimensions: 1.90 x 0.90 x 0.45 m (Fig. 2). It consists of vertically laid tegulae with the dimensions 0.52 x 0.34 x 0.03 m. On the north and south sides there are four tegulae, and two tegulae of different dimensions are on the lateral sides. The bottom of the grave is made of whole tegulae,

with the dimensions of 0.57 x 0.44 m x 0.03 m and 0.52 x 0.40 x 0.03 m, or from large tegulae shards. Rows of horizontally laid, mostly damaged tegulae, preserved mainly along the southern and eastern sides, indicate the existence of a cover, most likely made of three rows of tegulae. This is the grave of a male, aged between 16 and 20 years. The grave was robbed, and the skeleton bones were scattered. Parts of a skull and a mandible were found in the western part of the grave.

Grave G-63/2 is situated 3.65 m south of the G-62/1 grave and oriented east-west, with a deviation of 14° of the western end towards the north (Fig. 3). The construction of the grave has the following dimensions: 1.83 x 0.43 x 0.35 m. It has a cover of five horizontally laid tegulae, measuring 0.49 x 0.39 x 0.04 m. The coffin is made of vertically laid tegulae measuring 0.48 x 0.35 x 0.04 m. The longitudinal sides consist of four tegulae, and the lateral sides of one whole tegula. The bottom of the grave is paved with longitudinally laid tegulae.
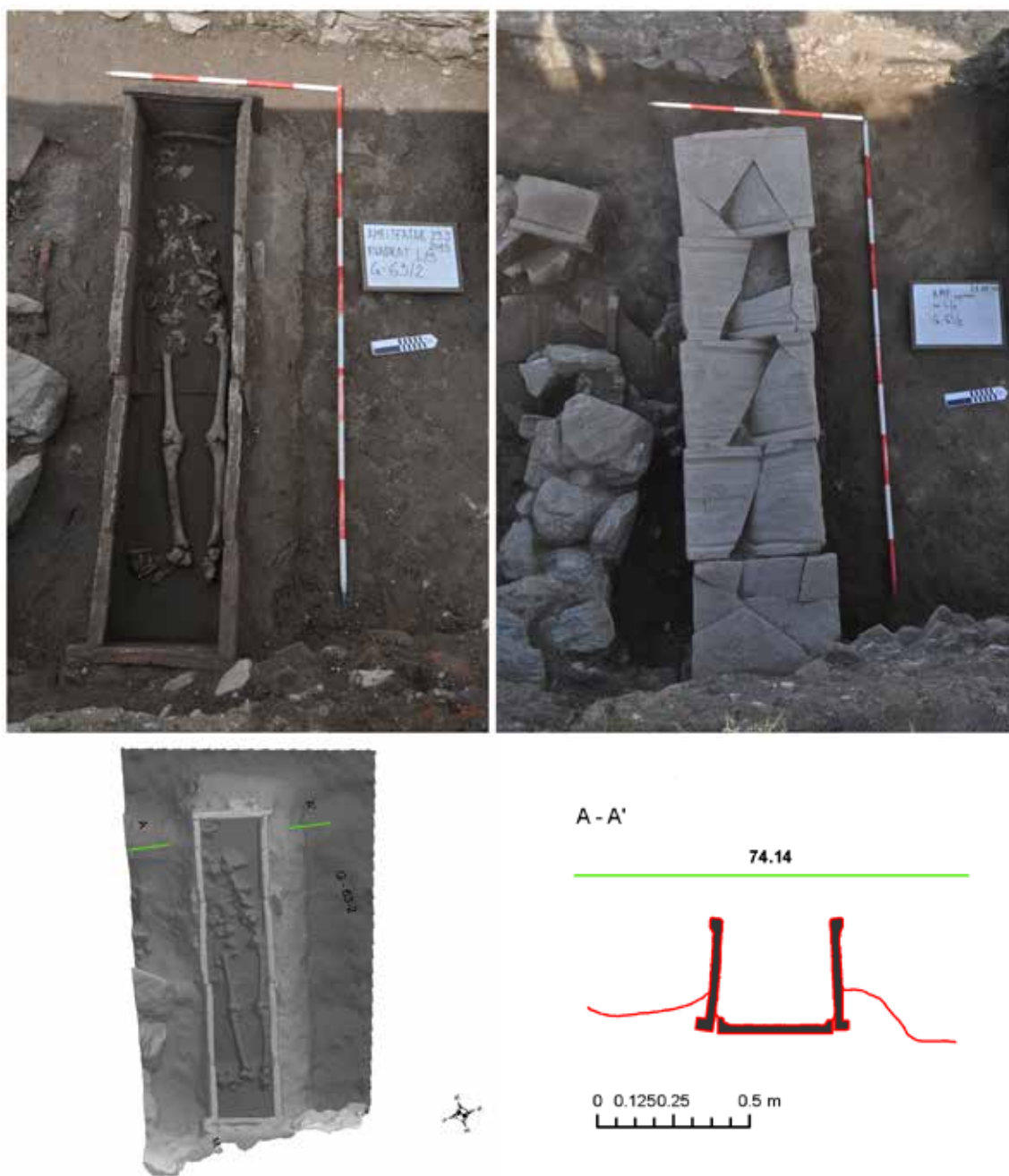
Fig. 3 Grave G-63/2 (digital model by Ž. Jovanović)

Even though the grave hasn't been looted, the skeleton is only partly preserved, to a length of 1.33 m. Leg bones and a partial vertebrae were found *in situ*. Other bones are scattered, and parts of the skull were in the western part of the grave.

It is the grave of an adult person, but due to the condition of the skeleton it is not possible to determine the gender.

Two coins, minted in 346/361 AD, as well as part of a bronze bracelet, were found in the grave infills.

Grave G-64/3 is located 1.25 m south of the G-63/2 grave, above the wall of the structure with an apse (Fig. 4). The major part of the structure made of vertically arranged tegulae was devastated, only its western part, with a dimension of
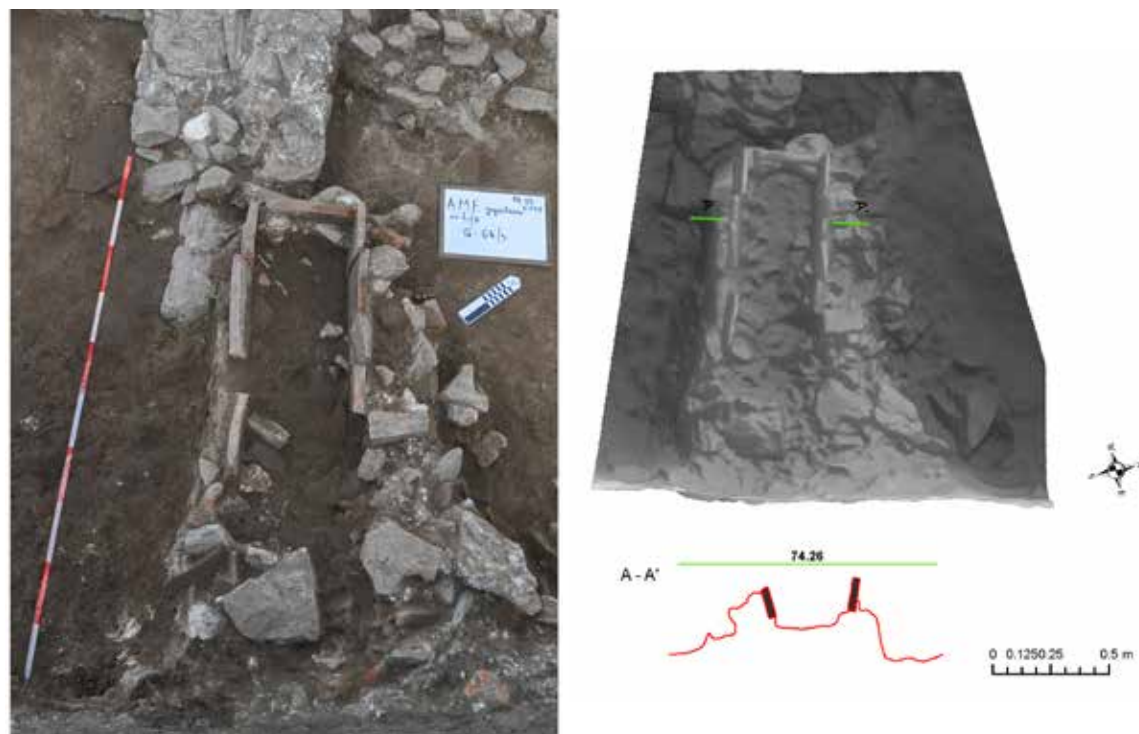
Fig. 4 Grave G-64/3 (digital model by Ž. Jovanović)

0.86/0.70 x 0.38 m, was preserved. The grave has a west-east orientation, with a deviation of 18° of the western end towards the north. Only a small amount of fragmented bones were preserved and several pieces of skull were found in the western part of the grave. In the eastern, devastated part of the grave, as well as along the northern edge of the structure, there is a lot of debris, mostly of broken slate and brick fragments.

Due to the very poor and incomplete preservation, it is not possible to determine gender or age.

Grave G-65/4 is located in the eastern profile, i.e., under the modern road, and it was possible to investigate only by excavating under the profile (Fig. 5). The grave is located northeast of the above-mentioned graves, at 0.70 m from grave G-63/2 and 2.50 m from grave G-62/1. The structure is slightly inclined to the south, probably due to the pressure of the earth. For these reasons, the construction of the grave has not been fully disclosed, and only provisional dimensions have been determined: 1.70 x 0.40 m. The grave is oriented west-east with a deviation of 20° of the west-

ern end towards the north. The grave structure has a saddle roof consisting of six tegulae, measuring 0.49 x 0.39 m. The bottom is not paved, it consists of a layer of brown–yellow soil with debris. The skeleton bones are partly preserved: the skull is artificially deformed, the pelvis and leg bones were found *in situ*, while in the middle part the bones were dislocated. The length is 1.60. It is the grave of an adult female.

Based on the stratigraphy and finds, the graves are dated to the second half of the 4th century. In addition to the small number of grave goods found in grave G-63/2 (coins minted in 346/361 AD and part of a bronze bracelet), in the eastern, devastated part of grave G-64/3, a frame of a lead mirror was also found. Similar frames, but with different ornaments, have been found, both at the amphitheatre, and at other locations in Viminacium. In the area surrounding the graves, several coins, also dated to the third quarter of the 4th century, were also found, as were numerous ceramic and glass vessel fragments, dated to the second half of the 4th century.

Fig. 5 Grave G-65/4
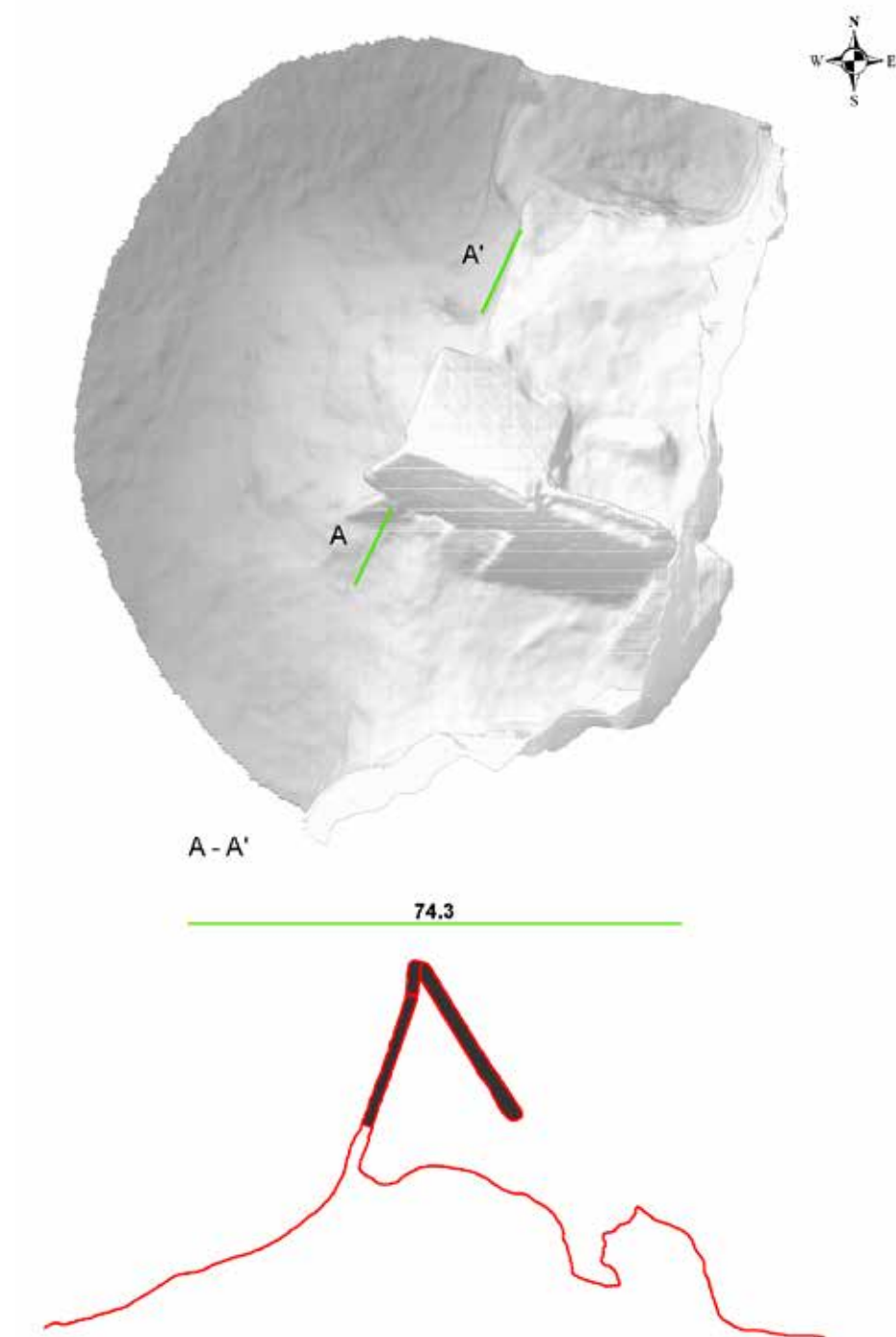
Fig. 5 Grave G-65/4 (digital model by Ž. Jovanović)

Two adults, one male and one female, were buried in the graves, while in one grave, due to devastation and poorly preserved skeletons, the gender and age of the individuals could not be determined, and in the other only the age was determined.

The grave structures consist of simple rectangular brick coffins, with a flat lid, except for one with a saddle roof.

Rectangular grave structures with a flat lid are often dated to the Roman period, and they are the

most common type in the necropolis above the amphitheatre as well. In contrast, constructions with a saddle roof are considerably less common. At the necropolis above the amphitheatre, nine graves had similar, but somewhat more complex constructions: besides the saddle roof, tegulae were vertically laid at the front sides, and the floor was paved, also with tegulae. The most common orientation of these graves was northwest-southeast.

The G-65/4 grave deserves particular attention, with a saddle roof, in which an adult female was buried, on whose skull an artificial deformation was detected.

During exploration of the "Više Grobalja" necropolis at Viminacium, over 30 individuals with artificially deformed skulls dated to the 5th and 6th centuries were discovered (Mikić 2008, 45). Thus, grave G-65/4 would represent one of the older graves with artificial skull deformation in the territory of Serbia. The second half of the 4th century was marked by economic decline in the Roman Empire, religious conflicts and constant fighting with barbarian tribes. The neighbouring Sarmatian tribes were a constant threat to the northern border of Upper Moesia, while battles with the Goths resumed in the east. On several occasions Roman emperors settled members of barbarian tribes in Roman cities, for example Constantine did so in 322 AD (Mirković, 1981, 96).

In the area of the Eastern Roman Empire, the earliest appearance of artificially deformed skulls was discovered in necropolises in Romania and Hungary and was chronologically defined to the 2nd-3rd century, with the deceased mostly attributed to the Sarmatians (Hakenbeck 2009, 69). The lack of grave goods in the grave of the deceased woman from Viminacium certainly makes ethnic definition more difficult, but without a doubt that person was not of Roman origin. Burial of an adult female of foreign origin in a brick built grave, with a west-east orientation, indicates the acceptance of Roman customs.

The area east of the amphitheatre had a sacred character, and in the aforementioned structures with apses, rituals related to events in the amphitheatre were performed.

The investigated area with graves,[5] as well as the number of graves, are not sufficient for making relevant conclusions. Namely, the question arises as to whether these are individual graves or if they represent the western border of the new necropolis. Bearing in mind the proximity of the necropolis above the amphitheatre, as well as the graves along the western rampart of the camp, the assumption of the existence of another late antique necropolis does not seem plausible. As already mentioned, the area east of the amphitheatre had a sacral character and, in the structures with apses, rituals related to events in the amphitheatre were performed. However, it is certain that the structure in its youngest stage, which is dated to the second half of the 4th century, is not related to the amphitheatre. In addition to the fact that the amphitheatre was no longer used for spectacles, the construction technique also points to a different function of the reconstructed object. Namely, in its youngest stage, the structure was built using the dry stone technique, and in addition to bricks and stone, parts of marble sculptures, most of which are related to Roman deities, were used as spolia. Therefore, the question arises as to whether the structure with apses in its very latest stage could have been used for the purposes of a cult that was associated with these graves.

It will be possible to resolve these issues after exploring the area east of the graves, stretching below the modern road.[6]

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5 In the area investigated east of the structure with apses, the graves appear only in the southern part, in the vicinity of the apses, while there were none in the other parts.

6 Exploration of the area east of the graves is not possible in the near future due to unresolved property/legal issues.

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REZIME
OSVRT NA NEKOLIKO GROBOVA IZMEĐU GRADA I LOGORA

KLJUČNE REČI: VIMINACIJUM, GROB, KONSTRUKCIJA, SKELET, VEŠTAČKI DEFORMISANA LOBANJA.

Novija arheološka iskopavanja Viminacijuma, pored istraživanja nekropola i prigradskih naselja, bila su usmerena na severoistočni deo grada i severozapadni segment vojnog logora.

U toku iskopavanja amfiteatra i površine oko njega, pored samog objekta i celina vezanih za njegovu funkciju, istraženo je nekoliko objekata koji su izgrađeni i korišćeni u različitim periodima. Otkriveni su i delovi gradske fortifikacije – segmenti severnog i istočnog bedema, istočna kapija grada, kao i ulica koja je vodila od kapije prema zapadu. Za ovaj rad su značajna dva objekta sa apsidama, podignuta na istom prostoru - istočno od amfiteatra (*extra muros*). Objekti su slične osnove, ali pripadaju različitim periodima (stariji je datovan u II vek, a mlađi u treću četvrtinu III veka) i korišćeni su za održavanje rituala vezanih za događanja u samom amfiteatru.

U kasnoantičkom periodu, iznad amfiteatra je formirana nekropola u okviru koje je istraženo preko 60 skeletno sahranjenih pokojnika. Najveći broj grobova bio je skoncentrisan iznad jugozapadnog dela tribina.

Na udaljenosti od oko 60 m jugoistočno od amfiteatra nalazi se vojni logor, čije istraživanje je u toku. Između zapadnog bedema logora i odbrambenog rova, otkriveno je 30 grobova, datovanih u kasnoantički period.

Na prostoru između amfiteatra i logora, a pored objekata sa apsidama, otkrivena su četiri groba sa konstrukcijama od opeka, datovana u drugu polovinu IV veka. Među njima se izdvaja grob sa konstrukcijom koju čini pokrivač na dve vode, u kome je bila sahranjena odrasla ženska osoba, sa veštački deformisanom lobanjom.

S obzirom da grobovi ka istoku zalaze pod

neistraženu površinu, postavlja se pitanje da li se radi o pojedinačnim grobovima ili oni predstavljaju zapadnu granicu nove nekropole. Imajući u vidu blizinu nekropole iznad amfiteatra, kao i grobova duž zapadnog bedema logora, pretpostavka o postojanju još jedne kasnoantičke nekropole ne čini se verovatnom.

MILAN B. MILOVANOVIĆ
Požarevac, Serbia
E-mail: mimidusanovac@gmail.com

TWO EARLY BYZANTINE FIBULAE FROM THE PČELINJI KRŠ SITE IN LAZNICA NEAR ŽAGUBICA

ABSTRACT

The paper deals with early Byzantine fibulae from the Pčelinji krš site, located in the area of Laznica village, near Žagubica in eastern Serbia. The objects are accidental finds, discovered by locals on surface terrain and during earthworks. They were subjected to conservation and X-ray fluorescence. The first specimen is completely preserved. It is a bow-type fibula with a backward turned foot and a coil. The other presented fibula, in this case fragmented, is defined in older literature as the "western Balkan" or the "Dalmatian" type.

KEYWORDS: FIBULAE, EARLY BYZANTINE PERIOD, PČELINJI KRŠ, "XRF" ANALYSIS, DATING.

In the south-eastern part of the Braničevo district, more precisely in the vicinity of Žagubica in the area of Homolje, several sites that can be characterised with certain reservations, on the basis of archaeological research, as late antiquity or early-Byzantine, have been registered (Fig. 1). Trench excavations in the aforementioned area were performed at the sites of Zad in Ribare and Pčelinji krš in Laznica (Миловановић и Филиповић 2018: 2-3; Цуњак и Миљковић 1992: 103; Миловановић 2016b: 25, 76). Archaeological field surveys were also performed to a greater or lesser extent at some sites: Šetaće in Osanica, Pregrada-Podkrš in Žagubica and Potaj Čuka near Žagubica. Based on collected accidental finds, visible architectural remains and terrain configuration, it can be assumed that the above mentioned sites were inhabited during the 6th century.[1] It should be noted that these are high,

hardly accessible positions, which are mainly approachable from only one side. One of these archaeological sites is the aforementioned Pčelinji krš. Archaeological excavations at this site were carried out on two occasions, in 2006 and 2007. Archaeological findings from prehistory, late antiquity and the early Byzantine period were recorded at that time.[2]

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1 Such a statement must be taken with certain caution since the chronological determination is based on accidental archaeological findings. The possibility of settling at these sites should not be ruled out, e.g. also in the 4th century, Миловановић и Филиповић 2018: 6; Миловановић

2016a: 137. In the vicinity of Žagubica, there are also indicative sites that, based on toponyms, reports of individual travel writers and memories of the locals, may indicate settlement during the late antiquity and early Byzantine period. So far, they have not been archaeologically explored, Миловановић и Филиповић 2018: 5, 15, сл. 2; Каниц 1985: 272.

2 The head of archaeological excavations in 2006 was D. Mrkobrad (with Project Manager S. Mišić). Excavations in 2007 were conducted by D. Jacanović. Additionally, numerous accidental finds originating from this site have been collected by the locals for decades. Upon inspection of these finds it is concluded that this material predominantly belongs to the early Byzantine period. A smaller number of finds, at least for the time being, suggest settling also during the late Antiquity period, Миловановић и Филиповић 2018: 2, нап 3, кат. бр. 20, 56; Миловановић 2016 a: 125-126. Based on a partial insight into the documentation from archaeological excavations and the examination of the accidental finds, which, as already empha-

Fig. 1 Approximate distribution of 4th -6th century archaeological sites in the vicinity of Žagubica: 1. Pčelinji krš in Laznica; 2. Pregrada-Podkrš in Žagubica; 3. Potaj čuka near Žagubica; 4. Zad in Ribare; 5. Šetaće in Osanica.

The site in question also has the Vlach name "Krš ku albina," which loosely translated means bee's karst, i.e., Pčelinji Krš. At the beginning of the 20th century, the ethnologist T. Đorđević also recorded the toponym "Šetaće" for this place (Ђорђевић 1910: 232),[3] but it was not preserved by the locals. When we speak about the site's position, we can say that it was wisely selected, at an altitude of about 580 m.[4] The massive wreath of the Homolje Mountains stretches towards the north. On the south side of the elevation, below sharp cliffs, flows a stream called "Valja kum umbarju" (Valley with the vessels). In the western and eastern part there are slopes. A spacious meadow, on which, according to the memories of the local people, there were walls, stretches northwest, at a slightly lower altitude from the place where the aforementioned archaeological excavations were carried out (Fig. 1, 2). Approach is most suitable from this side. On the terrain the remains of fortifications are visible (Fig. 3, 4). East of the fortification, there are the surrounding hills, while on the opposite side, at an altitude of about 400 m, there is a view towards Laznica village, through which the Kamenička River flows (Миловановић 2018: 8).

A certain number of accidental archaeological finds, roughly defined as from prehistory, late antiquity and the early Byzantine period, are kept in the Homolje Heritage Museum in Žagubica, as well as by the locals of Laznica. On this occasion, we have selected two fibulae which are currently the only items from this site that have been subjected to any conservation procedure. They were

sised, are mostly determined as being from the time of the 6th century, the Pčelinji krš site is defined by the author of this paper as early Byzantine. More precisely, the fortified settlement was most probably built during the time of Emperor Justinian (527-565), and served the population until the Avar and Slav attacks at the end of the 6th or the beginning of the 7th century, Миловановић 2018; Whether there was construction activity on the hill above Laznica during late Antiquity or some other period, we will learn after the published report from two years of archaeological excavations, Миловановић 2016а: 122, нап. 491.

3 About the history of Pčelinji krš research see Миловановић 2018: 7-8.

4 The height is calculated according to the military geographical map.

Fig. 2 Pčelinji krš, Google Earth image.
34T Easting: 566260.29 m E, Northing 4898588.46 m N, Eye altitude 1.44 km, Imagery Date 29 June 2017, Image 2018 CNES / Airbus

Fig. 3 Pčelinji krš, sketch of fortification base.

subjected to X-ray fluorescence (XRF analysis)[5]

The first fibula is completely preserved, with a noteworthy feature being that its part that is bent backward is slightly deformed. It is a type of early-Byzantine bow fibula with a bent backward foot and a coil. The object is made of high quality iron, with the dimensions 7.1 x 1.5 x 0.2 cm. The width of the bow is 1.2 cm, and the width of the foot is 0.9 cm (Fig. 5, Fig. 7/1). It is a strap-shaped bow and is slightly wider than the trapezoidal foot. Both of the aforementioned parts of the fibula have a rectangular cross-section, decorated with framed incised lines on the upper side, while a well preserved coil is between them. On the head of the fibula, around the horizontal axis, a spring, also made of iron, is formed. The preserved needle is located outside a deformed tubular catch-

plate. According to the testimony of the locals, the object was found at the foot of the western slope of the site during earthworks in 2015.

There are three developmental forms of these fibulae (Uenze 1992: 146-154). A specimen from Pčelinji krš can be classified with great certainty in the so-called second transitional form in which the bow gradually increases in relation to the foot. The ornamentation, also presented, involves an equal amount of decoration in the foot and bow of the fibula. It should be emphasised that the first form is characterised by approximately the same dimensions of the foot and bow where the foot is primarily decorated, while in the third the bow becomes visibly wider. Chronologically, all three forms can be roughly placed in the 6th-7th century. It should also be noted that they are simultaneous with buckles of Sučidava and Salona – Histria types (Špehar 2010: 58-59). On the other hand, we also note the recent findings from the early-Byzantine site of Gradina on Jelica Mountain, near Čačak. During archaeological excavations in

5 Conservation and XRF analysis were performed by M. Čolović and M. Stojanović from the National Museum in Belgrade, in 2016. I am most thankful to my colleagues for their generous help. The fibulae are located in the Homolje Heritage Museum in Žagubica, Миловановић и Филиповић 2018: 21-22.

Fig. 4 Pčelinji krš, remains of the western rampart.

2015, similar samples of functional parts of cloth-ing were found. The difference which is observed at first glance relates primarily to the width of the bow, which is in this case slightly narrower than the trapezoidal shaped foot (Радишић 2017: 103, кат. 40, 41). Here is most probably a special group of transitional forms of early Byzantine bow fibu-lae with a bent backward foot and a coil. The final conclusion on this assumption will be provided by future research and interpretations. Also, it should be emphasised that during this period, the Romans wore fibulae in the middle of the chest or on the shoulder when buttoning their robes (unlike the Germanic tribes who wore them in pairs). This kind of clothing was common for both sexes in the Empire (Милинковић 2004: 192, сл. 6). The transitional form of early Byzantine bow fibulae with bent backward foot and a coil, according to previous research, was widespread in the area of Ђердап. It is interesting to note that all previously discovered specimens in the aforementioned re-gion were made of bronze (Špehar 2010: 58-59;

Јанковић 1981: 173-174, Т. XVI/4-5). Some anal-ogous items have also be found in Gamzigrad *(Fe-lix Romuliana)* (Јанковић 1983: 136, кат. бр.194; Живић 2003: 184, кат. 435; Петковић 2010: 199, сл. 173). Several fibulae of the transitional form were discovered in Macedonia, at the Budinar-ci and Gradište sites (Mikulčić 2002: 200, Abb. 95/2; 300-301, Abb. 199/2). In Bulgaria, simi-lar findings have come from Pernik (Любенова 1981: 168-169, обр. 107/2, 108). One fibula was also discovered in the vicinity of Ljubljana in Slo-venia (Bitenc in: Knific 2001: 58, kat. 169). In the area of the Braničevo district, findings of this type were recorded in the Germanic tombs of the 6th century in the Viminacium area (*Viminatium*) (Ivanišević, Kazansky et Mastikova 2006, Fig. 9).

The other fibula from Pčelinji krš belongs to a type that is known in the older literature as a west-ern Balkan or Dalmatian type. It is a fragmented specimen, made of iron, missing a needle, spring and a bent backward part of the foot. The fibula was found at the site itself (on the top of the hill)

Fig. 5 Bow fibula with backward bent foot and coil.

Fig. 6 Fragmented fibula of the "western Balkan" type.

in 2004 in disposed earth from illegal explorations. Its preserved dimensions are 5.5 x 0.9 x 0.4 cm, bow width 0.9 cm, foot width 0.5 cm (Fig. 6, Fig. 7/2). On the head of the object there is a polyhedron shaped button, coated with brass. On the wide fibula bow, or more precisely on its lateral, front sides, a damascening technique was noted with inserted copper wires, diagonally or vertically arranged, some of which are not preserved. In these places, the position in which they were originally inserted is visible. Using the same technique, in the middle of the bow, a ribbon made of gold and silver alloy was inlayed, and is partially preserved. The ribbon was framed by copper wires located on the sides. On the surface there are three smaller evenly distributed horizontal incisions. Between the foot and the bow of the fibula, a larger, preserved double coil is visible. The foot, with a wavy upper surface, was originally covered with thin foil (gilding technique), and it is also made of an alloy of gold and silver. Over this foil, thin copper wires, evenly distributed, were transversally attached using a damascening technique. Most of them remain preserved on the lower, flat part of the foot. The characteristic of this type of functional part of the garment is primarily reflected in the foot, which is noticeably longer than the smaller wide bow. In older literature it was written that these specimens were typical for the western Balkan region of the early Byzantine

period and that they ethnically belong to the indigenous population. They were most numerous in Salona and its surroundings, therefore it was considered that this was their production centre (Vinski 1967: 39-40; Радичевић 2009: 413). However, recent archaeological research has shown that such specimens are also seen in the central Balkans. In 2009, D. Radičević was the first to draw attention to their distribution outside the western part of the peninsula during the aforementioned epoch. Certain analogies were even found in the territory of Bulgaria.[6] Territorially, the closest specimens were recorded in the Više grobalja necropolis (grave 143) in the Viminacium area during archaeological excavations. The entire grave is defined as being from the second third of the 6th century, the horizon C2 (Ivanišević, Kazanski et Mastykova 2006, 122, Pl. 26/7). On the other hand, there are specimens from the early Byzantine settlements that have some similarities to the fibula from Pčelinji krš. These are fibulae that originate from the Gradac site near Svrljig (Радишић 2015: 291) and Gradina on Jelica Mountain (Радишић 2017: 105, кат. бр. 46). The common features of these findings are transversal wires on a wavy foot. Analogous specimens have, on the upper part of the foot, a preserved foil, made of copper alloy, as opposed to the finding from

6 Радичевић 2009: 412-416 with the aforementioned analogies.
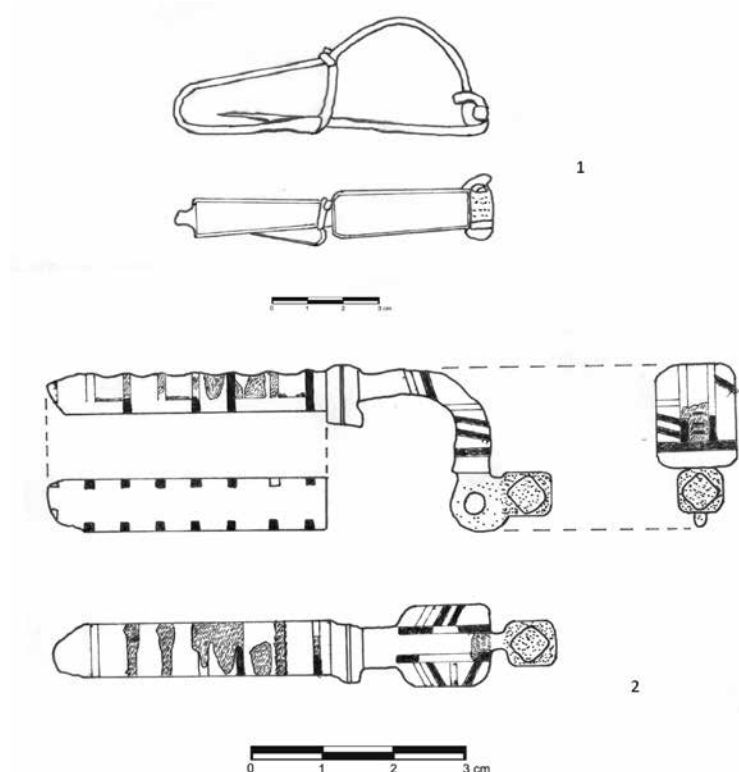
Fig. 7 Fibulae from Pčelinji krš after conservation.

Laznica, which is made of gold and silver alloy. Similarities are also seen in the ornamented bow. They are dated to the second half of the 6th and the beginning of the 7th century (Радишић 2015: 292 и 295; Радишић 2017: 105, кат. бр. 46). In the area of south-eastern Serbia, fibulae of this type are also seen in the vicinity of Knjaževac (Јовановић 1993: 65). Analogous items can also be found in Nebeske stolice in Kopaonik, as well as in the vicinity of Kruševac, and they are dated to the 6th century (Рашковић 2015: 323-324, Т. II/4-5). Several specimens also come from the surroundings of Belgrade (Bojović 1983: 73-74, kat. br. 325-327, T. XXXIII). In Macedonia, analogous findings for these fibulae can be found at the Hisar-Kale site near Tetovo (Mikulčić 2002: 470, 388, 3).

Based on the various techniques and materials, the fibula from Pčelinji krš in the area of the village of Laznica, near Žagubica, represents a special specimen of early Byzantine fibulae. Although the find is fragmented, according to analy-

ses that have been executed, it can be said that the specificity of this object is primarily reflected in the various techniques that were applied during its manufacture. In addition, XRF analysis has also revealed different metals. At this point, it is difficult to say how this fibula reached these areas, since it was an accidental find. Their appearance in the territory of the Central Balkans has been interpreted in different ways in science (Радичевић 2009: 415-416).

The objects that were discussed in this paper, as pointed out, were found on the terrain surface and during earthworks, according to the testimonies of locals from Laznica. It seems that their archaeological context will remain forever unknown; therefore, caution is needed when making any final conclusions. Judging by analogous bow fibulae with a backward turned foot and a coil which were discovered at early Byzantine sites in Serbia and its surroundings, they are generally defined as being from the time of the 6th-7th

century. A somewhat similar situation exists with the "western Balkan" type. On the other hand, it should be noted once again that the remains of fortifications at Pčelinji krš most likely belong to the time of the great Justinian restoration after 527 AD, while their destruction is related to the Avar and Slav attacks at the end of the 6th or the beginning of the 7th century.[7] In this case, the fibulae presented in this paper can be placed chronologically, with a certain reservations, at the time between the emergence and the destruction of the fortification in the village of Laznica.

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REZIME
DVE RANOVIZANTIJSKE FIBULE SA LOKALITETA PČELINJI KRŠ U LAZNICI KOD ŽAGUBICE

KLJUČNE REČI: FIBULE, RANOVIZANTIJSKI PERIOD, PČELINJI KRŠ, „XRF" ANALIZA, DATOVANJE.

U radu su obrađene ranovizantijske fibule sa lokaliteta Pčelinji krš, koji se nalazi u ataru sela Laznice kod Žagubice na prostoru istočne Srbije. Predmeti predstavljaju slučajne nalaze, pronađene od strane meštana na površini terena i prilikom zemljanih radova. Na njima je izvršena konzervacija i rendgenska fluorescencija. Prvi primerak je sačuvan u celosti. U pitanju je tip lučne fibule sa posuvraćenom stopom i obmotajem. Druga predstavljena fibula, u ovom slučaju fragmentovana, opredeljena je u starijoj literaturi kao „zapadnobalkanski" ili „dalmatinski" tip. Arheološka iskopavanja na ovom lokalitetu vršena su u dva navrata, 2006. i 2007. godine. Tom prilikom su evidentirani arheološki nalazi iz praistorije, kasne antike i rane Vizantije. Vidljivi ostaci fortifikacija, najverovatnije pripadaju vremenu velike Justinijanove obnove nakon 527. godine, dok se samo stradanje vezuje za avarske i slovenske napade krajem 6. ili početkom 7. veka. U tom slučaju, fibule koje su predstavljene u ovom radu možemo u hronološkom smislu, sa određenom dozom rezerve, opredeliti u vreme između nastanka i stradanja utvrđenja u ataru sela Laznice.

EMILIJA NIKOLIĆ
Institute of Archaeology
Belgrade, Serbia
E-mail: e.nikolic@ai.ac.rs

DRAGANA ROGIĆ
Institute of Archaeology
Belgrade, Serbia

SHORT OBSERVATIONS ON THE POSSIBLE HYDRAULICITY OF VIMINACIUM LIME MORTARS BASED ON THE RESULTS OF LABORATORY RESEARCH

ABSTRACT

During the last decade, laboratory research of different types of ancient Viminacium lime mortars was conducted. It included research of core, bedding, pointing and rendering mortars with or without paintings, originating from the amphitheatre, the small structures beneath its auditorium and the city wall surrounding it, but also from the graves excavated near the Mausoleum central burial structure. Results of the research have led to a variety of discussions regarding the materials used for mortar preparation in Viminacium, but also about its preparation technology. One of the discussions was connected to the possible hydraulicity of Viminacium mortars.

KEYWORDS: VIMINACIUM, LIME MORTAR, HOT LIME TECHNOLOGY, HYDRAULICITY.

INTRODUCTION

During the excavations of ancient *Viminacium* - today an archaeological site and an archaeological park in Serbia near the confluence of the rivers Mlava and Danube and the town of Kostolac, once the capital of the Roman province of *Moesia Superior* and a very important legionary fortress on the Danubian limes, numerous graves and tombs, city baths, streets, roads, aqueducts with other water supply facilities, parts of the city and fortress' walls with gates, villas and suburban settlements, craftsmen's centres for the production of bricks and pottery, as well as the most monumental of all excavated buildings so far - the amphitheatre, were excavated.[1] The excavations have been fol-

lowed by conservation processes and, for this, laboratory analyses of various types of mortars have been performed during the past decade. The laboratory research included samples of bedding, pointing and rendering mortar with or without paintings, originating from the amphitheatre (Fig. 1) and the small structures found beneath its auditorium (construction no.1 and construction no.2), core mortar coming from the city wall surrounding the mentioned building, together with bedding and core mortar from the graves excavated near the Mausoleum central burial structure in the eastern *Viminacium* necropolis named "Pirivoj" (Fig. 2).[2] The mutual comparison of the loss on ignition

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Technological Development of the Republic of Serbia.

[2] The research of *Viminacium* mortars done in C.S.G. Palladio Laboratories, Vicenza, Italy, in 2007, included the analyses of lime mortars originating from the surrounding wall of the Mausoleum, and the walls of particular graves near it (Cornale, P. and Monni, E. 2007; the research has not been published). Mortar samples from the *Viminacium* amphitheatre, examined in the Institute for Testing Materials (IMS) in 2011, included lime mortars functioning

Fig. 1. Arena wall of the amphitheatre (documentation of the Institute of Archaeology Belgrade).

as bedding, pointing, and rendering mortars (with or without wall paintings), all coming from the arena wall of the amphitheatre and a small structure found beneath its auditorium (construction no.2, assumed to be a small shrine – aedicula), but also a sample of the lime mortar from the core of an outer city wall next to the building (results of the research done by IMS - Delić, Nikolić, I. *et al.* 2011, are partly published in Nikolić *et al.* 2016 and Nikolić and Bogdanović 2012). Samples examined in 2014 in IMS and Vinča Institute of Nuclear Sciences, University of Belgrade, were again those of rendering lime mortar from the arena wall, but also those taken from the small built structure found under the auditorium (construction no.1), all with wall paintings (the research was done for the purpose of Rogić 2014; research done by IMS - Vušović, O. and Ivović, B. 2014, has not been published, while the one done by Vinča Institute - dr M. Gajić-Kvašćev and V. Andrić, is part of Rogić 2014). The C.S.G. Palladio Laboratories research of bedding mortars included the analyses of mineralogic and petrographic composition with the determination of materials. The IMS research of bedding, pointing and rendering mortars without paintings included the analyses of the volume mass, water absorption, compression strength, porosity with the pore distribution, chemical composition, and mineralogic and petrographic composition with the

values at different temperatures obtained by the laboratory research of *Viminacium* mortars, and the principles applied in the analogous research, indicated the possible hydraulicity of *Viminacium* mortars (Nikolić *et al*. 2016: 142) and raised questions as to how it could have been gained.[3]

HYDRAULICITY OF VIMINACIUM MORTARS

Hydraulicity of mortar is a feature that includes its water resistance and strength. Lime

determination of materials, while the research of lime mortars with wall paintings included mineralogic and petrographic composition with the determination of materials. The research of the lime mortars with wall paintings done in Vinča, included XRD analyses of different mortar layers with the determination of the sum of minerals in the samples.

3 Some of the results on the mentioned characteristics were published in Nikolić et al. 2016.

Fig. 2. Mausoleum (documentation of the Institute of Archaeology Belgrade).

mortars can achieve hydraulicity in a few ways: using a quarry sand with a high percentage of clay as an aggregate, natural or artificial hydraulic lime as a binder (using a limestone with impurities – natural, or adding certain materials to the limestone before or after its burning - artificial), or using certain materials of natural or artificial origin with pozzolanic features, as an addition to, or replacement for, the aggregate (Nikolić, Rogić and Milovanović 2015: 71-72).

The use of brick as an artificial material with pozzolanic features was most often the method for obtaining the better characteristics of Roman lime mortars in the territory of the present-day Serbia. *Viminacium* builders used brick as an additive in structures directly exposed to water and in humid or warm environments, but their structural mortars rarely contained this addition. (Nikolić *et al.* 2016: 142). However, the results of the laboratory

research of the bedding mortar from the amphitheatre arena wall and the core mortar from the city wall surrounding the amphitheatre, without brick in the mixture, showed remarkable strength (Fig. 3) and a high percentage of silicon and aluminium oxides (Fig. 4). This led to the assumption that the builders could have added some natural aluminosilicate materials. However, based on the current understanding of available sources, they did not use any natural material with pozzolanic features. That is why attention is focused on some other methods of gaining hydraulicity. An increased strength and the percentage of silicon and aluminium oxides in mortars could also have been achieved by the introduction of impurities into the mixtures using hot lime technology or by using lime already containing impurities (Nikolić *et al*. 2016: 142).

chemical composition (% vol)

method	SRPS B.D8.205, B.D8.210						
sample	SiO_2	Al_2O_3	Fe_2O_3	CaO	MgO	Na_2O	K_2O
bedding mortar	66.84	5.12	1.42	13.21	1.19	0.13	0.46
core mortar	53.38	5.15	2.25	20.92	1.08	0.36	0.48

Fig. 3. Physical and mechanical characteristics of the mortar samples from the amphitheatre
(data taken and modified from Nikolić et al. 2016, 141, Table 3).

method	EN 1015-10	EN 1015-18	EN 1015-11	mercury porosimetry
sample	volume mass (g/cm³)	water absorption (vol.%)	compression strength (MPa)	porosity (vol.%)
bedding mortar	1.65	22.3	2.7	33.4
core mortar	1.86	11.7	5.3	24.7

Fig. 4. Results of the chemical analyses of the mortar samples from the amphitheatre
(data taken and modified from Nikolić et al. 2016, 140, Table 2).

ORIGIN OF THE VIMINACIUM LIME

Analyses of lime mortars of certain ancient Greek buildings that were not prepared using materials with pozzolanic features showed their great strength, but also the usage of impure limestone (Elsen, Van Balen, Mertens 2012: 125). However, it is thought that ancient people could see the differences between pure limestone and that with certain impurities, but also that they thought the impurities lowered the lime quality (Adam, 1999: 128). In Great Britain, in spite of available impure limestone - with a high percentage of clay, Romans made lime mortars of non-hydraulic lime, and the hydraulicity of the mortars was achieved with the addition of artificial materials with pozzolanic features (Van Balen 2003: 82). From the Middle Ages, hydraulic mortars were intention-ally prepared with the addition of materials with pozzolanic features, but also using clay-bearing limestone (Elsen, Van Balen, Mertens 2012: 130). Those impurities in limestone - clay (actually the presence of silicon and aluminium oxides - authors' comment), made the lime created from this limestone naturally hydraulic (Adam, 1999: 129).

The research to date has shown that local and regional limestones dominated as building stones in *Viminacium* (63% of the examined stone samples), while the other stones used were travertine and marble (Đurić, Kale and Rižnar 2018: 474-475). The Austro-Hungarian travel writer from the XIX century, Felix Kanitz, wrote that tertiary limestone quarried in the surroundings of Belgrade – today Višnjica, was exploited by *Viminacium* builders (Каниц 1987: 157). The area from Belgrade to Kostolac, along the Danube, can be connected with the deposits of crypocrystal

limestones, corallinacean limestone (Leitha limestone)▯, sandy limestone, sandy calcarenites and oolitic limestones (Ivković 1975: 19-22), but also with Sarmatian sediments of clays (most often marly), sands, sandstones and limestones (Pavlović 1980: 42, 22-23; Ivković 1975: 20). Sarmatian limestones are present as building blocks in the arena wall of the *Viminacium* amphitheatre. Oolitic limestones from the mentioned area have "sparry" calcites in their composition (Ivković 1975: 20) which is interesting to mention because those calcites were found in the analyses of *Viminacium* bedding mortars from the graves in the zone of the Mausoleum. Also, sandy calcarenites of this area have cherts (Ivković 1975: 20), found in a rendering mortar with the paintings from the construction no.2, and in the core mortar from the city wall. It is also interesting that in this area Leitha limestones are often very marly (Ivković 1975: 20).

Following this short review, it can be assumed that during the exploitation of the limestone for the lime used in *Viminacium*, there was a chance that the clayish and marly sediments, which could have been a source of hydraulic lime, were also exploited. However, the intention of using impure limestones by *Viminacium* builders, to obtain better mortar characteristics, can not be presumed based on the current understanding.

HOT LIME TECHNOLOGY AND DIFFERENT ADDITIONS

In the visual examination of *Viminacium* mortars from graves excavated in the southern Viminacium necropolis named "Pirivoj", done by the conservators long before the first laboratory research, the presence of impurities was highlighted. The aggregate of these lime mortars was often river sand with the presence of soil, indicating that the sand that was not rinsed (Станојловић 1992: 58). In the laboratory analysis of a sample of the rendering mortar with paintings from the construc-

tion no.2, the presence of mud-alevrite interlayers was observed. The first possibility for the presence these impurities is that they got into the mortars accidentally during its preparation, as a result of the carelessness of the worker or the fast process of building. The second possibility is that the mortar came into contact with the earth-lime mortar used for the building of the wall structure on which it was applied (the structure was probably built very fast). The third possibility is that the impurities were put in the mixture on purpose. In all the cases, they could have given the mortar mild hydraulicity. However, it could happen only when the lime was slaked *in situ,* whilst using hot lime technology. The traces of organic fibres are also found in the samples of analyzed mortars from *Viminacium*, that is, in rendering and pointing mortars of the arena wall and rendering mortars with wall paintings of the construction no.1 and construction no.2 (Fig. 5). Their presence in mortars, especially renders and plasters, is often ascribed to the tendency for the improvement of the tensile strength (Elsen 2006: 1419), but they can also be introduced to the mixtures accidentally.

It was often the case in Roman buildings that baked limestone was transported to the site and slaked there with a small amount of water and sand (Adam, 1999: 128). This hot lime technology, when done properly, produces distinctly strong mortars (Moropolou *et al.* 1996: 158), with good adhesion of lime and sand (Balksten 2007: 7). In the analysed rendering mortar of *Viminacium* which was painted, from the construction no.1 and construction no.2), we can find traces of this process. It is presented with lime inclusions, often noted in historical structures as a consequence of the use of dry slaked lime (Callebaut et al 1999: 118-119), actually the use of lime not slaked enough, because of the simplification and speed of the process (Станојловић 1992: 58), or during the use of hot lime technology (Pecchioni, Fratini and Cantisani 2006: 258; Станојловић 1992: 58).

The impurities, during the slaking of the lime *in situ*, with the development of temperature,
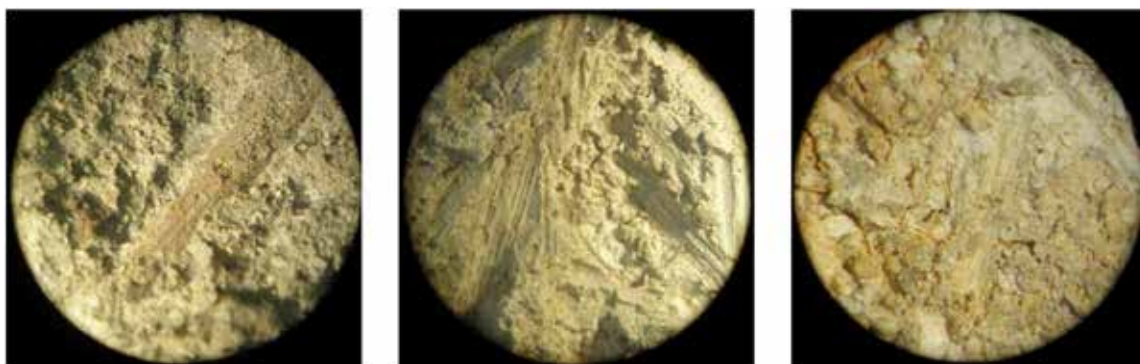
Fig. 5. Straw traces visible in the mortar samples from the amphitheatre (views under the laboratory magnifier): a. rendering mortar from the arena wall (Delić Nikolić, I. et al. 2011); b. pointing mortar from the arena wall (Nikolić *et al.* 2016, 139, Fig.1; Nikolić, E. and Bogdanović, I. 2012, 60, Sl.2); c. rendering mortar with wall paintings from the construction no.2 (Delić Nikolić, I. *et al.* 2011).

would react with lime, making artificial hydraulic lime, sometimes forming mortars with remarkable strength (Moropolou *et al.* 1997: 119, 129, 151, 159). The strength of the mortar samples taken from the walls of a monastery from Mount Athos, dated to the 16th century, was attributed to hot lime technology and clay additions. Here, the fine ground magnesium-alumino-silicate dust of the clays in the area was mixed with the *in situ* slaked lime and reacted as a pozzolanic addition (Moropolou *et al*. 1996: 151, 158-159). However, intentions in these processes are often hard to prove (Elsen 2006: 1419) and the properties of the particular clays are also very important (Pinheiro, Montenegro and Gumieri, 2010). In the case of *Viminacium*, the properties of the mud mortar used to build a brick kiln showed a total of the oxides SiO_2, Al_2O_3 and Fe_2O_3 exceeding 70%,[4] and in one of them as high as 90,25% (Raičković 2012, tab. 8), indicating the pozzolanic features of the clay and the technology for making building materials from it (Nikolić, Rogić and Milovanović 2015, 76). It can be assumed that the *Viminacium* builders knew about the possibility of making mortar stronger by adding clays during the use of hot lime technology because they were well acquainted with brick making and, consequently, soil selection.

During the *in situ* slaking of lime, other minerals of aggregate could also have reacted as the addition with pozzolanic features when heated. Regarding the rock fragments found during the laboratory research of *Viminacium* lime mortars, mostly metamorphic and sedimentary rocks are present. Schist, created by the metamorphosis of volcanic rocks, can have a small amount of reactive silicon and will react with lime, giving a mild hydraulic feature to mortar (Henry, Stewart 2011: 58). Volcanic rocks are natural materials with pozzolanic features (Elsen 2006: 1419). In one sample of the bedding lime mortar from a Viminacium grave found around the Mausoleum, the presence of a volcanic rock is noted, in a percentage of 10% of the aggregate, This is very interesting because the zeolithised tuff is found around the settlements of Slanci and Veliko Selo, also near the Danube, a few kilometres from Višnjica (Ivković 1975: 39-40; Kašić *et al.* 2017, 51-52, 54-56). However their exploitation throughout history is unknown and modern exploitation has only just begun. As already mentioned previously, chert was found in a small amount in the rendering mortar with paintings originating from the construction no. 2, but also in the core mortar of the city wall. Granitoid was present in the pointing mortar and rendering mortar with paintings from the arena wall, and the core mortar from the city wall.[5] During the

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4 In the Vienna and Belgrade area, it was exploited in the Roman times (Moshammer *et al*. 2015: 255; Bogojević 1968: 81, Бојовић 1977: 5-22).

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5 According to international standards, the sum of
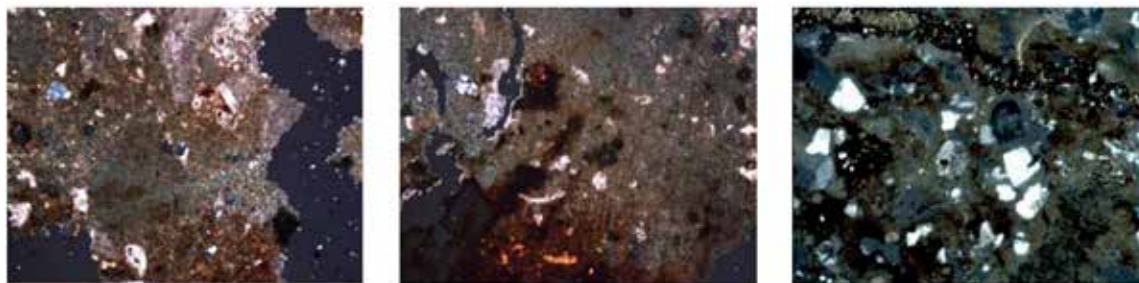
Fig. 6. Micro views of the mortar samples from the amphitheatre in which lime inclusions were found: a. b. construction no.1 (Vušović, O. and Ivović, B. 2014; c. construction no. 2 (Delić Nikolić, I. *et al.* 2011).

laboratory research of bedding mortars found in the graves found in the zone of the Mausoleum, a small amount of flint, which was mentioned by some authors as an admixture with possible pozzolanic features (Elsen, Van Balen, Mertens 2012: 129), was also found in many samples.

Viminacium is situated in the Kostolac lignite basin, one of the most important industrial areas in Serbia. However, the earliest written records of organised lignite exploitation in Kostolac date to the XIX century (Симић 1971, 75). By the 1870's, coal was exploited in very small quantities in Serbia. Considering the richness of the forests, it was not much needed until the second half of the century, when industrial complexes and the infrastructure were rapidly developing, also influencing the increased destruction of forests (Пејић, Јаношевић 1971, 62). We do not know if the Romans of *Viminacium* used the coal as a fuel, but it can be assumed that they knew about its presence, because the coal layers are very close to the surface in some parts of the area, and soil burnt by coal fires was used by them as a building material ("crvenka").[6] This can also be assumed from the presence of impurities, noted as "fragments of coal", visually observed in *Viminacium* mud mortars used for the building of the graves in the southern *Viminacium* necropolis (Станојловић 1992: 57), although

they could be charcoal, left after the burning of the wood used as fuel. The remains of the wood and coal, used as fuels during the limestone burning, (Elsen 2006: 1419) are often present in ancient mortars. They may have originated in the process of the lime preparation, when quicklime was not sieved enough after the limestone burning (Callebaut *et al*. 1999: 118). Their ash, which could have been introduced to lime in this way, could have had slight a hydraulic feature (Henry, Stewart 2012: 57) The slag, visually observed in lime mortars with a small amount of lime and of lower quality, originating from the graves found in the southern *Viminacium* necropolises and used for the strengthening of the walls of the graves from their outer side (Станојловић 1992: 59) is, with charcoal, mentioned in literature, as a possible mortar admixture with pozzolanic features (Elsen, Van Balen, Mertens 2012: 129).

It is often very difficult to distinguish between the deliberate and accidental use of certain impurities found in the composition of mortar (Elsen, Van Balen, Mertens 2012: 129). However, their presence, together with other data acquired from the laboratory research of mortar samples, can offer precious conclusions about the way builders and artists prepared mortars for different functions in the structure.

percentages of the oxide content of SiO_2, Al_2O_3 and Fe_2O_3 in natural pozzolanic materials should be higher than 70% (ASTM C618-12a: 2012, Pinheiro, Montenegro, Gumieri 2010: 2).

6 Considering very small amount of granitoid and chert present in the sample of the core mortar from the city wall, its presence was omitted in Nikolić *et al*. 2016, 140, Table 1.

CONCLUSION

Results of the laboratory research of *Viminacium* mortars conducted until today have provoked different discussions regarding the materials used for mortar preparation, but also about the preparation technology.

It is very probable that, besides the deliberate hydraulicity achieved by the use of an artificial material with pozzolanic features - brick, and the possible use of some natural material with pozzolanic material, the hydraulicity of *Viminacium* lime mortars was very often produced by accident. It was done by using a natural hydraulic lime - created by burning impure limestone, or by the negligent introduction of different impurities to the mixture - which reacted as materials with mild pozzolanic features during the hot lime technology process. These impurities could have been: soil or mud with a clay component present in unrinsed sand; coal, wood, their ash, or charcoal present in the lime which was unsieved after burning; or different rocks present in the sand. However, they are mostly present in a very small percentage of the mortar mixture, and these assumptions have to be taken carefully and analysed separately in each particular mortar sample.

Concerns about the hydraulicity of *Viminacium* mortars and the ways it could have been gained can be partially removed only by future laboratory analyses of a large number of samples originating from various buildings and several historical periods of *Viminacium*, as well as by deeper research into the origin of the materials used for the preparation of these mortars.

NOTE

As the authors of the paper Nikolić E., Rogić D. and Milovanović, B. 2015 we use this opportunity to give two corrections. Page 80 - instead of: "In structural mortars, lower mortar layers of floor constructions and mortars for rendering, brick admixture is visible in the mortar structure in the form of smaller or larger fragments, (Fig. 11, Fig. 12) while in those mortars used for plastering, wall-paintings and finishing floor layers, the brick appears in the form of small fragments, but also in the form of a dust. (Fig. 13, Fig. 14)", it should be written: "In structural mortars, lower mortar layers of floor constructions and leveling layers of the mortars for the walls exposed to water, brick admixture is visible in the mortar structure in the form of smaller or larger fragments, (Fig. 11, Fig. 12) while in those mortars used for rendering and plastering – with or without wall-paintings, and finishing floor layers, the brick appears in the form of small fragments, but also in the form of a dust. (Fig. 13, Fig. 14)." Page 81 - instead of "Fig. 12. Rendering layers of Viminacium thermae with brick in the form of large fragments", it should be written: "Fig. 12. Leveling layer of the mortar on the wall exposed to water, with brick in the form of large fragments".

* * *

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REZIME
KRATKA ZAPAŽANJA O MOGUĆOJ HIDRAULIČNOSTI KREČNIH MALTERA VIMINACIJUMA ZASNOVANA NA REZULTATIMA LABORATORIJSKIH ISTRAŽIVANJA

KLJUČNE REČI: VIMINACIUM, KREČNI MALTER, HIDRAULIČNOST.

Tokom protekle decenije, sprovedena su laboratorijska istraživanja različitih vrsta krečnih maltera antičkog Viminacijuma, odnosno maltera za zidanje, maltera za malterisanje i dekorativnih maltera iz građevine amfiteatra, maltera iz jezgra gradskog zida koji je okruživao amfiteatar, i više grobnih struktura.

Rezultati ovih istraživanja, zajedno za vizuelnim opažanjima istraživača vezanih za maltere upotrebljavane u Viminacijumu, doveli su do razvoja različitih diskusija o poreklu materijala i tehnikama pripreme maltera u ovom rimskom centru, ali i o mogućoj hidrauličnosti ovih maltera i načinima na koji su ovu osobinu mogli dostići.

Vrlo je verovatno da je osim namerne hidrauličnosti dostizane upotrebom opeke, ili eventualnih prirodnih materijala sa pucolanskim svojstvima, ova osobina krečnih maltera nastajala često slučajno, upotrebom prirodnog hidrauličnog kreča nastalog od pečenja nečistog krečnjaka ili nemarnim uvođenjem nečistoća koje su tokom tehnologije spravljanja matera uz gašenje kreča na listu mesta, reagovale kao materijali sa blagim pucolanskim svojstvima. Ovi dodaci su mogli biti zemlja i mulj sa glinovitom komponentom, uneti u mešavinu uz neispran pesak, ugljen ili pepeo nastali nakon pečenja krečnjaka sagorevanjem uglja ili drveta, uvedeni u malter uz kreč, ili pak, neka stena koja je mogla biti nosilac blage pucolanske aktivnosti, a koja je bila deo peska. S obzirom da su ovi dodaci bili zastuoljeni u malom procentu, prethodne pretpostavke se moraju uzeti uslovno, odnosno proveriti na svakom pojedinačnom uzorku maltera.

Nedoumice vezane za hidraličnost viminacijumskih maltera i načine njenog dostizanja mogu biti delimično otklonjene samo budućim laboratorijskim analizama uz veliki broj uzoraka, koji potiču iz različitih građevina i iz više istorijskih perioda antičkog Viminacijuma, kao i dubljim istraživanjima porekla materijala upotrebljivanih za pripremu ovih maltera.

LJUBIŠA B. VASILJEVIĆ
National Museum Kruševac
Kruševac, Serbia
E-mail:ljubisa05@gmail.com

VOTIVE MONUMENTS IN SERBIA DEDICATED TO THE CULT OF THE NYMPHS (INCLUDING FOREST DEITIES AND SILVANUS)

ABSTRACT

Three votive monuments dedicated to nymphs, in Bunjaci (Kuršumlijska Banja), Orhanje (Kačanik) and Viminacium, have been discovered in the territory of Serbia, and there is also a report about a monument from Vranjska Banja. All of these monuments are solely epigraphic, and, so far, a relief monument or sculpture with a nymph is not known of in the territory of Serbia. Two votive monuments (from Viminacium and Podujevo) dedicated to the "forest deities" can be added to this group. There is an opinion that on the monument from Ulpiana, with a dedication to Silvanus and another deity, Silvana, who can be associated with the nymphs, was also honoured. There is an assumption that sanctuaries of the nymph cult in Viminacium, Vrnjačka Banja and Vranjska Banja possibly existed.

The theme of this paper is votive monuments dedicated to the cult of the nymphs, discovered in the territory of today's Serbia (Fig. 1). Their number is not great, but we assume that the nymphs were often honoured in areas of untouched nature, where the testimonies of the cult are not preserved, or have a form that we cannot precisely identify.

All known monuments of the nymph's cult from Serbia are solely epigraphic. So far, no reliefs or sculptures have been discovered that would reflect how the population in the Antiquity period in Serbian territory represented the nymphs (we have no reason to consider that on this type of monument, the nymphs would have been presented differently than the well-known iconographic representation in neighbouring provinces).

On the votive monuments, which were unambiguously raised in their honour, the nymphs were honoured independently. We believe that we can

recognise them as well, as a part of the cult community of "forest deities", while the inscription on the monument from Ulpiana is not definite proof of the nymph's cult connection with the god Silvanus, which is undisputed in religious practice.

According to mythology, nymphs are most often referred to as Zeus' daughters (sometimes referred to as daughters of Oceanus, Uranus or certain river gods - Aegina, for example), eternally beautiful and young, living in untouched nature, in forests, mountains, fields, caves or near springs and rivers. In older myths they are immortal, but later it was believed that they were mortal, but that they could live for a very long time, for thousands of years.

Nymphs are deities of nature, closely related to water and vegetation. They help flowers blossom and fruits ripen, take care of pastures, help shepherds, and also take care of human youth. They provide people with bees and honey. They

also possess the power of healing and prophecy (they also have their own oracles), and it was believed that they were able to give eternal life to their chosen favoured ones. They created and preserved healing springs, for which they were especially honoured in spas throughout the Empire, particularly in the Roman period. Myths said

that the nymphs taught people about a plant-based diet, with which they eradicated cannibalism.

The nymphs' names differ according to their dwelling. The most commonly mentioned are Naiads, who own springs and spend their lives on river banks and lake shores. Mountain nymphs are called Oreiades, and forest nymphs are Dryades, Hama-
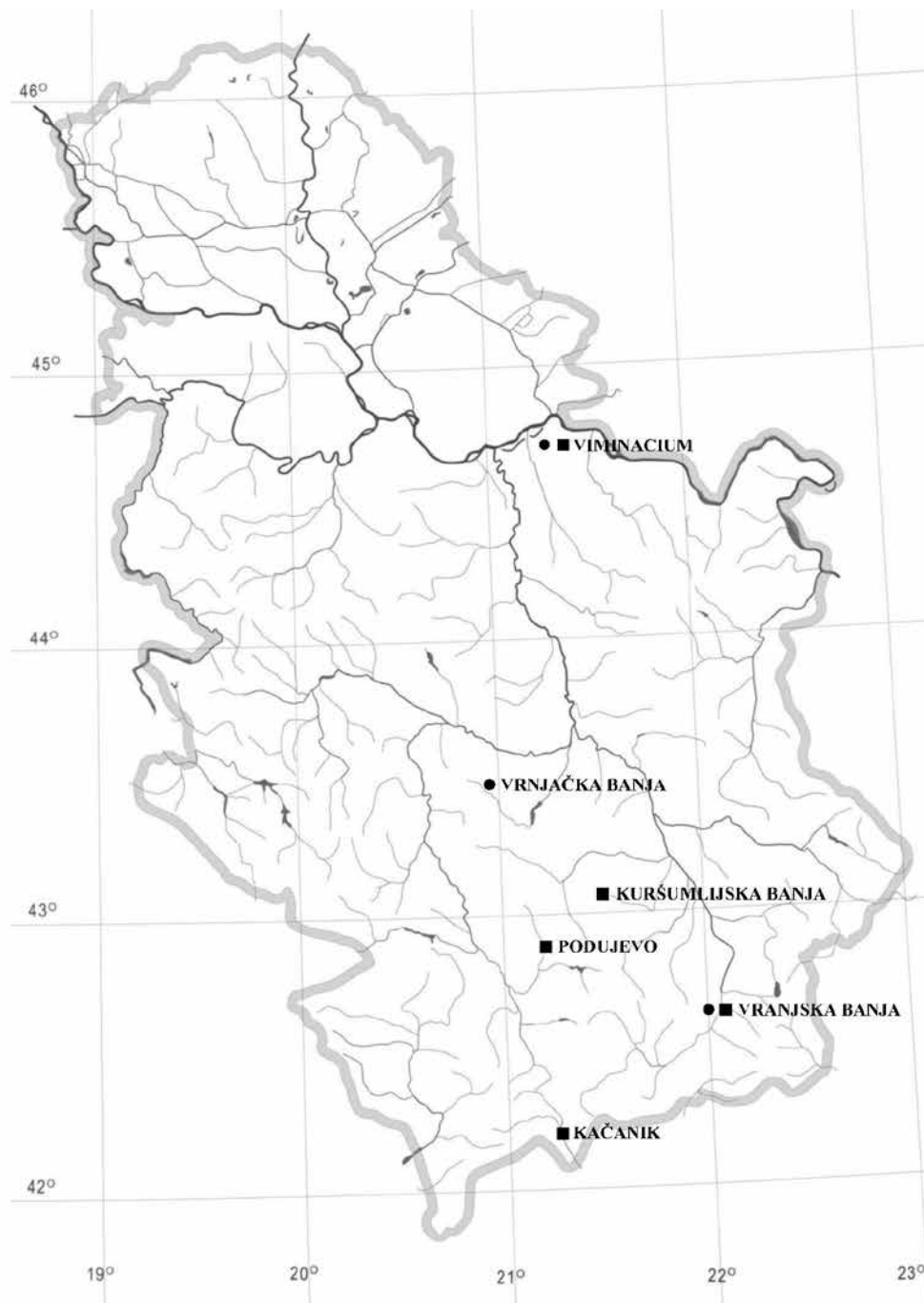
Fig. 1 Map of monuments dedicated to the cult of the nymphs and the "forest deities" − ■ votive monument ● possible sanctuary (drawing: Nataša Miladinović).

dryades and Meliai (the *nymphs* of the *ash tree*, considered the oldest). The *nymphs* of groves (Alseids) were also mentioned, as well as the nymphs of certain areas and places (Nysiades, Dodonides).

The cult of the nymphs most often had a personal nature and was generally limited to Naiads. They were primarily honoured by shepherds, peasants, fishermen and hunters. Nymphs were honoured in nature, near springs and inside caves. Flowers, wreaths, honey and milk, and occasionally domestic animals (hens, lambs or goat kids) were sacrificed to Naiads.

On Greek painted vases from the Archaic period, the nymphs are shown without any special characteristics, as an entourage of certain deities or nurses of little Dionysus. Reliefs from the Hellenistic period show three nymphs dancing to the music of Pan or Apollo. In the Hellenistic and Roman period, sculptures of nymphs are frequent, placed near springs or drinking fountains. Nymphs are presented according to the model of Aphrodite, but regularly with a shell or a bowl in their hands. They are often presented in a lying position, with bare breasts, leaning against an overturned bowl from which water is poured.

The nymph cult was markedly developed with the Romans, who especially honoured the nymphs of water and springs, such as Juturna. They associated the name "nymph" with *lymph*, which is a Latin poetic term for water. Throughout the Roman Empire, special honour was given to numerous local nymphs (Срејовић, Цермановић-Кузмановић 1992: 184-185, 289-290; Освалт: 167, 237-238).

At this point we can also ask the question regarding Silvanus' female companion Silvana, which is an epigraphic notion, though she is not mentioned in any ancient source (Deurcey 1992: 42-48). We will quote the opinion of Lj. Perinić, according to which it is certain that Silvana is a nymph, but with reservations that epigraphic and iconographic data do not provide sufficient data to conclude which kind of nymph she belongs to (Perinić 2016: 7). This opinion will be extended with the view that Silvana represents a common

name for a nymph who was, at a certain point in time, associated with Silvanus, most probably as the protector of a particular place where a votive monument was dedicated (Васиљевић 2008: 158). If this opinion proves correct, it would indicate that nymphs could also be named by the deity with whom they were worshiped together within a sanctuary or a holy place.

Three votive monuments dedicated to nymphs, (in Bunjaci (Kuršumlijska Banja), in Orhanje (Kačanik) and in Viminacium), have been discovered in the territory of Serbia. All of these monuments are solely epigraphic, so, until now, a relief monument or sculpture with a nymph representation is not known in the territory of Serbia.

F. Kanitz also recorded the existence of a votive monument from Vranjska Banja, dedicated to the spa nymph, but about which he did not provide details. The literature also mentions the assumption that in Vrnjačka Banja, Viminacium and Vranjska Banja there could have been sanctuaries dedicated to the nymphs. It is possible that on two votive monuments (Viminacium and Podujevo), as a part of a group dedication to the "forest deities," the nymphs were also honoured. We will also mention an altar from Ulpiana where, according to some opinions, together with the god Silvanus, Silvana, his female companion who can be identified with nymphs, was also honoured.

There were probably a far greater number of sacred places where nymphs were honoured. These sacred places could be found in forest glades, along rivers, by healing springs... At the sanctuaries in nature, wooden statues or vows may have been dedicated to nymphs who were honoured individually or together with related deities, as protectors of nature and of healing springs (Silvanus and Diana).

We consider it necessary to mention, taking into account the topic of this work, that one structure from the Mediana complex, due to the existence of a fountain and motifs, has sometimes been defined as a Nympheum in the literature (Дрча 2006: 23). Bearing in mind much more accept-
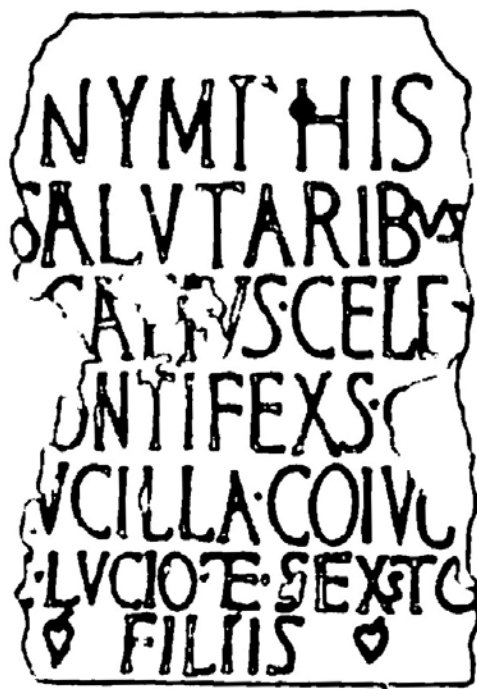
Fig. 2 Inscription from the votive monument from Kuršumlijska Banja dedicated to the nymphs, (according to: Вулић, Премерштајн 1900, 25).

able interpretations of the purpose of this structure (Vasić 2006: 69-75), it will not be specially treated in this text, nor will it be associated with the cult of the nymphs, although the nymphs could have been honoured, in some other way, as the protectors of the healing springs in Mediana and Niška Banja.

In the following section we will discuss the importance of votive monuments for our topic.

During construction work on the bath in Kuršumlijska Banja, at the end of the 19th century, Roman bricks and walls, as well as a silver *denarius* of *Philip* the *Arab* were found (Ризнић 1884: 83). A votive monument dedicated to nymphs was also discovered in the immediate vicinity (Fig. 2).

This is a monument that was found in 1884 at the Bunjaci village cemetery, not far from Kuršumlijska Banja, where it was initially erected, according to the well-grounded opinion of M. Riznić (Ibid., 82-83). The monument was transferred to the National Museum in Belgrade in 1889, and was noticed in its lapidarium by Premerstein and Vulić in 1900 (Premerstein, Vulić 1900:

127). Today it is located in Pećine in the Lower Town of Kalemegdan Fortress, in Belgrade.

It is a votive monument dedicated to the healing nymphs, protectors of warm springs. The dedicant is Catius Celer, most likely a pontifex of Ulpiana, together with his wife and sons.

The text of the inscription reads as follows:
Nymphis
Salutaribus
[.] Catuus Cele[r]
pontifexs (?) [2-3]
[L]ucilla coiug(e)
[et] Lucio et Sexto (!) filiis.
(Premerstein, Vulić 1900,:127).

The monument is made of grey tuff, 80 cm high, 41 cm wide and 37 cm thick. The inscription field has dimensions of 47 x 37 cm. N. Vulić and A. von Premerstein are of the opinion that the monument was created at the beginning of the 3rd century, and that the dedication to the nymphs, *Salutares*, clearly indicates that thermal springs were used even in Roman times, as it expresses gratitude to the nymphs for being cured by the healing waters. Also, the author states that the dedicant of the monument, at the time of its construction, was a pontifex in Ulpiana (Вулић, Премерштајн 1900: 25).

A. Jovanović provides a slightly different dating of the monument and links it with the time of the reign of Gordian III and considers that it should be dated into the period of the second quarter of the 3rd century (Јовановић 2003: 36).

From the beginning it was thought that the dedicant may have been connected with Lucius Catius Celer, who made the honorary base for the Emperor Gordian III in Timacum Minus in 242 AD on behalf of the II Dardanian cohort, however that connection has remained hypothetical for a long time. His high rank in the province (governor of the province?) and his presence in the ore-bearing Timok region could easily be explained by the mining operations that he performed at the imperial domain in Timacum Minus. The discovery of a milestone from the area of Ad Fines, found on the doorstep

Fig. 3 Votive monument from Viminacium dedicated to the nymphs, (according to: Ferjančić, S., Korać, M. and Ricl, M. 2017, 238, fig. 4).

Fig. 4 Inscription from the votive monument from Viminacium dedicated to the nymphs, (according to: Ferjančić, S., Korać, M. and Ricl, M. 2017, 238, fig. 5).

his vow.

So far, two votive monuments that are important for our topic have been found in Viminacium. One monument is undoubtedly devoted to the nymphs, while in the other case, nymphs are probably honoured within the group consecration to the "forest deities."

The first votive monument, dated to the 2nd century, was discovered in 2013 between the Viminacium amphitheatre and the northern city rampart (Fig. 3). Researchers believe that, given the fact that a number of figurines of baked earth and oil lamps were found near the monument, it is possible that there was a sanctuary at this location (Nikolić *et al*. 2014: 50).

The monument is made of limestone. It is extended at its base and profiled at the top. On the front side, on the profiled part, the remains of an acroterion and triangular decoration are visible. A pit for libation was at the top. The dimensions of the monument are: height 58.5-59 cm, width 26.5 cm (39.8 cm at the base and profiled part) and thickness 25 cm (30.5) on the left and 23.5 cm (29.5) on the right. The height of the letters on the inscription varies between 2-3.5 cm.

The text of the inscription reads (Fig. 4):

Nymphas |
Aug(ustas) (!) P. An( ) |
MARCELEO |
v(eteranus ?) AT leg(ionis) VII Cl(audiae)
v(otum) s(olvit)

of the Church of St. Nicholas in Kuršumlija, serves as confirmation that the same person is in question. On the inscription there is an identical name, *L. Cattius Celer*, with the associated title, *legatus Augusti propraetore* (Петровић, В. 2007: 92- 93).

The question of the career development and the places of residence of Lucius Catius Celer, undeniably a significant person in his time, remains open.

A votive monument dedicated to the nymphs was also found at the Orhanje site in Kačanik. The monument was discovered in 1900. The dimensions of the altar are: height 58 cm, width 14 cm, thickness 34 cm. The font height varies between 3-5 cm.

The text of the inscription reads as follows:

Nym[phis]
L. Tito[vius…]
Pro […]
v(otum) s(olvit) [l(ibens) m(erito)]
(Šašel, A. i Šašel, J. 1986: 59).

From the inscription we can conclude that L. Titovius dedicated the monument, thus fulfilling

Fig. 5 Inscription from the votive monument from Viminacium dedicated to the "forest deities," (according to: Вулић 1905: 83).

Fig. 6 Votive monument from Ulpiana dedicated to Silvanus and to one other deity (Silvana?), (according to: Петровић П. 1975: Т. V, fig. 14).

(Ferjančić, Korać and Ricl 2017: 237).

The inscription notes that the nymphs were honoured with the epithet *Augustae*. The dedicant of the monument was P. An. MARCELEO (possibly *Marcello* or *Mercellio*), a member of the VII Claudius legion, probably a veteran. The authors consider that, on the basis of the analysed text of the inscription, it is possible that the dedicant was of Greek origin, and that he probably, along with the altar, also dedicated one or more statues or statuettes to the nymphs (Ibid.).

This reasonable assumption additionally supports, as already stated, the possibility that there was a sanctuary in this place, devoted to the nymphs.

The second monument from Viminacium originates from the Čair site. The dimensions of the monument are: height 39 cm, width 30 cm, thickness 30 cm. The height of the letters of the inscription is 2.7 cm. The monument has since been lost.

The text of the inscription reads (Fig. 5):

Deabus Silv

estris (!) Achil

leus ex v

oto l(ibens) p(osuit)

The "forest deities" to whom the monument was dedicated were not specifically mentioned. N. Vulić directly connects the monument to the cult of Silvanus Silvester (Вулић 1905: 82-83).

We will accept Vulić's opinion, with the addition that the monument was probably devoted to Silvanus in a cult union with the nymphs, and

perhaps also devoted to Diana.

A votive monument dedicated to the "forest deities" also originates from Podujevo. The dimensions of the monument are: height 70 cm, width 70 cm, thickness 50 cm.

The text of the inscription reads:

Deabus S(ilvestribus) |

Virgines (!) |

Gaudens Li |

vi(a)e s(ervus) p(ro) s(alute) |

 p(ecunia) s(ua)

(Вулић 1934: 53).

The epithet in the first row could also be read as *S(alutaribus)*. We will accept the solution *S(ilvestribus)*, proposed by A. Šašel and J. Šašel (Šašel A. i Šašel J. 1986: 54), assuming, as in the case of the Viminacium monument, that the votive monument was devoted to the "forest deities," i.e., to Silvanus and members of his cult community (probably nymphs and Diana), which makes it significant for our topic.

A marble votive monument, dedicated to Silvanus and to one other deity (or deities), was discovered in Ulpiana. The upper part of the monument is broken off horizontally (Fig. 6). The dimensions of the altar are: height 50 cm, width 24 cm, thickness 18 cm.

The text of the inscription reads:

---]
et Silvano
Sac(rum) M. Aur(elius) Silvester
dec(urio) q(uin)q(ennalis) v(otum) s(olvit)
M. Maximo et
Aeliano co(n)s(ulibus)
(Петровић, П. 1975: 132).

Based on the names of the consuls, the inscription is precisely dated to 223 AD. The votive monument was dedicated by M. Aurelius Silvester, Decurion of Ulpiana.

E. Čerškov states that the altar is dedicated to Silvana and Silvanus (Čerškov 1969: 66–67). We cannot take this presumption without reservations because the altar could be dedicated to some other deity besides Silvana. For this reason, the altar of Ulpiana is mentioned in the text, as an opportunity that should not be ignored, taking into account the aforementioned assumption of Silvana as a nymph. However, it is not included in the geographical map that shows the distribution of other votive monuments dedicated to the nymphs and "forest deities."

Renowned travel writer, F. Kanitz, wrote that "one Roman marble stone with inscriptions was dedicated to the spa nymph, including parts of pillars with cannelure and other construction fragments" (Каниц 1989: 263). Unfortunately, we do not know the destiny of this monument dedicated to the nymph, nor details related to the appearance of the monument or its inscription. It is worth noting that the remains of buildings and votive monuments were discovered in Vranjska Banka, indicating the possibility of an ancient sanctuary dedicated to the iatric deities with an iatric character, which might have included an altar dedicated to the spa nymph (Васиљевић 2014: 161).

The possibility of there being a sanctuary de-

voted to the nymphs was also presumed in Vrnjačka Banja. Among the numerous sites registered within this spa settlement, the Roman spring is the most interesting for our topic. Beside it, at a depth of 2.40 m, the remains of a rectangular swimming pool built of wooden beams and measuring 4.50 x 2.40 m were found in 1924 (Сариа 1925: 199-200; Гарашанин, Д. и Гарашанин, М. 1950: 208).

The pool was filled with warm mineral water from a special spring that was precisely carved in a vertical rock in the form of a small well. In the immediate surroundings of the spring, 200 Roman coins were found, which belong to the coinages from Augustus to Valentinian. In the pool itself, 60 Roman coins dated from the end of the 1st to the second half of the 4th century, one ring, and one key were discovered (Боровић Димић 2001: 166). N. Crnobrnja suggests that the money got into the pool as an act of gratitude to the divinity of the spring or to the nymphs, for successful healing (Црнобрња 1987: 67-69).

Despite the lack of direct evidence, we believe that in the area of the healing springs in Vrnjačka Banja, the cult of the nymphs could have been honoured.

From the previous text we can conclude that in the territory of today's Serbia, in the ancient period, the cult of the nymphs was honoured, which is evidenced by the votive monuments, while the possibility of the existence of a sanctuary is also implied. On known monuments, the nymphs have the epithets *Salutaris, Augustae* and, within the cult group of "forest deities," *Silvestres* and *Virgines.* Dedicants, whose occupation is mentioned on the inscriptions, are a priest (also a Legatus) (Bunjaci) and a soldier (Viminacium), and we also mention the duumvir who dedicated the votive monument from Ulpiana.

Based on this data, it can be concluded that the votive monuments dedicated to the nymphs were mostly raised by members of the higher classes, although it was certain that the wider population also showed a strong affinity to the cult of these deities. We refer again to the thesis stated

in the introductory part of this text that the largest number of sanctuaries associated with the cult of the nymphs were located in natural surroundings, where modest monuments were dedicated to them, made of materials that did not withstand the ravages of time (wood) or were hardly recognisable altars (untreated stone without inscription or relief). It is possible that the nymph sanctuaries, honoured in untouched nature, also retained some of their splendour and religious appeal in the epochs that followed the dusk of the ancient world.

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REZIME
VOTIVNI SPOMENICI POSVEĆENI KULTU NIMFI (UKLJUČUJUĆI „ŠUMSKA BOŽANSTVA" I SILVANU) U SRBIJI

KLJUČNE REČI: NIMFE, SRBIJA, VOTIVNI SPOMENICI, KURŠUMLIJSKA BANJA, KAČANIK, VIMINACIJUM, PODUJEVO, VRNJAČKA BANJA, VRANJSKA BANJA.

Na teritoriji Srbije otkrivena su tri votivna spomenika posvećena nimfama (Bunjaci (Kuršumlijska Banja), Orhanje (Kačanik) i Viminacijum). Svi navedeni spomenici su isključivo epigrafski, tako da, za sada, u Srbiji nije poznat reljefni spomenik, niti skulptura, koji prikazuje nimfe. Zabeležen je i podatak o postojanju votivnog spomenika u Vranjskoj Banji.

Ovom korpusu pridodajemo i dva votivna spomenika (Viminacijum i Podujevo) posvećena „šumskim božanstvima", u okviru kojih su, najverobatnije, poštovane i nimfe. Postoji mišljenje da je na spomeniku iz Ulpijane, posvećenom Silvanu i još jednom božanstvu (oštećen je deo natpisa sa imenom drugog božanstva), poštovana i Silvana, čiji kult možemo povezati sa nimfama.

Kao pretpostavka se iznosi mogućnost postojanja svetilišta kulta nimfi u Viminacijumu, Vrnjačkoj Banji i Vranjskoj Banji.

Nimfe, na poznatim spomenicima, nose epitete Salutares, Augustae i, u okviru kultne zajednice „šumskih božanstava", Silvestres i Virgines. Dedikanti, čije zanimanje je navedeno na natpisima, su sveštenik (i legat) (Bunjaci) i vojnik, verovatno veteran (Viminacijum), a pomenućemo i duomvira koji je posvetio votivni spomenik iz Ulpijane.

Na osnovu ovih podataka može se izvesti zaključak da su votivne spomenike posvećene nimfama, u najvećoj meri, podizali pripadnici viših staleža, iako je kult ovih mitskih bića izvesno bio prijemčiv i širim slojevima stanovništva. Verovatno se najveći broj svetilišta kulta nimfi nalazio u prirodi, gde su im posvećivani skromni spomenici od materijala koji nije izdržao zub vremena (drvo) ili teško prepoznatljivi žrtvenici (neobrađeni kamen bez natpisa ili reljefa). Moguće je da su svetilišta nimfi, poštovana u nedirnutoj prirodi, zadržala deo svoga sjaja i religijske privlačnosti i u epohama koje su usledile nakon sutona antičkog sveta.

MIRJANA VOJVODA
Institute of Archaeology
Belgrade, Serbia
E-mail: mirjana.vojvoda@gmail.com

SAŠA REDŽIĆ
Institute of Archaeology
Belgrade, Serbia

DECVRSIO MOTIFS ON THE REVERSE OF NERO'S SESTERTII (REVISITING AN OLD ISSUE)

ABSTRACT

Debates among the scientific community regarding the meaning and motives for the coinage of decursio reverse motifs on Nero's sestertii have persisted for a long time. This paper aims to point to other possibilities of interpretation through the connection with concomitantly coined reverse depictions (Adlocutio coh, Annona/Ceres, congiarium).

KEYWORDS: DECVRSIO, NERO, REVERSE MOTIFS, SESTERTII.

Since the time of the Roman Republic and also later in the Empire,[1] the term *decursio h*as been defined as military manoeuvres with full equipment for the purposes of training,[2] military honours during funerals of prominent generals or emperors with soldiers and cavalry circling around the bonfire,[3] or false battle, in the form of a play, between two military groups which was a kind of sport practiced in the Circus.[4] It has been recorded that besides the Circus, false battles were also performed at the aforementioned funerals.[5]

In Roman imperial coinage the legend DECVRSIO occurs only on Nero's sestertii. These specimens (Fig. 1-3) were emitted in the mints of Rome 63-64 AD (in two variants of the legend: without S C and with S C and with three different depictions) and Lugdunum 65-67 AD (only with S C and one depiction).[6] We want to

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1 The study results from the project: IRS – Viminacium, Roman city and legionary camp – research of the material and non-material culture of inhabitants using the modern technologies of remote detection, geophysics, GIS, digitalisation and 3D visualisation (No. 47018) – Ministry of Education and Science of the Republic of Serbia.

2 Liv. 23.35,6 (... crebro **decurrere** milites cogebat ...); 24.48,11 (... **decurrendo** signa sequi ...); 26.51,4 (... primo die legiones in armis quattuor milium spatio **decurrerunt**...); 42.52,4 **(...** non iusto **decursu** tamen ...); Tac. Ann. 2.55 (... sed exercito equitum, **decursibus** cohortium inteeresse ...).

3 Liv. 25.17,4-5 (...armatum exercitum **decucurrisse** cum tripudiis Hispanorum motibusque armorum et corporum suae cuique genti adsuetis...); Verg. A. 11.187-188 (...Ter circum accensos cincti fulgentibus armis **decurrere** rogos ...); Tac. Ann. 2.7 (... restituit aram honorique patris princeps ipse cum legionibus **decucurrit**...); Suet. Claud. 1.3 (... ceterum exercitus honorarium ei tumulum excitauit, circa quem deinceps stato die quotannis miles **decurreret...**).

4 Liv. 44.9,3 (... iuvenes etiam quidam Romani **ludicro circensi** ad usum belli verso partem humillimam muri ceperunt...);RE Bd. IV.2, 2354.1-19.

5 Liv. 40.6,5 (... mos erat lustrationis sacro peracto **decurrere** exercitum, et divisas bifariam duas acies concurrere ad simulacrum pugnae...).

6 Gnecchi once defined sestertii without the S C mark as module 2 medallions, with diameters from 35-36 mm and weight from 26-28 gr (*cf*. Gnecchi 1912: 5, nos. 15-19). After decades-long debate, this determination was rejected and it has been concluded that specimens without S C in the reverse legend belong to the regular emissions (of sestertii) of the mint of Rome. For detailed discussion with a quoted bibliography *cf*. MacDowall 1979: 55-60; RIC I: 137-139.

note that this reverse motif, in both mints and in different emissions, always occurs with the types ADLOCVT COH, ANNONA AVGVSTI CERES, CONG I – DAT – POP or CONG II – DAT – POP.

The presence of the reverse types on sestertii in some emissions of the mints of Rome and Lugdunum are shown in the following tables in order to be presented more clearly (Table 1, 2).

RIC I no./nos.	Reverse legend	Reverse types
Rome, Issue 2, 63 AD		
95-97	ADLOCVT COH	Nero with praetorian perfect on platform on right, addressing three soldiers. In background, pillared building below battlemented crescent-shaped structure (the praetorian camp?).
98-99	ANNONA AVGVSTI CERES	Ceres and Annona, between them modius on garlanded altar; behind, ship's stern.
100-101	CONG II – DAT – POP (R)	Cogiarium, platform on left
102	CONG II – DAT – POP	Cogiarium, platform on right
103-104	DECVRSIO (ex)	Nero, bare-headed, cuirassed, and with cloak floating free, prancing right on horseback; in right hand holding spear; beyond and behind him, mounted soldier prancing left with vexillum held over right shoulder (RIC I, type 11).
105-108	DECVRSIO (ex)	Nero bare-headed, cuirassed, and with cloak floating free, prancing right on horseback, in right hand holding spear; foot-solder in front advancing right looking back, in right hand holding up vexillum, and with a second foot-soldier, helmeted, running behind the horse (RIC I, type 12).
Rome, Issue 3, 64 AD		
130-136	ADLOCVT COH S C	Same as nos. 95-97
137-142	ANNONA AVGVSTI CERES S C	Same as nos. 98-99
151-155	CONG I – DAT – POP SC (ex)	Cogiarium, platform on left
156-157	CONG II – DAT – POP SC (ex)	Cogiarium, platform on left
158-162	CONG II – DAT – POP SC (ex)	Cogiarium, platform on right

RIC I no./nos.	Reverse legend	Reverse types
163-166	DECVRSIO (ex) S C (left and right)	Nero, bare-headed, cuirassed, and with cloak floating free, prancing left on horseback, in right hand holding spear; beyond and behind him, mounted soldier prancing left with vexillum held over right shoulder (RIC I, type 10).
143-150	S C (left and right)	Triumphal arch
178-183	AVGVSTI POR OST S C	Harbour of Ostia

Table 1 – Presence of Nero reverse types on sestertii of the mint of Rome

RIC I no./nos.	Reverse legend	Reverse types
Lugdunum, Issue 1 (= Issue 3 of Rome), 64 AD		
371	ADLOCVT COH S C	Same as nos. 95-97
372	ANNONA AVGVSTI CERES S C	Same as nos. 98-99
Lugdunum, Issue 2 (= Issue 3 of Rome), 64 AD		
386-388	ADLOCVT COH S C	Same as nos. 95-97
389-391	ANNONA AVGVSTI CERES S C	Same as nos. 98-99
394	CONG I – DAT – POP SC (ex)	Cogiarium, platform on left
395-397	DECVRSIO (ex) S C (left and right)	Same as nos. 103-104 (RIC I, type 11).
392-393	S C (left and right)	Triumphal arch
398	ROMA (ex) S C (left and right)	Roma with Victory and parazonium
Lugdunum, Issue 3 (= Issue 3 and 4 of Rome), 65 AD		
429	ADLOCVT COH S C	Same as nos. 95-97
430-431	ANNONA AVGVSTI CERES S C	Same as nos. 98-99
434-435	CONG I – DAT – POP SC (ex)	Cogiarium, platform on left
436-437	DECVRSIO (ex) S C (left and right)	Same as nos. 103-104 (RIC I, type 11).

RIC I no./nos.	Reverse legend	Reverse types
432-433	S C (left and right)	Triumphal arch
438-439	PACE P R TERRA MARIQ PARTA IANVM CLVSIT S C	Temple of Janus; door to right.
440-441	AVGVSTI POR OST S C	Harbour of Ostia
442-443	ROMA (ex) S C (left and right)	Roma with Victory and parazonium
Lugdunum, Issue 4 (= Issue 5 of Rome), 66 AD		
498-492	ADLOCVT COH S C	Same as nos. 95-97
493-497	ANNONA AVGVSTI CERES S C	Same as nos. 98-99
501-504	CONG I – DAT – POP SC (ex)	Cogiarium, platform on left
505-506	CONG II – DAT – POP SC (ex)	Cogiarium, platform on right
507-509	DECVRSIO (ex) S C (left and right)	Same as nos. 103-104 (RIC I, type 11).
498-500	S C (left and right)	Triumphal arch
510-512	PACE P R TERRA MARIQ PARTA IANVM CLVSIT S C	Temple of Janus; door to right.
513-514	AVGVSTI POR OST S C	Harbour of Ostia
515-517	ROMA (ex) S C (left and right)	Roma with Victory and parazonium
Lugdunum, Issue 5 (= Issue 6 of Rome), 67 AD		
564-565	ADLOCVT COH S C	Same as nos. 95-97
566-572	ANNONA AVGVSTI CERES S C	Same as nos. 98-99
576	CONG II – DAT – POP SC (ex)	Cogiarium, platform on left
577-582	DECVRSIO (ex) S C (left and right)	Same as nos. 103-104 (RIC I, type 11).
573-575	S C (left and right)	Triumphal arch
583-585	PACE P R TERRA MARIQ PARTA IANVM CLVSIT S C	Temple of Janus; door to right.

RIC I no./nos.	Reverse legend	Reverse types
586-589	AVGVSTI POR OST S C	Harbour of Ostia
590-594	ROMA (ex) S C (left and right)	Roma with Victory and parazonium

Table 2 – Presence of Nero reverse types on sestertii of the mint of Lugdunum

From the previous tables it is clearer that the two groups of reverse motifs were coined together only in two emissions in the mint of Rome and four emissions in the mint of Lugdunum. On the one side there are *decursio* and *adlocutio* motifs, intended as propaganda directed to the Praetorian Guard and reflecting Nero's constant need to secure their support. On the other side the motifs Annona/Ceres and *congiarium* represent Nero's wish to assure an adequate grain supply for Rome and the sharing of it with the civilian population. The exception is the first emission of the Lugdunum mint in which all four types are not present, but only two are. However, in this case one type from both groups of motifs *(adlocutio* and Annona/Ceres) is also present. Besides the aforementioned, in some emissions four more types of reverse depictions (Triumphal Arch, the Port of Ostia, Roma

Fig. 1 RIC I, type 10 (according to BMC I, Pl. 42.4; enlarged)

Fig. 2 RIC I, type 11 (according to BMC I, Pl. 42.3; enlarged)

Fig. 3 RIC I, type 12 (according to Gnecchi III, Tav. 141.8; enlarged)

and the Temple of Janus) appear, which has no impact on our debate on *decursio* motifs.

Different interpretations of the *decursio* motifs have been presented since 1920 (Sydenham 1920: 113; Sutherland 1974: 169; Griffin 1984: 121; Smith 2000: 282-289), and have been connected with other games organised by Nero *(Neronia – Ludi Quinquennales), w*ith the permission from Nero that the public can attend military training on the Campus Martius, with a showing of the emperor leading the military procession in the Circus, or with motifs illustrating the Troy Games *(Lusus Troiae)*, etc. We start our debate with the solution offered by Sutherland (Sutherland 1974: 169), with whom we agree, who identified the soldiers in Nero's entourage as members of the Praetorian Guard.

The Praetorian cohorts were organised during the Punic Wars, as a personal entourage of consuls, consisting of auxiliary troops. These equites extra-ordinarii delecti were placed at Porta Praetoria in legionary barracks. Since Scipio Africanus, the Praetorian cohorts were formed by selecting the strongest soldiers (*fortissimi*), to whom an allowance was provided that was six times higher than that of the legionnaires (Rossi 1967: 20). With the beginning of the Principate and the reign of Octavian Augustus, issues related to military organisation and military service were arranged in a new way. A reduced number of legions were deployed along the borders, the service became professional and the path of military careers, payment and reward were defined. Augustus established nine Praetorian cohorts, three of them were settled in Rome, and the rest were deployed throughout Italy (Suet. Aug. 49). Service in them was considered a privilege because they represented the Imperial Guard. The presence of the Praetorians in Rome, their privileged status, as well as the position of the Praetorian prefect who was close to the emperors soon opened the possibility to them to become the decisive factor in the election of a new Princeps.

The immediate successors to Augustus already started to rely heavily on the Praetorians. The re-verse motif *adlocutio cohortium* occurs for the first time in Caligula's emissions, which were coined each year during his rule (RIC I: 110-111, nos. 32, 40, 48).[7] Nevertheless, the Praetorians took part in the conspiracy and murder of Caligula (Suet Gaius 56), as well as in the proclamation of Claudius as the Princeps. After that, Claudius paid 15,000 sestertii to each of the Praetorians and, thus, became the first emperor to gift money for his election (Suet Claud 10). The Praetorians became an important factor in political life, openly showing their attitude towards the candidates for the purple, and their presence in Rome favoured that.

After Caligula, the *adlocutio cohortium* reverse motif appears in the aforementioned emissions of Nero (Table 1, 2). In the description of the reverse depiction, a structure with a crescent–shaped vault in the background is mentioned (RIC I: 156, type 1; Fig. 4), for which, with certain reservations, it is assumed to be the Praetorian camp. On the specimen published by Gnecchi as a medallion without S C (Fig. 5) (cf. supra ref. 5) a structure with a saddle roof is clearly visible in the background. In RIC I only the first variant with a crescent-shaped vault is mentioned, but in his discussion Rossi separates them as variants A and B (Rossi 1967: 28).

The same author compared the details of the *adlocutio cohortium* reverse depictions of Caligula and Nero and came to conclusions regarding the affiliation of the presented soldiers with specific formations (Rossi 1967:15-38). Based on the clothes, armour and military insignia on Caligula's specimens, Rossi concluded that Praetorians were depicted.[8] According to that author, depictions on Nero's specimens show a series of various and unique details, which define them as *cohors Germanorum corporis custodies* and, as such, they represent a unique numismatic docu-

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7 Dio Cassius (Dio Cass. LIX.2.1) mentions the visit of Caligula and the Senate to the Praetorians at the beginning of his reign. On that occasion he assigned 1,000 sestertii to each of them.

8 Ritter 1971:81 and Smith 2000: 284. also agree with his opinion.

Fig. 4 RIC I, type 10 (according to BMC I, Pl. 41.5; enlarged)

Fig. 5 RIC I, type 11 (according to Gnecchi III, Tav. 141.5; enlarged)

mented depiction of the auxiliary in Roman service (Rossi 1967: 38).

Corporis custodes represented, unlike the Praetorians, a more personal entourage of the emperor. Ethnically they belonged to the Germanic tribes (Batavi) and they had no personal or political connections with Rome. Augustus inherited the custom of having Germanic peoples in his personal entourage from Caesar (Caesar, *De bello Gallico* 7.13.1), although he disbanded them after Varus's defeat (Suet *Aug.* 49). Caligula had them again in his closest entourage (Suet. Gaius 43, 58), as did Nero, who trusted them more because they were foreigners (Tac. *Ann.* 15.58), but they were definitely disbanded by Galba (Suet. *Galba* 12).

Therefore, at the time of Nero, a certain dictatorship of the Praetorians was already established in the election of a Princeps, when they did not hesitate to even commit murder. In such an atmosphere, the Princeps should not have ignored the needs of the Praetorians, but, as we have seen in the previous discussion, he also had his own more personal Germanic guard whom he trusted more. If we accept that Nero on the *adlocutio* types refers to his Germanic guard, then on the *decursio* types the Praetorians must have been shown, as Sutherland already concluded (Sutherland 1974: 169).

In the attempts to interpret the *decursio* types, it was generally believed that they have a promi-

nent militaristic propaganda, which is in contrast to Nero's character and theatrical preferences, which were, according to the testimony of historical sources, considered disorderly. Taking this into consideration, Smith assumed as one of the possibilities that Nero's entourage on the *decursio* types are not real soldiers but actors and that the depicted scenes have no military character, but that they rather present a form of theatre (Smith 2000: 284). Pointing to the sources confirming Nero's affection for Trojans and his love of horses, the same author suggested that one aspect of the legend of Troy, *lusus Troiae (Ludus Troiae)*, was depicted on the *decursio* types.

Virgil described *Lusus Troiae* in detail in the Aeneid (Verg. *Aeneid V.* 545-603). It represents a staged battle that peaks in the games representing the commemoration of the first anniversary of the death of Anchises. This chivalrous game was restored by Caesar as a part of the propaganda that the family of the gens Julia descended from Aeneas (Suet. *Divus Iulius* 39).

The game included various equestrian games which required special skills, and they were performed by young Roman men from respectable families. Continuing this tradition, Augustus organised the Troy game several times (Suet. *Divus Aug.* 43; Dio Cass. 51.22.4; 54.26.1), and the young Tiberius took part in one of them (Suet.

Tib. 6). Caligula organised the Troy games in the Circus (Suet. *Gaius* 18), as did Claudius on the occasion of the centenary games (Suet. *Claud* 21). In these games, held in 47 AD, Nero participated successfully as a still immature boy, and received great applause (Suet. *Nero* 7; Tac. *Ann* 11.11).

The Troy games had been organised in the early Principate during the consecration of temples, imperial funerals, as well as during major celebrations in the Circus, etc. Trying to find a reason for performing a Troy game involving Nero, which would then be depicted on sestertii, Smith proposed the funeral of Nero's daughter Claudia in the year 63 AD (Smith 2000: 287).[9] The main problem, according to Smith, is that at that time, Nero was 26 years old, and that, as a rule, young men took part in the Troy game years before they wore a toga *virilis*. Nero's participation, regardless of his age, seems quite possible to the author, taking into account the nature of his personality, love of performances, of acting and of horses (Smith 2000: 289).

We cannot agree with this interpretation for a number of reasons. It seems highly unlikely that the performance of the Troy games at the funeral of Nero's daughter, who lived only four months, was the reason for the appearance of *decursio* types over five years (from 63-67 AD). The birth of Claudia was recorded in the sources (Suet. *Nero* 35), as was Nero's joy about it, as well as the games that were organised, the statues that were laid, the temple of fertility that was about to be built, etc. Tacitus also describes Nero's mourning after the death of his daughter, who he had deified: "Nero's grief, like his joy was without bounds and measure." (Tac. *Ann.* 15.23). Regardless of the detailed descriptions of all celebrations and actions that were performed after the birth of Claudia, Tacitus does not mention her funeral at all, but in his presentation shifts to the Parthian question and preparations for the arrival of Tiridates in Rome

in the same year. In addition, according to Smith, the soldiers in the entourage were actors who followed Nero to the staged battles or *lusus Troiae*. Thereby, he finds justification for Nero's participation in the games, taking into consideration his age (26), which was not in accordance with the rules of the games. The author finds the argument in Tacitus's descriptions of his reign as "…as a deceptive adolescnece, and it retained a childish quality to his death..." (Smith 2000: 287).[10]

The root of our disagreement with Smith's conclusions that this is an illustration of the Troy games on the occasion of Claudia's funeral is based, among other things, on the fact that in the same sources the term *decursio* clearly differs from *ludus Troiae*. The fact that the staged battle that was practiced in the Circus as *decursio* is a different manifestation than the Troy games that also could have taken place in the Circus.[11] In the sources these two terms do not appear together (*cf. supra* ref. 1-4), but separately and clearly emphasised. It turns out that these close manifestations cannot equate.

Besides, if our thoughts would go in this direction, which is not the case, more arguments would be found for the appearance of *decursio* types in relation to *Neronia* (60 and 65 AD). The games that Nero designed in honour of his reign were conceptualised according to the Greek models, and consisted of musical, gymnastic and equestrian parts (Suet. *Nero* 12; Tac. *Ann.* 14.20-21; Cass. Dio LXI.21). This would better chronologically justify the appearance of the *decursio* types on the sestertii (63-67 AD).

It is clear that with this discussion the question of the *decursio* type's appearance in Nero coinage

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9 Claudia was the daughter of Nero and Poppaea Sabina. She was born on January 21, 63 AD and died as soon as April or May of the same year (*cf.* Kienast 2010: 100; Suet. *Nero* 35; Tac. *Ann.* 15.23).

10 The truth is that in his conclusion Smith states that the presented idea is not without problems, but that it seems much more acceptable than the previously proposed solutions (*cf.* Smith 2000: 288).

11 Tacitus, for example, uses the term *decursibus (...sed exercitio equitum, decursibus cohortium interesse...; cf.* Tac. *Ann.* 2.55) and *ludicrum Troiae (...cum pueri nobiles equis ludicrum Troiae...; cf.* Tac. *Ann.* 11.11), as *decursio* could also have been performed during funerals. *(cf. supra* ref. 4).

will not be solved. Our intention is to point out some lack of logic in the earlier interpretations. We tend to look for the explanation in entirely practical reasons, unrelated to the intimate nature or character of Nero, which caused his deranged acts that were documented. Historical sources are full of such descriptions of his behaviour, which logically leads modern researchers to seek in them the reasons for the various consequences. No matter how disturbed Nero's personality really was, he still ruled for 14 years. Behind the Princeps of the early Principate, there was a complex state apparatus, with an elaborate hierarchy. An army of people governed the state and, among other things, took care of coinage and the propaganda effects when choosing its types. If Nero's personal influence in the choice of reverse types can be observed, this would only refer to a reverse depiction without the associated legend, Nero as Apollo (Nero as Apollo Chitaroedus). By analysing other reverse types, we find only those who propagate the achievements of the reign, as in the case of the former or the latter Princepses (*Adlocutio, Annona, congiarium,* triumphal arch, *Genius*, Temple of Janus, market, port, Roma, Victoria, etc...).

Here we return to our initial observation, that the minting of certain types was a must, as seen in the emissions of the Roman and Lugdunum mints. The official propaganda policy in the period from 63-67 AD was primarily focused on the emphasis of good relationships with the Praetorians and the Emperor's personal guard (*adlocutio* and *decursio* types), as well as in the preservation of peace in the capital, which was the result of a regular supply of grain to the civilian population (*congiarium* and Annona/Ceres types, the Port of Ostia). The types on sestertii, which appear alongside the above-mentioned, are related to current external or internal political circumstances (the Temple of Janus, Victoria and the Triumphal arch, Roma). In that regard, the *decursio* types should, in the sense of propaganda, officially demonstrate and support the closeness and good relationships of the Princeps with the Praetorians. In comparison with pre-

vious recent experiences, this was quite desirable for any Princeps, even Nero.

The two isolated groups of reverse depictions on Nero's sestertii had the goal of having a propaganda impact on two core supporting elements of his rule - the Praetorians and the risky mass of the civilian population in the capital. In our opinion, the *decursio* types (as well as *adlocutio*, congiarium, Annona and Ceres) do not need to be associated with the personal characteristics of the Princeps in interpretations, but with the official propaganda policy, which ultimately aimed to keep Nero, as an offspring of the Augustus lineage, ruling as long as possible.

This is also supported by the historical facts. The privileged position of the Praetorians and their high-handedness shown in the election of the Principes during the early Principate led to the discontent of the provincial legions who were proclaiming their pretenders, which ended with the outbreak of the civil war in 68 AD and resulted in the end of the Julio-Claudian dynasty. After that, the influence of the Praetorians in the election of a Princeps was only occasionally expressed. It is known that their pressure was decisive in Nerva's selection of Trajan as his heir (Cass. Dio LXVIII.3-4), and in the last but also biggest incident, the Praetorians selling the state to Didius Julianus at the auction they organised (Cass. Dio LXXIV.1). As the historical and political circumstances changed, the influence of military formations in the election of a new emperor also changed. This privilege was acquired by the Danube Legions in the middle of the 3rd century, primarily because of the shift in the focus of military operations into these areas and the decisive role that they had in the defence of the Empire from the ever-growing barbarian threat.

As the previous researchers of Nero's *decursio* types have already concluded, this question remains open for future debate and possible interpretations. Our paper is a modest contribution to this debate.

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REZIME
DECVRSIO REVESNI MOTIVI NA SESTERCIJUSIMA NERONA (JOŠ JEDNOM O STAROM PROBLEMU)

KLJUČNE REČI: DECVRSIO, NERON, REVERSNI MOTIVI, SESTERCIJI.

Od vremena rimske republike a i kasnije u carstvu, termin *decursio* označavao je manevre vojske pod punom opremom u cilju treninga, vojničku počast prilikom sahrana istaknnutih generala ili careva pri kojoj su vojnici i konjanici kružili oko lomače, ili lažnu bitku, u formi predstave, između dve vojne skupine koje su predstavljale vrstu sporta upražnjavanu u cirkusu. Zabeleženo je da se lažna bitka, osim u cirkusu, izvodila i prilikom pomenutih sahrana.

U rimskom imperijalnom kovanju legenda DECVRSIO pojavljuje se jedino na sestercijusima Nerona. Ovi primerci (Fig. 1-3) emitovani su u kovnicama Rim 63-64 AD (u dve varijante legende: bez S C i sa S C i tri različite predstave) i Lugdunum 65-67 AD (samo sa S C i jednom predstavom. Želimo da skenemo pažnju kako se

ovaj reversni motiv, u obe kovnice i u različitim emisijama, pojavljuje uvek sa tipovima AD-LOCVT COH, ANNONA AVGVSTI CERES, CONG I – DAT – POP ili CONG II – DAT – POP. Motivi decursio i *adlocutio*, bili su u svojoj propagandnoj nameri usmereni na pretorijansku gardu i stalnu potrebu Nerona da osigura njihovu podršku. Sa druge strane motivi Anona/Cerera i congiarium, odražavaju Neronovu želju za adekvatnim snabdevanjem Rima žitom i podele civilnom stanovništvu.

Različite interpretacije decursio motiva su iznete počev od 1920. g. pri tome su povezivane sa drugim Neronovim igrama (*Neronia – Ludi Quinquennales*), sa Neronovom dozvolom da javnost prisustvuje vojnim vežbama na Marsovom polju, da prikazuju cara koji predvodi vojnu procesiju u Cirkusu, ili da su ovi motivi ilustracija Trojanskih igara (*Lusus Troiae*), itd.

Dve izdvojene grupe reversnih predstava na sestercijusima Nerona, imale su za cilj da praopagandno utiču na dva glavna oslonca njegove vladavine – pretorijance i rizičnu masu civilnog stanovništva u prestonici. Po našem mišljenju, *decursio* tipovi (kao i *adlocutio*, *congiarium,* Anona i Cerera) ne treba u interpretacijama povezivati sa ličnim karakternim osobinama princepsa, već sa oficijelnom propagandnom politikom, koja je u krajnjoj instanci imala za cilj da što duže održi Nerona na vlasti, kao izdanka Avgustove loze.

ĐORĐE ĆIRIĆ
Nova Pazova, Serbia
E-mail: djordjeciric1980@gmail.com

THE BIBLE AS A SOURCE OF INFORMATION ON MEDIEVAL WINEGROWING IN SERBIA

ABSTRACT

Words from the Bible represent an inexhaustible source of information, either as symbolic and moral lessons or as technical descriptions of every-day life. It is precisely those technical data, read by farmers, and compared with other sources, that enable us to penetrate into the processes which affected grapevine and wine during the Middle Ages. Numerous verses from the Bible were directly cited in medieval codes of law, statute books and charters of the Serbian state. Aside from those, many descriptions and pieces of advice can also be read in these verses, whose application is confirmed by centuries-long practices in vineyards and wine cellars. Verses from the Bible contribute largely to the clarification of the manners in which winegrowers cultivated grapevine during the Middle Ages, and what effect it had on the plant itself, the wine, even the character of winegrowers which were tending vineyards and making wine.

KEYWORDS: THE BIBLE, WINEGROWING, MIDDLE AGES, SERBIA, WRITTEN SOURCES.

INTRODUCTION

The Bible[1] is a compilation of sacred texts written over a very long time span by numerous authors. Its reliability has often been contested, but in some cases also confirmed. Aside from that, the number of translations, as well as stylistic liberties taken by translators can prove to be a problem for an objective overview of the verses as sources of information. Undoubtedly, the symbolism in the verses of the Bible is significant and absolutely necessary for the understanding

of it. However, as a relevant historical source for studying techniques of growing vine and making wine, it is necessary to take only the context of time and space as described by the authors of those verses, without attempting to shed a light on their moral teaching. The history of winegrowing,[2] even though it is intertwined with different aspects of the human civilization, firmly depends on earth-related factors: the course of the nature and human actions.[3] This is the reason why the authors of those verses who mentioned grapevine and wine also used their characteristics to make

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[1] As the principle source for verses, the translation of the Bible by the Institute for Hebrew language and literature in Belgrade was used for the Serbian language (*Свето писмо или Библија Старог и Новог завета*, Institut za Hebrejski jezik iz Beograda). As additional sources, the Bible, the Old and the New Testament, Sinodal Text was used (*Библия Книги Священного Писания Ветхого и Нового Завета, Синодальный Текст*), as well as *The King James Version of the Holy Bible*.

[2] Winegrowing is understood here as a term which comprehends the entire process, from planting the vine up to the placing of wine onto the table.

[3] Phenophases of the growth of grapevine are under a direct influence of ecological factors, first and foremost – climate. On the other hand, the final quality of wine is affected by genetic aspects of the vine from which the grapes were picked and especially by the character of the winemaker who handled the process of wine making.

Fig. 1 Noah work vineyard. Fresco from monastery Decani. Gallery of frescoes, Belgrad.

comparisons with the human character and so on. *Moab hath been at ease from his youth, and he hath settled on his lees* (Jeremiah 48:11).

Grapevine, wine, grapes and other terms directly or indirectly linked to winegrowing are mentioned in 43 out of a total of 72 books from the Old and the New Testament, in over 400 verses.[4] Certain books are profuse and picturesque when it comes to the subject of grapevine growing

techniques. The Book of the Prophet Isaiah lists all things that need to be done for the grapevine to bear grapes, what types of wine exist, which varieties are cultivated, what the consequences of inebriations are, etc. Others mention them solely in the context of moral lessons. The Bible abounds with information on grapevine and wine, and, aside from geographic determinants and, partially, ecological factors,[5] those typical for the Near East, the areas of Judea and Israel, everything else can also be comparable with the area of the Serbian medieval state as well. Here, we mostly comprehend the social context which followed the development of winegrowing and agro-technical measures applied in vineyards and wine cellars.

In the beginning of the seventh decade of the 9th century, Constantine, the elder of the missionary brothers, translated some the most essential liturgical books from Greek to Church Slavonic – a weekly Gospel, to be read during sermons (*Aprakos*), one legal text (*Zakon sudny ljudem*) and the most essential books of sermons for praying together (Hrvatska enicklopedija 2018). Serbian medieval winegrowers would have been, to a larger or smaller extent, familiar with the verses from the Bible. The easiest way that they would learn them would have been though clergymen and noblemen of lower ranks. Since the Church was the most omnipresent and probably the most organized structure in the Middle Ages, and the Bible essential for performing all liturgical services, it is beyond doubt that words it contained echoed far and wide. Therefore, recommendations from the Bible, both those concerning the spiritual life and those concerning every-day life, ranked high among role-models of proper living for a medieval man. As a proof for this, we may see that there are articles in medieval codes of law and statutes which sound as if they were copied directly from the verses of the Bible. Christian customs

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4 This difference is the consequence of different translations.

5 Terrains suitable for growing vine along the Adriatic coast and most of the area of Southern Levant have similar climate conditions (temperature, precipitations, etc.). According to Kepen's classification, it is considered as Mediterranean, with hot summers (Csa). (M. C. Pell *et al.* 2007).

of bestowing gifts and the sense of morality can be seen in the verse: *When thou comest into thy neighbour's vineyard, then thou mayest eat grapes thy fill at thine own pleasure; but thou shalt not put [any] in thy vessel* (Deuteronomy 23:24). To feed a traveller or a neighbour was quite natural, while stealing, on the other hand (taking more than needed) was considered unacceptable. This custom law found its place in numerous written stipulations of medieval Serbia. Byzantine agricultural law and its Serbian transcript completely agree with the essence of these verses, with one difference, in the enumeration of articles dealing with the subject. Article 58 from the Serbian transcription goes as follows: *Those who enter into vineyards or fig-trees belonging to someone else, if they do so to eat, let them be innocent, and if they come to steal, let them be beaten while disrobed of their clothes* (Благојевић 2007: 69). Verses from the Bible concerning the compensation of damages done to the grapevine were also included into the articles of this code of law: *If a man shall cause a field or vineyard to be eaten, and shall put in his beast, and shall feed in another man's field; of the best of his own field, and of the best of his own vineyard, shall he make restitution* (Exodus 22: 5). A similar disposition is found in Article 76 of Dušan's Code: *If any man's cattle trespass on corn or a vineyard or a meadow in error, then let him pay for the damage done what the valuers assess. But if he let them trespass knowingly, let him pay for the damage done and also six oxen* (Бубало 2010: 175). Charters of Serbian rulers also contain verses from the Bible. To name just one – the Chryssobull of King Dušan for the Monastery of Saint Nicholas of Myra in Orehovo.[6] In the introduction, he cited a verse from Solomon's Proverbs – *By me kings reign, and princes decree*

Fig. 1 Noah work vineyard. Fresco from monastery Decani. Gallery of frescoes, Belgrad.

justice [7] (Марјановић-Душанић 2003: 59). Out of a total of a dozen verses from Solomon's Proverbs dealing with winegrowing, we will single out verse 31:16: *She considereth a field, and buyeth it: with the fruit of her hands she planteth a vineyard.*

SOCIO-ECONOMIC CONDITIONS

Grapevine and wine, in a large number of cases, directly reflect historical events. They are often subjects of these occurrences, but protagonists as well. This link was recognized in the Bible. According to verses from it, the restoration of the human civilization began with the planting of vineyards. Verses from the Genesis[8] state that, after the

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6 The Chryssobull was written in 1339, and the Monastery of Saint Nicholas of Myra, with all its possessions and men, was thus gifted to the Monastery of Hilandar. Also, King Dušan exempted the settlements and people from the metochion of St. Nicholas of all works and taxes due to the Serbian Kingdom *cf.* Марјановић-Душанић 2003, 55.

7 Solomon's Proverbs 7:15.

8 Genesis, the First Book of Moses, is the first book in the

water retreated, a sacrifice was made to God, who gave blessing to Noah and his descendants. Upon receiving this blessing, Noah planted a vineyard: *And Noah began [to be] an husbandman, and he planted a vineyard* (Genesis 9: 20). However, the very next verse talks of the dangers of inebriation: *And he drank of the wine, and was drunken; and he was uncovered within his tent* (Genesis 9: 21). The noxiousness of intemperate use of wine and other alcoholic beverages appears, as a warning, in numerous verses of the Old and the New Testament. The Book of the Prophet Isaiah speaks of the wrong decisions made by people who relied more on men than on God, which lead to the fall of the Israelites into Babylonian captivity. One of the culprits for those bad decisions was immoderate wine consumption: *But they also have erred through wine, and through strong drink are out of the way; the priest and the prophet have erred through strong drink, they are swallowed up of wine, they are out of the way through strong drink; they err in vision, they stumble [in] judgment* (Isaiah 28: 7). And again, similarly, in this verse: *Woe unto [them that are] mighty to drink wine, and men of strength to mingle strong drink* (Isaiah 5: 22). Alcoholism, i.e. immoderate consumption of wine, mead and beer continued to be a great problem during the Middle Ages as well. Sources tell us that the Slavs had the custom of using wine, instead of torture, to uncover secrets (Орбин 1968: 151). An event which occurred in the autumn of 1342 confirms the existence of a problem. In his book Istorija Srba (The History of Serbs), Ćorović wrote that, during the military campaign of the Serbian state and the Byzantine emperor Kantakousenos against the city of Serres, Serbian soldiers drank, too eagerly, new wine, which they weren't used to, hence, as many as 1.500 of them got sick with dysentery,[9] and they were thus rendered use-

less without any actions from the enemy. Being familiar with this problem, from their experience, Serbian rulers placed stipulations in their laws to try and prevent this damaging social occurrence (Ćorović 2001). Article 166 of Dušan's Code says: *If a drunken man come from anywhere and strike anyone or cut him or wound him, yet not to death, then shall one eye be removed and one hand cut off. But if a drunken man molest anyone or pull off his cap or do him other insult, but do not wound him, he shall be flogged with one hundred strokes and cast into prison, and when he is taken from prison he shall be flogged again and released* (Бубало 2010: 213).

Grapevine and wine were also mentioned in contexts of consequences or warnings of imminent events. The element of action and reaction doesn't refer only to the consequences of inebriation. God rewards correct actions with abundance of grapevine and wine, and punishes evil actions with their absence. It is through the Prophet Amos that God warns the people of Israel: *Forasmuch therefore as your treading [is] upon the poor, and ye take from him burdens of wheat: ye have built houses of hewn stone, but ye shall not dwell in them; ye have planted pleasant vineyards, but ye shall not drink wine of them* (Amos 5: 11). On the other hand, at the gathering at Shechem, the one true God addresses the united tribes of Israelites: *And I have given you a land for which ye did not labour, and cities which ye built not, and ye dwell in them; of the vineyards and oliveyards which ye planted not do ye eat* (Joshua 24:13). With these words, the alliance is fortified between the tribes of Israel and Yahweh (the one true God), who fought on their side and enabled them to conquer Israel, under the leadership of Joshua. The Serbian people found themselves in a similar historical situation during the reign of King Milutin (1282–1321) and the conquering of winegrowing areas in the valley of Vardar, Gornji and Donji Polog and Pijanec. However, during the 16th and the 17th century, after large migrations of the Serbian population from the ar-

Christian Bible and the Hebraic Tanakh. It is the story of the creation of the world.

9 Dysentery can easily be caused by consuming large amounts of must, which hadn't finished fermenting and turning sugars into alcohol. Because of the high percentage of sugar in it, must can get spoiled and microorganisms

can develop in it, which could, in turn, cause dysentery.

eas of Macedonia and Kosovo into the Pannonian valley, the art of winegrowing in these areas began to dwindle. Let us conclude this topic with verses: *Who goeth a warfare any time at his own charges? who planteth a vineyard, and eateth not of the fruit thereof? or who feedeth a flock, and eateth not of the milk of the flock?* (1 Corinthians 9: 7).

An important evidence of the value – and not just symbolic value – of grapevine and its fruit, grapes and wine, in the Bible, is provided by a verse from the Gospel of Matthew: *Woe unto you, scribes and Pharisees, hypocrites! for ye pay tithe of mint and anise and cummin, and have omitted the weightier [matters][10] of the law, judgment, mercy, and faith: these ought ye to have done, and not to leave the other undone* (Matthew 13: 23). A tenth portion of agricultural produce and such, called tithe (*desetina* – "tenth part"), was the usual tribute given by subordinate population during the period of the Serbian medieval state. Wine was intensely consumed during the Middle Ages, hence, it was very convenient for being taxed. Wine taxes were the main fiscal income of Serbian cities along the Adriatic coast. In Kotor, though, it wasn't $^1/_{10}$ of the price but $^1/_{16}$ of the value of wine, however, with the obligatory surtax – it was higher than the usual tithe. The Statute of Kotor, in Article 389, speaks of those special taxes: *patroni vini solvant sextam decimam pertem vini, videlicet quantum dant doane, ad dictum laborerium, incipiendo die primo septembris* (Čremošnik 1933: 29). In accordance with the value of wine, Serbian rulers absolved, as a form of economic protectionism, people from monasteries and metochia of various forms of tributes and obligations linked to grapevine and wine. In Article 34 of his Code, Emperor Dušan exempted people of the church of work obligations in manorial and imperial vineyards: *И што соу села црькована и людїє црьковныи, да не гредоу оу меропшине царьства ми, ни на съно, ни на ѡранїє, ни на виноградь* (Бубало 2010: 82).

Grapes and wine have represented, ever since the Antiquity, a source of economic prosperity. Vineyards were objects of valuable gifts and also trade, buying, selling, exchanging, leasing. We learn this from The First Book of Kings: *Because I spake unto Naboth the Jezreelite, and said unto him, Give me thy vineyard for money; or else, if it please thee, I will give thee [another] vineyard for it* (1 Kings 21: 6). The fact that the yield of grapevine represented a fundamental nourishment in every-day life made it more important than its economic value. The first words of blessing that Isaac gave to his son Jacob: *Therefore God give thee of the dew of heaven, and the fatness of the earth, and plenty of corn and wine* (Genesis 27: 28). Wine, or, in this case, must[11], goes hand in hand with corn – bread. There are many reasons for that. It suffices to mention only the hygienic value of red wine, which, during the Middle Ages, often represented, in terms of health, a safer beverage than water, especially in city centres.[12]

Thus, confirming what was said in our previous passage, vineyards were traded with, they were given as presents and lease contracts were signed in the Serbian medieval state. Among the numerous vineyards gifted by rulers to their foundations, there were also vineyards bought from the *small* people. Thus, Prince Lazar listed among gifts to his foundation Ravanica, along the vineyards he inherited and planted himself, two which were bought from Crep and Jugda (Новаковић 1912: 769). Lease was a common manner of managing vineyards along the Adriatic coast. We have information on this from numerous contracts, but also articles of statutes of cities along the Adriatic which regulated the rights and obligations of lessees and owners of vineyards. In the Statute of Budva[13], as many as five chapters

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10 In the Serbian translation, these verses were thus translated: *Woe unto the literates and Pharisees, who pay tithe of dill and pomegranate, while robbing and omitting to give grapes, which have a higher price...*

11 In some verses of the Bible, new wine can be considered as actual new wine, with recently finished fermentation and removed from lees. In other cases, it seems more likely to be must, where we can explain the epithet of "new" as not yet fermented into wine, which can cause drunkenness.

12 The wine is free from pathogens which may have been present in the water. Also, its acidity and alcohol in it kill many of the pathogens which can contaminate water and cause diseases.

13 A fundamental document which arranged every-day

were dedicated to this subject, almost all of them dealing with norms regarding vineyards. Chapter 36, On lease, clearly stipulates: *We order that he who takes under lease for a certain price a vineyard, field, house or other, is duty bound to work well and finish the works in time, according to the contract* (Средњовековни статут Будве 1988: 23). On the importance of wine in the alimentation of the population, we have an exhaustive article from the Law of Novo Brdo (ω тргу рупнемъ):[14] *For as long as the wreath, placed by the Prince onto the square, shall stand, the common folk shan't buy flour and wine and other things until the miners (*rupnici*) have provided for themselves on Sundays before eating* (Радојичић 1962: 53). Miners were a highly valued class, whose productivity was directly linked to the scope of the wealth of Serbian medieval rulers. This is the reason they had priority in procuring basic food. Flour and wine go hand in hand, as the basis of alimentation of medieval men.

Two factors are listed in the Bible as directly responsible for the beginning and further development of winegrowing in a certain area. They are both significant for almost every sphere of human actions, but the first one to suffer because of their absence are precisely grapevine and wine quality. The first one is a stable social situation; no wars, natural disasters, epidemics or great migrations of the population. Even the increase of life standard is a desirable factor for successful cultivation of grapevine and wine. The second historical circumstance which aids the development of this activity is independence, freedom of the people and the territory they live on and practice the activity of winegrowing. Winegrowing is a sphere of human actions which demands that a large number of people takes part in it during most of the year, both for the tending of vineyards and also for consuming the products from those vineyards. This was recognized by the Bible in verses: *When I shall have gathered the house of Israel from the people among whom they are scattered, and shall be sanctified in them in the sight of the heathen, then shall they dwell in their land that I have given to my servant Jacob. And they shall dwell safely therein, and shall build houses, and plant vineyards; yea, they shall dwell with confidence, when I have executed judgments upon all those that despise them round about them; and they shall know that I [am] the LORD their God.* (Ezekil 28: 25, 28: 26). In this fierce speech against the heathens, the one true God promises peace and prosperity to the Israelites, symbolized with the building of homes and planting of vineyards. But even before a foundation of home, the people could estimate, on the basis of prosperity of grapevine, the level of wellbeing of an area. Here's what Moses had to say on the subject: *... whether there be wood therein, or not. And be ye of good courage, and bring of the fruit of the land." Now the time [was] the time of the first ripe grapes* (Numbers 13: 20). And later: *And they came unto the brook of Eshcol, and cut down from thence a branch with one cluster of grapes, and they bare it between two upon a staff; and [they brought] of the pomegranates, and of the figs* (Numbers 13: 23). The oversized clusters born by Moses' scouts from The Promised Land symbolize the fertility of the valley of Eshcol. A beautiful depiction of these verses can be seen in the Igumenaria[15] of the Monastery of Hilandar on Mount Athos.

Success in cultivation of grapevine, spreading of vineyards, and intensity of production and especially consumption of wine can be directly linked to state-building processes of a given people as well. Planting vineyards and making wine in medieval Serbia was followed, hand in hand, by its

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life in the city municipality of Budva during the Middle Ages. It was most probably written in the middle of the 14th century, during the reign of Emperor Dušan, even though many of its stipulations were being applied long before that.

14 The Law of Novo Brdo regulated every-day life at Novo Brdo, the most important mining settlement on the Balkans. It is an integral part of the Law on mines by Despot Stefan Lazarević. It was published on January the 29th 1412. *Cf.* Радојичић 1962.

15 *Igumenaria* is an object within the Monastery of Hilandar, ranging from the dining chamber built by King Milutin all the way to the great dormitory on the north-western side of the monastery. Its name is due to the fact that hegumens (*iguman*) lived in it.

territorial, economic and demographic development. On top of that, the amount of wine present in the alimentation and trade provides a direct reference on the level of life standards and cultural development of a given group of people. The peak of many aspects of medieval Serbia can be found at the Monastery of Dečani, built by two members of the Nemanjić dynasty,[16] and whose architecture and fresco-paintings are extremely important for the world cultural heritage.[17] The iconostasis and architectural decorations of the Monastery of Dečani abound in depictions of every-day life and represent a rich source of data on life in Serbia during the 14th century. One important part of those motifs are also those with grapevine, which show the indubitable importance it had in the Serbian medieval state. During the Middle Ages, wine represented a valuable nutriment, worth the trouble of organizing the risky trade by caravans. Bearing witness of intense wine trade, we have numerous contracts and articles from statute books of various cities (Čremošnik 1933: 31). For example, the laws of Kotor forbade its citizens to sell any wine aside from that of Kotor in the area between Budva and Molunat. Wine was transported in special wooden barrels (*vozilnica*) and wineskins, especially those made of goat skin (Јиречек 1978: 169). The Bible doesn't mention wooden barrels, but wineskins and ceramic vessels (pitchers) were frequent means for transporting and storing wine. *[O]ne carrying three kids, and another carrying three loaves of bread, and another carrying a bottle of wine* (1 Samuel 10: 3). Wineskins were made of leather obtained from different animals[18] and they had different use val-

ue and quality. They were used over long spans of time, hence, they were often mended: *and took old sacks upon their asses, and wine bottles[19], old, and rent, and bound up* (Joshua 9: 4).

The ascending trajectory of Serbian winegrowing can be traced through charters, creating an almost unbroken ascending line all the way until the fall of Smederevo in the middle of the 15th century. From the first charters, made in the end of the 12th century, where vineyards were seldom mentioned, all the way to those from the period of the Serbian Empire and Despotate, when they were so widely diffused that they represented borders and prominent spots in village counties, named after the people tending them or their proprietors, etc. Since the time of the founder of the Nemanjić dynasty, Stefan Nemanja, winegrowing was a direct reflection of the economic power of the ruler and the state. In the end of the 12th century, he gave Hilandar the gift of nine villages in the vicinity of Prizren, stressing that he planted two vineyards there as well: И два винограда тоуигє насадихь... (Новаковић 1912: 384). One century later, vineyards were so numerous that they were actually a border. His descendant Milutin was one of the most powerful Serbian rulers of the Middle Ages. He displayed his and Serbia's economic power in the Saint Stephen Chryssobull (1314–16). The founding charter of his foundation – the Monastery of Banjska depicts the highly developed level of winegrowing in several aspects. The Monastery of Banjska had had, from the very foundation, a very large metochion. It incorporated 75 villages and hamlets. In a detailed description of its lands, vineyards were also listed. For example, the village of Gumno in Hvostno[20] had for a border, among other things, the vineyard of a certain Georgije: *And in Hvostno the village of Gumnište, with borders [...] and on the ridge which leads from Plužine, on the opposite side from the vineyard of Georgije, into the same*

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16 It was built in the period from 1327 up to 1335. The original founder was King Stefan Dečanski (1322–1331), and it was during the reign of his son Dušan (1331–1355) that the building was finished.

17 Since 2004, the Monastery of Dečani is included in the UNESCO list. The explanation states that the architecture of the monastery and its paintings represent an extraordinary combination of the eastern Byzantine and western Roman tradition.

18 The Bible mentions sheep, goats, especially kids, cattle. Therefore, their skin represented materials out of

which wineskins for wine transport were made. It was a similar case in medieval Serbia.

19 In the Serbian translation, instead of the word bottle, word wineskin is used.

20 The area of today's Northern Metohija.

Bojatja pear [trees] (Ковачевић 1890: 3). Large surfaces planted with grapevine induced Milutin to impose the obligation onto his depending subjects of hoeing the vineyards of monasteries. At the peak of the Serbian medieval state, in the middle of the 14th century, the founding charter of the Monastery of the Holy Archangels was written. The economic power of the metochion of this monastery was accompanied by extremely complex activities in winegrowing. In order to meet the needs of this monastery, land consolidation was performed in the area of Prizren, by which the vineyards of the monastery were augmented through exchange with the local population: *And these are the vineyards of this church (Rajkova crkva): the vineyard at Kruševo polje, was taken in exchange from Nježa; and the vineyard in Babište, and the vineyard in Pustice, they were both taken in exchange from Nježa for those at Kurilo. The vineyard behind the courts, and we took it in exchange from Dabiživ the usurer for that at Kurilo; the vineyard at Gabrovci, and we took it in exchange from Bojko for that at Kurilo; and another vineyards behind the courts, and we took it in exchange from Dabiživ the usurer for that at Kurilo; the vineyard at Gabrovci, and we took it in exchange from Odeljan, for that at Kurilovo; and in Pustice two vineyards, and we took it in exchange from Ivanko the weaver for that at Kurilovo; the vineyard in Lipovci, and we took it in exchange from Dmitar for that at Kurilovo; the vineyard at Hinatovci, and another in Dubrovice; the vineyard above Puljša; the vineyard at Drenovci; the vineyard at Babišta; the vineyard at Pustice, and Rajko's field between the waterworks, below Đurovište, up to the walnuts; and other fields below from the waterworks, two parts in the same place* (Новаковић 1912: 684, 685). We can see from the charter that a dozen vineyards, which were the property of people from Rajkova crkva, and in the immediate vicinity of Prizren, had been exchanged for vineyards at Kurilo. It seems that from the fertile vineyards of Kurilo exquisite vintages arrived. In order to perform land consolidation in a proper manner, vineyards going into exchange have to

have similar health status, fertility potential, even grapes (varieties) of similar quality. Augmenting the property (vineyards) enabled easier cultivation of grapevine and larger influence on the quality of wine, which would end up in the imperial wine cellars of the city of Prizren.

The same bound between the development of winegrowing and state-building can be seen in the verses from the Book of the Prophet Jeremiah: *Ye shall drink no wine, [neither] ye, nor your sons for ever: Neither shall ye build house, nor sow seed, nor plant vineyard, nor have [any:] but all your days ye shall dwell in tents; that ye may live many days in the land where ye [be] strangers* (Jeremiah 35: 7). The subject of those verses is the fall of the state of Israelites into Babylonian captivity. They lost their homeland, thus, as apatrides, they couldn't build a future in a foreign land. Building a house, making a home, sowing the seeds of grain to obtain flour and planting vineyards; all in the same context of permanent settlement in a specific area. Vineyards are planted for the period of at least half a century[21] and always for the descendants. They can be maintained on the same spot, propagating either spontaneously, from seeds, or with the help of men, through layering, and they can bear fruit for several centuries (Blagojević 2004: 114). One vineyard in the vicinity of Peć, given by Stefan Prvovenčani to Hilandar, can be traced in written sources for at least 250 years. Even Solomon, the personality which is the symbol of wise actions in many traditions, says: *I made me great works; I builded me houses; I planted me vineyards* (Ecclesiastes 2: 4). Judging by their actions, this was also a notion which guided the rulers of Serbian lands

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21 A foundation of Emperor Dušan, the Monastery of the Holy Archangels Michael and Gabriel had a very imposing metochion, one in accordance with the founder. Four churches which were placed under the primacy of the Monastery of the Holy Archangels owned vineyards in the farther or imminent vicinity of Prizren. Also, new vineyards were planted for the needs of this Monastery. Judging by these data, vineyards, and probably the number of monks of the Monastery of the Holy Archangels were quite large. This is additionally confirmed by the fact that monks were forbidden to venture into wine selling, hence, probably all of the monastery wine ended up on the tables of the monks.

during the Middle Ages. The increasing amount of surfaces covered with grapevine directly reflected the increase of the territory of the state, not only through mere appropriation of the existing ones, but also through planting new ones. Therefore, as a permanent mark of state-building and identity as a whole, vineyards were planted near monasteries, on their properties.

CULTIVATION OF VINEYARDS

The Bible provides numerous descriptions of winegrowing practices. They are sufficiently realistic to provide proof beyond doubt that authors of those verses had models for them in every-day life, and never more so than in the Book of the Prophet Isaiah.[22] The introductory verses explicitly state that vineyards are planted on fertile hills: *Now will I sing to my wellbeloved a song of my beloved touching his vineyard. My wellbeloved hath a vineyard in a very fruitful hill* (Isaiah 5: 1). We can also judge this practice of planting vineyards on hills by a Roman proverb that Bacchus loves hills – *Bacchus amate coles*. Certainly, grapevine has been planted, up to today, on terrains with almost every exposition and inclination, but mildly steep sides of sunny hills remain the symbol of quality, as shown by the verse: *Thou shalt yet plant vines upon the mountains of Samaria* (Jeremiah 31: 5). It was the same case with vine-growing terrains of medieval Serbia as well. The famous medieval vine-growing areas (*stupovi*)[23] of Preradovac in Levča, Senjani near Orahovac, Kurilo, uphill from Prizren, and others, they were all located on mild hill slopes. The following verses from the Book of the Prophet Isaiah provide us with plen-

ty of information on activities that a winegrower had to perform in order to have an abundant and high-quality harvest, and, on the other hand, what occurs should he fail to do them in due time and in the correct manner: *And he fenced it, and gathered out the stones thereof, and planted it with the choicest vine, and built a tower in the midst of it, and also made a winepress therein: and he looked that it should bring forth grapes, and it brought forth wild grapes* (Isaiah 5: 2). *What could have been done more to my vineyard, that I have not done in it? wherefore, when I looked that it should bring forth grapes, brought it forth wild grapes?* (Isaiah 5: 4). The revolted winegrower makes a promise then: *And now go to; I will tell you what I will do to my vineyard: I will take away the hedge thereof, and it shall be eaten up; [and] break down the wall thereof, and it shall be trodden down* (Isaiah 5: 5). *And I will lay it waste: it shall not be pruned, nor digged; but there shall come up briers and thorns:*[24] *I will also command the clouds that they rain no rain upon it* (Isaiah 5: 6).

A pictorial description of those verses by Isaiah can be seen on the iconostasis at the Monastery of Dečani. On the fresco-painting named *Noah cultivates his vineyard*, the icon painter of the Monastery of Dečani *Grešni Srđ* (Ковијанић 1962: 36–37) gave a faithful description of the practice described in the Bible. The central plan of the icons shows Noah with a vineyard knife, picking large reddish clusters. The grapevine is growing from stones on mild hill slopes. Also, it provides a clear depiction of the manner of forming a grapevine trunk in medieval vineyards. There are canes growing directly from the trunk, three on each vine. Indirectly agreeing with this depiction of the manner of cultivation, we have these verses: *And in the vine [were] three branches:*[25] *and it [was] as though it*

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22 Depending on the manner of propagation, grapevine reaches full fertility potential around year five, and, depending on how well they were tended, can be productive for over 100 years.

23 This Book speaks of the life of the Prophet Isaiah, who lived in the end of the 8th century BC. The story takes place in the Kingdom of Judah, an area which comprehended the central part of today's Israel, between the Dead and the Mediterranean Sea.

24 *Stup* is a section of land covered with grapevine or another horticultural crop, which differs from the neighbouring ones by a certain quality they possess.

25 King James Bible specifically lists briers (*Rosa canina*), while the Serbian translation only mentions weeds. Brier rose is very well known in these areas, and its fruit is highly valued, by the name of rosehip.

budded, [and] her blossoms shot forth; and the clusters thereof brought forth ripe grapes (Genesis 40: 9, 40: 10). It is said that all three branches are in bloom and bearing fruit. The appearance of the vine from the fresco-painting and the description from the verses irresistibly remind us of a very old and widely spread manner of shaping vine trunks. It is known under many names, and almost all populations which cultivate grapevine know it and practice it. In France it is called goblet (*gobellet*), in Italy – little tree (*alberello*), and in Spain simply – vineyard (*viñedo*). Winegrowers from Serbia know it under the name of "župski" method of cultivation. It is modelled on a short trunk with three or several more canes which form a goblet-shaped crown. During the Middle Ages, vineyards with short trunks were called "lozije" in Serbia, thus denoting a clear difference in respect to those formed on a trellis or a different kind of canopy (Благојевић 2004: 116). The difference is not based merely on the visual aspect. Depending on the height and heaviness of the fruit and vegetative parts of the grapevine, it will bear grapes, and afterwards provide wine, of different quality.

In the verses of the Bible, vineyards are pruned and hoed without fail, as in the already quoted verses from the Book of the Prophet Isaiah. These basic agro-technical measures of winegrowing were unavoidable in vineyards of medieval Serbia as well. They are mentioned as fundamental in Article 11 of the Serbian translation of the Agricultural law (Νόμος γεωργικός). *If a farmer takes from an impoverished farmer a vineyard to work on it, under lease, and doesn't prune it properly, doesn't provide shade, and doesn't put on poles, and fails to hoe it twice, he shall receive none of the fruit* (Благојевић 2007: 55). The vineyard had to be tended in a proper manner or the lessee of that vineyard would lose the right to the yields from it. The description of obligation lists agro-technical measures which a medieval winegrower was to apply, even under obligation, if necessary. It is interesting to note that the adverb "properly" was mentioned when it came to pruning, thus implying

that this operation required a certain level of expertise. Pruning is a fundamental operation in the cultivation of grapevine. It is, in fact, so important, that we cannot speak of true vineyard cultivation or beginnings of winegrowing until some sort of vine pruning started to be applied on a regular basis. A historical example of this can be found at the Apennine peninsula during the clash of two cultures – Etruscan and Roman. On the basis of written data, confirmed by analyses of grapevine seeds, it was established that the Etruscans hadn't practiced pruning until the Romans, who were instructed by the Greeks and the Phoenicians, introduced this practice as fundamental in their vineyards. The difference between these two practices can be noted since the 3rd century BC. Pruned vine has larger seeds and berries, which provide grapes and wine of higher quality (Aversano *et al*. 2017: 11). The Bible forbids the eating of grapes from an unpruned vine: *neither gather the grapes of thy vine undressed* (Leviticus 25: 5). Similarly to this, the Romans forbade that wine be served during their feasts which was made of grapes from unpruned vines (Toussaint-Samat 2009: 243). Pruning provides larger grapes of higher quality, prolongs the life cycle and condition of the vine and enables many other good aspects, as proven by practice during the fellowship of men with this noble plant. In order to perform the pruning in a proper manner, certain tools are necessary. Tools for pruning canes of grapevine and picking grapes mentioned in the Bible are knives and sickles: *For afore the harvest, when the bud is perfect, and the sour grape is ripening in the flower, he shall both cut off the sprigs with pruning hooks, and take away [and] cut down the branches* (Jeremiah 18: 5); and also: *Thrust in thy sharp sickle, and gather the clusters of the vine of the earth; for her grapes are fully ripe* (Revelation 14: 18). And, indeed, the vineyards of medieval Serbia were pruned and grapes from them harvested with vineyard knives or billhooks. When it came to vines with low trunks, pruning resembled mowing (Ћирић 2017: 48).

The second fundamental operation in tending

vineyards is working on the land. Hoeing around vines is important for multiple reasons concerning the tending of grapevine. Winegrowers came to realise this very early on. Justinian's Code, in Article 14, demands that winegrowers "dig through and grub" their vineyards (Благојевић 2007: 99). Pruning and grubbing the soil[26] maintains the humidity, looseness, and favourable air conditions. A fact especially stressed by authors from the Antiquity[27] is that frequent hoeing and grubbing, in due time, eliminates weed and thorns, here probably comprehending, amongst others, dewberry (*Rubus caesius*) and similar plants from the bedstraw family (*Rubaceae sp.*). Even today, they are very invasive in places where vineyards were planted. The verse: *And I will lay it waste: it shall not be pruned, nor digged; but there shall come up briers and thorns: I will also command the clouds that they rain no rain upon it* (Isaiah 5: 6) says enough on the antagonism between grapevine and its weedy enemies, especially thorn bushes. The importance of pruning in due time was also stressed by numerous articles from Serbian medieval laws, statutes and charters. One of the most extreme examples can be found in the Saint Stephen Chryssobull[28] by King Milutin. The founding charter of the Monastery of Banjska is extreme because of the punishment it provides for those under work obligation who should fail to hoe a section of the monastery vineyard before Easter. *And everyone must hoe the vineyard, both priest and neophyte and peasant, and also master builders and all other workers. He who doesn't hoe it until Easter, an ox shall be taken from him* (Новаковић 1912: 625).

26 The technical term for a new branch – a one-year-old extension between nodes – is actually *canes*, but we won't hold it against the author of these beautiful verses.

27 The Agricultural law was also known as the Slav law, since it combined articles from Justinian's Code and custom laws of the Slavs. This fundamental document regulated obligations in villages and agrarian production. It is assumed that it was in use since the Serbian conquest of Byzantine territories in Macedonia, in the period of reign of King Milutin. *Cf.* Благојевић 2007.

28 The term is used here to describe shallow digging, performed with the goal of breaking the hard thin layer covering the surface of the soil.

Ahab said to Naboth: *Give me thy vineyard, that I may have it for a garden of herbs* (1 Kings 21: 2). Forming a garden along with grapevine, as well as intercropping[29] was not a rare occurrence in medieval vineyards. This practice originates from the Antiquity, as confirmed by numerous Antique authors. Bertius wrote that it was best not to sow anything in a vineyard, but that he knew, from practice, that winegrowers planted vetches, squashes and cucumbers (Geoponika 1805: 154). The Bible even provides a technical measure which regulates the application of intercropping in vineyards, that is to say, it forbids that more than two types of seed be sown in a vineyard. *Thou shalt not sow thy vineyard with divers seeds: lest the fruit of thy seed which thou hast sown, and the fruit of thy vineyard, be defiled* (Deuteronomy 22: 9). Seed propagation shows us that agricultural or, more often, vegetable crops were used for intercropping in vineyards. Intercropping was common in vineyards of medieval Serbia as well. They enabled the husbandmen to have additional income and softened the economic loss created through long periods of waiting for the vineyard to reach the period of optimal fertility. In the area of the Adriatic, plants from the gourd family were often planted along grapevine, while sharing the same fate. Jiriček wrote that in 1336 the prior of the Monastery of Saint Jacob near Dubrovnik pressed charges against two neighbouring noblemen, Milten and Ruđer, who sacked the vineyard and orchard of the Monastery, especially the gourd garden with muskmelons, with their horseman (Јиречек 1978: 286).

Cui rei maxime videtur esse idonea opulus: ea est arbor corno similis (Columella 1745: 235) – Columella's description of red guilder rose (*Viburnum opulus*), which he considered to be the ideal species for supporting the dense growth of grapevine canes. Ever since the Antiquity, grapevine has been cultivated along the trunks of different trees, often fruit, which provide support for it or

29 One of the examples is a recommendation by Columella not to impose limitations on the number of times the soil is hoed, and that the only limitation should be the price for performing this operation. *Cf.* Columella 1745: 166.

simply grow along with them in some sort of orchard-vineyard, thus creating a specific agro-ecological unit. In the Song of Songs, the protagonists of the verses go into the vineyard to see if the vine has begun to flourish and pomegranate bloom: *Let us get up early to the vineyards; let us see if the vine flourish, [whether] the tender grape appear, [and] the pomegranates bud forth* (Song of Songs 7: 12). Pomegranate (*Punica granatum*) is a beautiful ornament of Mediterranean gardens and orchards typical for the Levant, which do not succeed very well in the humid continental climate. In continental parts of medieval Serbia, grapevine wasn't growing along pomegranate bushes, but rather in the company of apples, pears, cherries. According to Blagojević, we learn from the Practicum of Hilandar about the grapevine which grew in an orchard with the surface of one cable and a half: *... лозиѥ второ садьно сь ѡвоштиѥмь кьблѳ и поль...* (Благојевић 2004: 116).

During the Middle Ages, vineyards were often fenced. A fence around a vineyard was, in fact, a necessary agro-technical measure, regulated by law, in medieval Serbia. Article 55 (among others) of the Serbian transcript of the Agricultural law warned that: *He who sets the fence of a vineyard on fire, is to be beaten and his hand branded, but also has to compensate for the damage by twofold* (Благојевић 2007: 67). Aside from wooden fences, vines and their valuable fruits were protected from unprincipled people and hungry animals by raising stone walls, digging trenches, setting up legholds and other traps, and even by raising towers (*pirg*) in vineyards. Stone walls – drywalls (*suvomeđina*) were frequent means of protection of vineyards in verses of the Bible: *But the angel of the LORD stood in a path of the vineyards, a wall [being] on this side, and a wall on that side* (Numbers 22: 24).[30] Drywalls were widely diffused in vineyards of medieval Serbia as well, especially along the

Adriatic coast, which has similar ecological conditions (climate and soil type), but also the dominant raw material (stone) for making fences as that near the Dead Sea, where the events from the verses of Moses take place. Verses from the Proverbs of Solomon tell us how the vineyard of a lazy man is covered with nettles, and the wall of the vineyard collapsed, directly linking successful tending of the vineyard with fences: *I went by the field of the slothful, and by the vineyard of the man void of understanding; And, look, it was all grown over with thorns, [and] nettles had covered the face thereof, and the stone wall thereof was broken down* (Proverbs 24: 30, 24: 31). Towers in monastery vineyards at Mount Athos are not a rare occurrence, e.g. the tower of King Milutin[31] in the vineyards of the Monastery of Hilandar. Watchtowers were built as the final line of defence and refuge in tumultuous times of the Middle Ages, and their building in vineyards can be understood in two manners. One speaks of the value of grapevine per se, and the other of the position of vineyards on the properties owned by monasteries, since they were often built on inaccessible places, where other agricultural crops couldn't have been cultivated with success.

The Bible also abounds in descriptions of the climate which is favourable for the cultivation of grapevine. Successful cultivation of grapevine requires humidity. Therefore, God promises true believers that they will have rain in due time: *Then I will give you rain in due season, and the land shall yield her increase, and the trees of the field shall yield their fruit* (Leviticus 26: 4). Verses which compare peacefulness with ideal climate conditions during the time of harvest are especially interesting: *For so the LORD said unto me, I will take my rest, and I will consider in my dwelling place like a clear heat upon herbs, [and] like a cloud of dew in the heat of harvest* (Isaiah 18: 4). Morning dew is one of the representative traits for the quality of fruit and grapes. It is created when cold nights

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30 This charter of King Milutin was written after he finished building his sepulchral foundation, in the middle of the first decade of the 14th century. It lists in detail all properties given to the Monastery of Banjska and the obligation of the serfs towards it. C*f.* Новаковић 1912: 623.

31 Intercropping is a practice in which additional plants are planted in-between the rows of the basic plants which are being cultivated, most commonly fruit and grapevine.

and warm days alternate, most commonly in late summer and early autumn, i.e. in the period when grapes are harvested. This alternations provide that metabolism products, created in fruit during warm days, and large accumulation of sugar and other elements of quality remain preserved in fruit through diminished activity (breathing) during cold nights.[32]

In every consideration of the potentials of a winegrowing area, the starting point are always the dominant varieties in vineyards of that climate. Even though it's not very likely that varieties described in the verses of the Bible found their place in vineyards of medieval Serbia, it isn't entirely impossible. During the Middle Ages, there was a dynamic flow of people and goods between different areas of Europe, Northern Africa and Near East. Thus, for example, numerous pilgrims who went to the Holy Land, merchants, diplomatic missions, and even soldiers of the Crusades, could have easily taken with them canes[33] from the Near East into their own homelands. We don't know the exact names of varieties from the Bible, but there are wonderful descriptions of them. The Book of the Prophet Isaiah favours the variety with intense red colour of canes: *For the fields of Heshbon languish, [and] the vine of Sibmah: the lords of the heathen have broken down the principal plants[34] thereof, they are come [even] unto Jazer, they wandered [through] the wilderness: her branches are stretched out, they are gone over the sea* (Isaiah 16: 8). In ampelographic descriptions[35] there are

varieties with reddish-violet coloured branches / canes, but they are not that common. Therefore, the vines of Sibmah must have stood out in respect to the usual dark, yellow or brownish canes. On the Balkans peninsula, there were vineyards with canes in shades of red ever since the old times. *Ružica*, *prokupac* and *skadarka*; all these are varieties originating from the Balkans (*convarietas pontica, subconvarietas balcanica*), which have this particular characteristic (Cindrić *et al*. 1994, 23, 169, 225, 226). Perhaps the closest ones to the original vine from Sibmah are varieties from the chasselas group (*conculta Chasselas*), who are known in Serbia under their term of endearment – *plemenke*. Naturally, we cannot confirm the existence of chasselas in the verses of the Bible, however, aside from the similar canes colour, they have in common the fact that these are both very old varieties, originating from the Near East. According to their ecological-geographic attribution, they belong to *convarietas orientalis, subconvarietas caspica, provarietes aminea*, originating from the basin of the Caspian Sea (Cindrić *et al*. 1994: 23, 259). We learn from the verses that the vine of Sibmah spread spontaneously from Jazer all the way to the sea, most probably the Dead Sea.[36] Spontaneous spreading, without any interventions of men, would have been conducted, logically, with seeds being transported by animals which were attracted by its sweet fruits.

A poetical description of clusters can be seen in the Song of Songs: *now also thy breasts shall be as clusters of the vine* (Song of Songs 7: 8). Comparing berries or clusters with breasts is not uncommon in the history of winegrowing. The same influence can be seen with Antique authors who named one variety *Bumast* (Columella 1745: 108). According to Varro, it was named thus because of the remarkable similarity of its clusters with cow udder, in Latin *bumamma* (Res rusticae, Wikisource.org). In house gardens of Serbia, a variety called popularly *goat's tits* has been cultivated for

32 The coolness of the night is expressed through indexes. Very cool nights (marked as IF_4), combined with optimal conditions from the normal ripening of grapes, enable top-notch quality, characterized by a better aroma and berries with more intense colours. *Cf*. Nakalemić 2001: 130.

33 Grapevine can be easily propagated via canes, out of which seedlings can be made, which can be planted as cuttings or used for grafting. It is important that they be taken, for this purpose, during the period of winter (biological) stagnation.

34 While King James Bible doesn't specify the colour of the canes, it is a matter directly stated in the Serbian translation.

35 Modern ampelography is based on standards which can differ from descriptions given by Antique authors. That is why, under the section of canes colour (OIV, code 103), there are four characteristics listed. The one closest to red

is reddish-violet (OIV 2001).

36 The Dead Sea is at the distance of ca 25 km from the Antique city of Jazer.

a very long time. It was named thus because of its distinctive berries. Aside from this, the comparison from the verses probably went in the direction of the size of clusters, a property which is the first one to define a variety of grapevine, along with the colour of the berries. In the Antiquity, they had already known of varieties with sparse clusters. The Book of Job compares a wicked man with a grapevine casting off unripe fruit. *He shall shake off his unripe grape as the vine, and shall cast off his flower as the olive* (Job 15: 33). Sparseness is precisely an occurrence when the vine, because of a lower level of pollination, fails to create berries, which thus either never form or fall off early, making the clusters straggling, sparse.

The importance of various varieties of grapevine, but other cultivated crops as well, enticed the cultivators to begin, since the early period of cultivation of plants, with their selection. Selection was performed, in a conscious or unconscious manner, by farmers in medieval Serbia as well. In the Gospel of Matthew, the Bible explicitly says: *Do men gather grapes of thorns, or figs of thistles?* (Matthew 7: 16). *A good tree cannot bring forth evil fruit, neither [can] a corrupt tree bring forth good fruit. Every tree that bringeth not forth good fruit is hewn down, and cast into the fire* (Matthew 7: 18, 7: 19). This form of selection is called massive negative selection, and it is easily put in action by removing those species which don't meet the needs of husbandmen. We do not know if trees with bad qualities were burned during the Middle Ages, but they were certainly omitted when branches for grafting were taken (or canes, or other vegetative material for obtaining seedlings). Bearing witness of the existence of a conscious choice of grapevine varieties during the Middle Ages is the old Serbian variety *skadarka*. Rumanian ampelographist Cosme assumed that it had arrived into the area of the Pannonian valley during the migration of the Serbs in the 17th and the 18th century (Cindrić *et al*. 1994: 227). The fact that the people took canes of this variety, along with personal items and holy relics, into the unknown and a new life, speaks

enough of their value. Properties required from grapevines and their fruit varied as much as the characters of people who tended them. It is safe to assume that fertility and appealing taste of the fruit were desirable qualities during the entire period of selection of this noble plant. We will conclude the confirmation of the quality estimation of different varieties of fruit and grapevine by medieval winegrowers with these words: *Wherefore by their fruits ye shall know them* (Matthew 7: 20).

Harvest represents the pivotal period of every winegrowing season. The Bible contains verses which provide us with approximate harvest time: *And your threshing shall reach unto the vintage, and the vintage shall reach unto the sowing time* (Leviticus 26: 5). Harvests which begin with threshing and end with the beginning of sowing time tell us that different varieties were cultivated in vineyards, with different ripening time. On the basis of the time of harvesting and sowing crops mentioned in the Bible, we cannot determine the optimal harvest time.[37] Whenever it was that winegrowers picked grapes, they had to pick them only after they ripened. As verses from the Book of the Prophet Jeremiah say: *every man that eateth the sour grape, his teeth shall be set on edge* (Jeremiah 31: 30). Article 48 of the law of the tribe Paštrović also stipulates that only ripe grapes should be picked:[38] *He who should start picking grapes before the Nativity,*[39] *let his grapes be given to the poor from the village, and his wine be drunk* (Новаковић 1912: 109). Chapter 96 of the Statute of Budva strictly stresses the importance of timely harvest: *On forbidding to press charges*

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37 It is not by chance that the Bible lists numerous types of grain. Starting with barley, which was reaped first, wheat, flax, millet etc. were harvested from the fields. They all have different times of sowing and reaping, especially when we take into consideration the difference between summer and winter crops.

38 The Statute of the župa of Grbalj near Budva and the tribe Paštrović. *Cf.* Новаковић 1912: 104-105.

39 The Nativity of the Blessed Virgin Mary is celebrated on the 21st of September according to the Julian calendar, i.e. on the 5th of October according to the Gregorian calendar, which was in use at the time when this law was written.

during harvest and vintage. We forbid that any of our citizens press charges against another during the time of harvest, i.e. from Saint Vito's Day up to Saint Elijah's day, and during the time of vintage, i.e. From Saint Mary's day in August up until Saint Michael's Day in September (Средњовековни статут Будве 1988: 36). The period between these two feasts (the 4th of August – the 19th of September, according to the Gregorian calendar) was the optimal time for obtaining high-quality vintage from the winegrowing areas near Budva, hence, no hindrances were allowed in those days.

It is interesting to note that numerous verses from the Bible demand that winegrowers shouldn't pick all the grapes from the vineyard, but instead leave some for the poor, travellers, birds and various beasts. One of them says: *neither shalt thou gather [every] grape of thy vineyard; thou shalt leave them for the poor and stranger: I [am] the LORD your God* (Leviticus 19: 10). Judging by these verses, during the harvesting of grapes, not all of it was taken from the vineyards. The ones from sprouts, which weren't ripe enough, and the ones which fell on the ground, for being too ripe, or had another problem, were left behind. *Jagurida*[40] and grapes which have fallen to the ground significantly differ from those of top-notch quality. Harvesting time, as well as the attention dedicated to the quality of grapes tells us that medieval winemakers held firmly onto the truth that *wine is made in the vineyard*. Only completely ripe and hygienically clean grapes are good enough to end up in wine.

We don't know which percentage of grapes from vineyards ended up on the table, and which went on to wine presses during the Middle Ages. It is certain, however, that through processing, fermentation or drying, the nutritive value of grapes prolonged their expiration period. Hence, we see that in verses from the Bible winefats and wine presses went along with vineyards without fail: *There was a certain householder, which planted a*

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40 *Jagurida* is a type of grapes which grows on barren canes. Since it was formed during the summer, it reaches technological ripeness in late autumn, if it manages to reach it at all before the autumn frost.

vineyard, and hedged it round about, and digged a winepress in it, and built a tower, and let it out to husbandmen, and went into a far country (Matthew 21: 33). This way, we have confirmation that must and wine were considered as basic nutritional elements, whose quantity and quality made part of the general life standard. Sufficient is said by the verse in which grapevine declines the possibility of becoming the emperor of plants: *And the vine said unto them, Should I leave my wine, which cheereth God and man, and go to be promoted over the trees?* (Judges 9: 13). It is with these words that *grapevine* stresses the importance of its fruit and the impossible demand to deny it to the people, and leave them without it. Wine was an important nutriment on medieval monks' tables. Thus, Saint Sava prescribes its use in the Typikon of Hilandar – in everyday life (chapter 9) and during fasting periods (chapter 10). An extract from chapter 10, On Sacred fasts, the Grand fast and two small ones, in celebration of the Holy Apostles and Christ's birth, stipulates that: *And on Saturday and Sunday during these sacred fasts, there shall be two meals: vegetable stew on oil and octopods. And the beverage (wine) should be the usual large measure. Thus you shall have (...) and on Tuesdays and Thursdays, let two different meals be brought before you, but not both of them with oil, but just one. And when wine is measured, small measure should be used, which is one half of the large one. And on other days: that is to say, Monday, Wednesday and Friday, no stewed meal and no wine shall be taken, but only lentils prepared with water and some fruit, and water beverage with cumin* (Новаковић 1912: 353).

Numerous products made of grapes are mentioned in the Bible: *He shall separate [himself] from wine and strong drink, and shall drink no vinegar of wine, or vinegar of strong drink, neither shall he drink any liquor of grapes, nor eat moist grapes, or dried* (Numbers 6: 3). *All the days of his separation shall he eat nothing that is made of the vine tree, from the kernels even to the husk* (Numbers 6: 4) – almost all which can be used from grapes. Dried grapes (raisins) are

a common mode of preservation of fresh grapes. They are mentioned in several verses: *Stay me with flagons[41], comfort me with apples: for I [am] sick of love* (Song of Songs 2: 5). Undoubtedly, monks' tables abounded with dried fruit during the periods of fasting in the Middle Ages; figs, pears, grapes. It is interesting to note that the verse quoted from Numbers 6:4 mentions eating unripe grapes. While talking about data found in the Archive of Dubrovnik, Blagojević enumerated frequent cases of stealing grapes in the middle of July (Благојевић 2004: 131). There are few varieties of grapevine which can reach full ripeness at this period of the year. Hence, even though unripe grapes didn't fulfil quality norms, they were still being stolen. Similarly to this, grape husk is, in fact, a nus-product created during the vinification of grapes, i.e. processes of stomping and pressing.

We can judge the quality of Biblical wine on the basis of its vinification as described by several verses. The first action taken to produce wine is *pigeage* – grape stomping: *A [certain] man planted a vineyard, and set an hedge about [it,] and digged [a place for] the winefat* (Mark 12: 1) Winefats and wine presses in vineyards make it possible for grapes to be processed rapidly, thus diminishing the possibility of flaws and damage in must and, later, wine, caused by oxidation and high temperature. Similarly to this, special objects were built in vineyards of medieval Serbia: wineries, wine cellars, meadows used for quick processing of grapes and optimal storage of wine. In The Charter of the Holy Archangels, Emperor Dušan says: *I declare [that this place will represent] for this church of my Empire a granary, and winery, and the protector of the church instead of a tower* (Новаковић 1912: 683). Grapes were stomped by feet in presses: *the treaders shall tread out no wine in [their] presses* (Isaiah 16: 10). In the following verse, we see a description of an intense fermentation: *For in the hand of the LORD [there is] a cup, and the wine is red; it is full*

of mixture[42]; and he poureth out of the same: but the dregs thereof (Psalms 75: 8). Once the fermentation would be finished, the wine was either poured out or left on the lees. *Moab hath been at ease from his youth, and he hath settled on his lees, and hath not been emptied from vessel to vessel, neither ... therefore his taste remained in him, and his scent is not changed* (Jeremiah 48: 11). The Bible gives a faithful description of technological processes linked to wine production. Depending on whether the wine was poured out immediately or left to age on the lees for a while, different results are obtained. During the aging on the lees, wine components are released into it, yeast et al. Zoecklein writes that those can have a positive impact on the increase of phenol, the quality of texture, richness of aroma and stability of wine – its durability (Zoecklein 2012). The intensity of colour in red wine is slightly lessened with the absorption of yeast from the lees, making it turn paler: *Look not thou upon the wine when it is red* (Proverbs 23: 31). White wine, on the other hand, after remaining on the lees, becomes golden-yellow due to slight oxidation.

Two terms provide a clear distinction between how old the wine served on tables was. In the Bible, we find verses mentioning new wine and old wine. New wine can be understood in two senses: as must – freshly crushed grape juice, and as wine which only just finished fermenting. It is definitely must when Isaiah writes: *As the new wine is found in the cluster* (Isaiah 65: 8) or in the dream of the Cupbearer: *And Pharaoh's cup [was] in my hand: and I took the grapes, and pressed them into Pharaoh's cup* (Genesis 40: 11). Contrary to that, new wine, only just separated from the lees, can be seen in the following verse: *No man also having drunk old [wine] straightway desireth new: for he saith, The old is better* (Luke 5: 39). Old wine had a higher value in the Antiquity. Thus, we may see the following verses: *And no man putteth new wine into old bottles; else the new wine will burst the*

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41 In the Serbian translation, instead of flagons, we have dry grapes; however, the Russian translation we used also mentions wine, not dry grapes.

42 In the Serbian translation, the wine in question is described as foaming. In this case, however, the Russian translation coincides with the Serbian.

bottles, and be spilled, and the bottles shall perish. But new wine must be put into new bottles; and both are preserved. (Luke 5: 37, 5: 38)[43]. Wineskins were made from the entire skin of the animal, in one piece, which was tanned. In time, the leather would become hard and lose elasticity. Therefore, one shouldn't put new wine into an old wineskin, because alcoholic fermentation would continue in it. Because of this fermentation, the hardened leather of an old wineskin would most probably crack. On the other hand, new wineskins had more elasticity and they could endure the pressure created by the release of carbon dioxide. Different quality categories were also defined for wine. It could have been sour, but also the best (in comparison to others). The already mentioned verse from the Song of Songs, aside from clusters, also compares wine to the beloved person: *And the roof of thy mouth like the best wine* (Song of Songs 7: 9). In several verses, wine with higher concentration of alcohol is mentioned: *Thou hast shewed thy people hard things: thou hast made us to drink the wine of astonishment* (Psalms 60: 3). A mention of sweet wine is provided by King James Version: ... *and the mountains shall drop sweet wine, and all the hills shall melt*[44] (Amos 9: 13). High alcohol level or larger amounts of sugar which remained in the wine could have been the consequence of additions of some sort or using grapes with higher sugar concentration in the must. Both practices have been known ever since the Antiquity, and they have continued up to today. In the middle of the 14th century, it was forbidden to serve wine with the addition of honey (*molza, mellatum*) from continental parts of Serbia in taverns of city municipalities at the Adriatic (Čremošnik 1933: 25).

Finally, the Bible offers us a description of exotic cultivation of vineyards, orchards and fields: *Six years thou shalt sow thy field, and six years thou shalt prune thy vineyard, and gather in the fruit thereof; But in the seventh year shall be a sabbath of rest unto the land, a sabbath for the LORD: thou shalt neither sow thy field, nor prune thy vineyard. That which groweth of its own accord of thy harvest thou shalt not reap, neither gather the grapes of thy vine undressed: [for] it is a year of rest unto the land* (Leviticus 25: 3, 25: 4, 25: 5). The described manner of tending a vineyards has no parallel in any of the winegrowing techniques that the author is familiar with. It is possible that it is mentioned in the Bible only because of its symbolic value, but it is worth considering what would occur if a vineyards is not tended during every vegetation cycle. We know that a vineyard can be brought into the regular state of care, with a higher or smaller degree of success, even after several years of neglecting; if pruning, hoeing is omitted etc. One of the necessary conditions for that is that, during that pause, no severe epidemics of dangerous fungal diseases should occur, such as powdery mildew (*Uncinula necator*), grey mould on the grapes (*Botryits cinerea*) and especially downy mildew (*Plasmopara viticola*), which could lead to the drying of the vines. Judging by the verses from the Bible, but also the information from the Middle Ages, or, to be more precise, the lack thereof,[45] those listed diseases didn't represent a significant problem. According to the verses from the Bible, the only problems in vineyards, aside from the human factor, were caused by worms, foxes and other earthly creatures: *Take us the foxes, the little foxes, that spoil the vines: for our vines [have] tender grapes*[46] (Songs Of Songs 2: 15).

Leaving the vineyard to take care of itself

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43 Again, it should be noted that instead of the word bottle, word wineskin is used, more appropriately, in the Serbian translation.

44 In the Serbian translation, literally: *From mountains grape juice shall drop, and all the hills shall melt.*

45 Any epidemics of the mentioned diseases would certainly have been noted in history, for, unless they are brought under control, they cause an almost complete devastation of winegrowing terrains on which they occur. An example of this can be found in the middle of the 19th century, when their occurrence in European vineyards lead to a permanent change in the manner in which winemakers tend their vineyards.

46 While the Serbian translation talks about grapevines in bloom, King James Version talks about *tender grapes* (Song of Songs, 2:15). Those tender grapes can be taken as a description of the phenophase of berries, which follows the bloom.

leads to auto-regulation of the yields and vegetative parts of the grapevine, which leads to some sort of equilibrium being achieved, where the vine frees itself from the excess of fruit by letting it fall or of the surplus of green mass by letting it dry. However, when considering a vineyard left without any human intervention, we wouldn't be able to speak of winegrowing in the true sense of the word. Omitting to prune diminishes the activation of nodes, which, in a way, preserves the vegetative potential (strength) of the vine. However, even with these explications of the consequences of applying this agro-technical measure, we still don't have enough arguments on the basis of which we could deduce reliable conclusions.

* * *

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REZIME
SVETO PISMO KAO IZVOR PODATAKA O SREDNJOVEKOV- NOM VINODELSTVU U SRBIJI

KLJUČNE REČI: SVETO PISMO, VINODELST- VO, SREDNJI VEK, SRBIJA, PISANI IZVORI.

Upoređivanjem dostupnih izvora vidi se da je Sveto pismo direktno i indirektno uticalo na vinodelstvo srednjovekovne Srbije. Njegovi stihovi su predstavljali norme, propise i savete primenjivane u srednjovekovnim zakonicima, statutima i još direktnije sprovedeni u vinogradarskoj i vinarskoj praksi. U to nas ne uveravaju samo pisani i oslikani izvori tog perioda već i logika poljoprivredne proizvodnje. Za neke stihove nema konkretnih dokaza već samo pretpostavke. Sveto pismo ne otkriva određene sorte koje su sađene u vinogradima srednjovekovne Srbije ili bolesti koje su činile probleme u istim. Drugi stihovi su pak opšte poznati svakome ko se bavi negom vinove loze i vina. Okopavanje, rezidba, vino koje stoji na talogu, štetnost prekomernog ispijanja vina i drugi termini su bili vrlo bliski srednjovekovnom vinodelcu u Srbiji. Ovim radom se želi dokazati autentičnost reči iz Svetog pisma koji se odnose na vinovu lozu i vino kao i njihova interakcija sa srpskim srednjovekovnim vinodelstvom. Takođe u njemu su iznete potvrde vinogradarskih praksi koje su izvođene tokom srednjeg veka. Zanimljive su i prakse koje nisu potvrđene sa srednjovekovnim izvorima. Ostavljanje vinograda bez nege jednu vegetaciju verovatno nije bila voljna akcija vinodele, jer bi zbog toga bio kažnjen od strane crkve, vlastelina, vlasnika vinograda koji je uzeo u zakup. Iz svega navedenog reči Svetog pisma u saradnji sa drugim izvorima podataka o srednjovekovnom vinodelstvu i njihova eksperimentalna izvedba pomažu da se shvate mehanizami u kojima su negovani vinogradi i nastajalo vino srpske srednjovekovne države.

VANJA KORAĆ
Mathematical Institute SASA
Belgrade, Serbia
E-mail: vanja@mi.sanu.ac.rs

DRAGAN PRLJA
Institute for Comparative Law
Belgrade, Serbia

WEB SERVER SECURITY ASPECT

ABSTRACT

This work covers a security aspect when it comes to designing a secure web server that uses certain public services and public open source software. The uninstalling of unnecessary applications and services has been performed, since unnecessary applications or services can be vulnerable, thus resulting in a potential intrusion vector. A metric that is crucial for the system is defined. Since the database is an essential part of the web server, the required processor power, amount of memory, network speed and disk capacity are defined, so that the server can provide service in all conditions of operation without being disturbed. The metric is important in the phase when the parameters are defined according to which the system will operate, such that the parameters can be checked. Also, a vulnerability scan of the operating system must be performed after the implementation of the security mechanisms.

KEY WORDS: INTRUSION DETECTION ENVIRONMENT, VULNERABILITY SCAN, SSH BRUTE-FORCE PREVENTION.

WEBSERVEROPERATINGSYSTEM

The operating system on which the web server was launched is **Ubuntu 16.04.2 LTS**.[1] The name of the server is demo.mi.sanu.ac.rs, and the IP address of the server is ###.###.###.###.[2]

The RSA2 key fingerprint (ssh-rsa) of the server is:

demo.mi.sanu.ac.rs ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQDL2lelofsoQD-

SpQwELhC6qpjI73lNXKoa0FVIh61w7L-4rn9hfbSWg2P3wYPHJUHceMSFQY-W4sa9+MPEY1mz4Bug/NvA82gwaRw6L6M/a2/ntdaYZHMpzQ5nWpv71wgKUBoIIftLBP-POkzRv1PO7koy/LXnkE6tcmdVmE8MUnfnP-GALPew8+s7XZE/4T6lKvzdfBBCPecrNE2E-atqr9uU+7qjoM0OhpF12SeeMNezuLT2P/r4/RPigomzkiHjMt9PpykAjGsxDuvfuCvhuYHlxw-mTKZCVOKMprYgdqVM00yv6b0FbV/PJFAx-VavMafYbud2cGuR5nIZO7JcA7N+eXdh

The ECDSA key fingerprint is:

demo.mi.sanu.ac.rs ecdsa-sha2-nistp256

AAAAE2VjZHNhLXNoYTItbm-lzdHAyNTYAAAAIbmlzdHAyN-TYAAABBBApODNJa1cxRoXN0BM-PUJOPQvf9o/6E4at9DG59kYxJhmtjlrSa/FGbztp7pD5j8Mou8RaaF5A+BiAucZBajC58=

2 For security reasons, the IP address is not displayed, and the name of the server on which the protection measures have been implemented has been changed.

SERVICES ON THE OPERATING SYSTEM

Only the necessary services of ssh, mysql, apache, and postfix were booted on the system. The following ports are used on the server: 22(sshd), 25(smtp) and 80 (httpd).

MODULE FOR TESTING FILE AND DIRECTORY INTEGRITY

The AIDE (Advanced Intrusion Detection Environment) module for testing files and directories is applied on the system[3]. AIDE creates a database with regular expression rules read from the configuration file. After initialisation of the database, the verification (integrity check) of the files can be performed. There are several different Message Digest algorithms used for the file integrity check. The supported algorithms are as follows: md5, sha1, rmd160, tiger, crc32, sha256, sha512, and whirlpool (and with libmhash: gost, haval, and crc32b). Support for the file attribute check includes: File type, Permissions, Inode, Uid, Gid, Link name, Size, Block count, Number of links, Mtime, Ctime and Atime. The following algorithms "sha256+sha512+rmd160+haval+gost+crc32+tiger" were applied on the demo.mi.sanu.ac.rs server. All of the usual file attributes can be checked for inconsistencies. (Korać, Todorović and Mihaljević 2017).
AIDE has the following configuration:
# AIDE conf
# The daily cron job depends on these paths
database=file:/var/lib/aide/aide.db
database_out=file:/var/lib/aide/aide.db.new
database_new=file:/var/lib/aide/aide.db.new
gzip_dbout=yes

summarize_changes=yes

grouped=yes
verbose = 6

---

3 http://aide.sourceforge.net/.

# Set to yes to print the checksums in the report in hex format
report_base16 = no

# if you want to sacrifice security for speed, remove some of these
# checksums. Whirlpool is broken on sparc and sparc64 (see #429180,
# #420547, #152203).
Checksums = sha256+sha512+rmd160+haval+gost+crc32+tiger

# The checksums of the databases to be printed in the report
# Set to 'E' to disable.
database_attrs = Checksums

# check permissions, owner, group and file type
OwnerMode = p+u+g+ftype

# Check size and block count
Size = s+b

# Files that stay static
InodeData = OwnerMode+n+i+Size+l+X
StaticFile = m+c+Checksums

# Files that stay static but are copied to a ram disk on startup
# (causing different inode)
RamdiskData = InodeData-i

# Check everything
Full = InodeData+StaticFile

# Files that change their mtimes or ctimes but not their contents
VarTime = InodeData+Checksums
# Files that are recreated regularly but do not change their contents
VarInode = VarTime-i

Files that change their contents during system operation

VarFile = OwnerMode+n+l+X

# Directories that change their contents during system operation
VarDir = OwnerMode+n+i+X

# Directories that are recreated regularly and change their contents
VarDirInode = OwnerMode+n+X

# Directories that change their mtimes or ctimes but not their contents
VarDirTime = InodeData
# Logs grow in size. Log rotation of these logs will be reported, so
# this should only be used for logs that are not rotated daily.
Log = OwnerMode+n+S+X

# Logs that are frequently rotated
FreqRotLog = Log-S

# The first instance of a rotated log: After the log has stopped being
# written to, but before rotation
LowLog = Log-S

# Rotated logs change their file name but retain all their other properties
SerMemberLog =Full+I

# The first instance of a compressed, rotated log: After a LowLog was
# compressed.
LoSerMemberLog = SerMemberLog+ANF

# The last instance of a compressed, rotated log: After this name, a log
# will be removed
HiSerMemberLog = SerMemberLog+ARF

Not-yet-compressed log created by logrotate'sdateext option:
These files appear one rotation (renamed from

the live log) and are gone
# the next rotation (being compressed)
LowDELog = SerMemberLog+ANF+ARF

# Compressed log created by logrotate'sdateext option: These files appear
# once and are not touched any more.
SerMemberDELog = Full+ANF

# For daemons that log to a variable file name and have the live log
# hardlinked to a static file name
LinkedLog = Log-n

/journals Full
/usr/share/exist-db/webapp/WEB-INF/data Full
/home/bibladmin/exist_backup Full

E-mail sending after the integrity check was adjusted to operate every 24h at 07h.
/etc/default/aide
# Set this to no to disable daily aide runs
CRON_DAILY_RUN=yes
MAILTO=####@mi.sanu.ac.rs (#### has been placed in this report due to security reasons)

Postfix log after sending the AIDE report:

July 25 21:55:35 demo postfix/qmgr[2741]: 2D1EDCC0C7B: from=<root@demo.mi.sanu.ac.rs>, size=92790, nrcpt=1 (queue active)
July 25 21:55:35 demo postfix/smtp[8922]: 2D1EDCC0C7B: to=<###@mi.sanu.ac.rs>, relay=mi.sanu.ac.rs[147.91.96.2]:25, delay=0.13, delays=0.05/0.01/0.01/0.05, dsn=2.0.0, status=sent (250 2.0.0 v6PJtZUu026615 Message accepted for delivery)
July25 21:55:35 demo postfix/qmgr[2741]: 2D1EDCC0C7B: removed

MODULE FOR THE PREVENTION OF A BRUTE-FORCE ATTACK ON THE SSH SERVER

The denyhosts module, which prevents brute-force attacks on the SSH service of the server, has been implemented. A brute force attack is a method used by malicious attackers to obtain access to servers, by using hundreds and thousands of random combinations of user names and passwords. This module is designed to prevent a brute-force attack on the SSH server, by tracking inadequate attempts of logging into the system from the authentication log file of the server itself, blocking malicious IP addresses through/etc/hosts.deny.

DENYHOST CONFIGURATION

On Ubuntu Linux systems, the mode in which this module is started is daemon mode and the associated configuration file is /etc/denyhosts.conf.
\# Debian and Ubuntu
SECURE_LOG = /var/log/auth.log
\# Most operating systems:
HOSTS_DENY = /etc/hosts.deny
\#
\# PURGE_DENY: removed HOSTS_DENY entries that are older than this time
\#   when DenyHosts is invoked with the --purge flag
\#
\#   format is: i[dhwmy]
\#   Where 'i' is an integer (eg. 7)
\#   'm' = minutes
\#   'h' = hours
\#   'd' = days
\#   'w' = weeks
\#   'y' = years
\#
\# never purge:
PURGE_DENY =
\# To block only sshd:
BLOCK_SERVICE =sshd

\# DENY_THRESHOLD_INVALID: block each host after the number of failed login
\# attempts has exceeded this value. This value applies to invalid
\# user login attempts (eg. non-existent user accounts)
\#
DENY_THRESHOLD_INVALID = 3
DENY_THRESHOLD_VALID = 5
DENY_THRESHOLD_ROOT = 2
DENY_THRESHOLD_RESTRICTED = 1
WORK_DIR = /var/lib/denyhosts
ETC_DIR = /etc
SUSPICIOUS_LOGIN_REPORT_ALLOWED_HOSTS=YES
HOSTNAME_LOOKUP=NO
LOCK_FILE = /run/denyhosts.pid
ADMIN_EMAIL = ###@mi.sanu.ac.rs
SMTP_HOST = XXX.XXX.XXX.XXX ()
SMTP_PORT = 25
SMTP_FROM   =   DenyHosts<nobody@localhost>
SMTP_SUBJECT = DenyHosts Report
ALLOWED_HOSTS_HOSTNAME_LOOKUP=NO
AGE_RESET_VALID=5d
AGE_RESET_ROOT=25d
AGE_RESET_RESTRICTED=25d
AGE_RESET_INVALID=10d
DAEMON_LOG = /var/log/denyhosts
DAEMON_LOG_MESSAGE_FORMAT   = %(asctime)s - %(name)-12s: %(levelname)-8s %(message)s
DAEMON_SLEEP = 30s
DAEMON_PURGE = 1h
SYNC_DOWNLOAD = no

ENABLED FIREWALL

The firewall that is located in the kernel itself is a mechanism that manages network traffic (network packets). Its frontend is called iptables. It controls incoming and outgoing traffic, and routing and network address translation (NAT) can be performed. Iptables does not analyse the content of network packages (tcp/ip/udp), but it can function as a stateful firewall, on the basis of which connections can be paired. For example, the ftp protocol operates on two channels over ports 20 and 21, where one channel serves for data flow and the other for connection control. Iptables is aware of such connections and if there are such so-called stateful linked connections, it dynamically allows the required connection.

Logging of root users via ssh is not allowed with password only. Logging with root account via ssh is possible only with the help of a private ssh key.

The applied firewall on the demo.mi.sanu.ac.rs server has the following configuration:

root@demo:~# ufw status

Status: active

To	Action	From
22	ALLOW	Anywhere
80	ALLOW	Anywhere
443	ALLOW	Anywhere
8080	ALLOW	Anywhere
22 (v6)	ALLOW	Anywhere (v6)
80 (v6)	ALLOW	Anywhere (v6)
443 (v6)	ALLOW	Anywhere (v6)
8080 (v6)	ALLOW	Anywhere (v6)

An NMAP external system scan shows which ports are active:
#nmap 147.91.96.100
Starting Nmap 7.50 (https://nmap.org) at 2017-07-25 17:55 CEST
Nmap scan report for demo.mi.sanu.ac.rs (147.91.96.16)

Host is up (0.026s latency).
Not shown: 997 filtered ports
PORT   STATE   SERVICE
22/tcp openssh
80/tcp open   http
443/tcp closed https

Nmap done: 1 IP address (1 host up) scanned in 8.14 seconds

Important logs and examples:
 ufw.log blocked port 25
Successful sending of an e-mail to the mail server:
July 25 17:18:20 demo postfix/qmgr[2741]: 59BB1CC0E49: from=<root@demo.mi.sanu.ac.rs>, size=396, nrcpt=1 (queue active)
July 25 17:18:20 demo postfix/smtp[2773]: 59BB1CC0E49: to=<vanja@mi.sanu.ac.rs>, relay=mi.sanu.ac.rs[xxx.xxx.96.2]:25, delay=0.05, delays=0.02/0/0.01/0.01, dsn=2.0.0, status=sent (250 2.0.0 v6PFIKXr021367 Message accepted for delivery)
Unsuccessful sending of an e-mail to gmail from root:
July 25 17:25:41 demo postfix/qmgr[2741]: 0EAB3CC0E3F: from=<root@demo.mi.sanu.ac.rs>, size=317, nrcpt=1 (queue active)
July 25 17:25:41 demo postfix/smtp[3988]: connect to gmail-smtp-in.l.google.com[xxx.102.1.27]:25: No route to host
July 25 17:25:45 demo postfix/smtp[3988]: 0EAB3CC0E3F: to=<XYZ@gmail.com>, relay=none, delay=488, delays=483/0.02/4.3/0, dsn=4.4.1, status=deferred (connect to alt4.gmail-smtp-in.l.google.com[74.125.30.27]:25: No route to host)
Log of blocked access to ports 23 and 25:
July 25 18:07:20 demo kernel: [14806.975866] [UFW BLOCK] IN=ens160 OUT= MAC= 00:50:56:a2:4c:e4:00:19:e8:3d:11:42:08:00 SRC=81.248.41.124 DST=###.###.###.### LEN=44 TOS=0x00 PREC=0x00 TTL=47 ID=63551 PROTO=TCP SPT=57103 DPT=23
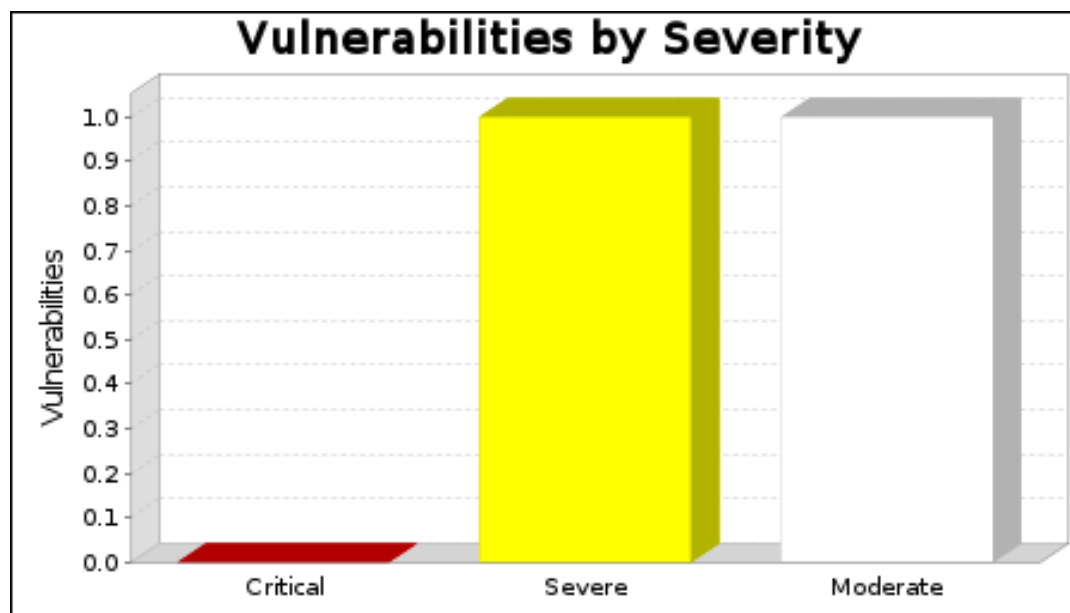
Fig. 2

WINDOW=59711 RES=0x00 SYN URGP=0
July 25 18:08:50 demo kernel: [14897.518444]
[UFW BLOCK] IN=ens160 OUT= MAC=
00:50:56:a2:4c:e4:00:19:e8:3d:11:42:08:00
SRC=89.248.160.252 DST=###.###.###.###
LEN=40 TOS=0x00 PREC=0x00 TTL=243
ID=54321 PROTO=TCP SPT=58269 DPT=25
WINDOW=65535 RES=0x00 SYN URGP=0

aide.log file was accessed but has not been
changed:
Directory: /usr/share/exist-db/webapp/WEB-INF/
data/fs/db/elb/2016/ActaStomatNis
Mtime   : 2017-05-17 10:34:15 +0200 |
2017-07-04 10:25:56 +0200
Ctime   : 2017-05-17 10:34:15 +0200 |
2017-07-04 10:25:56 +0200
Linkcount: 3
auth.log example of sudo command use
July 25 18:24:32 demosystemd: pam_unix(sys-
temd-user:session): session opened for user
bibladmin by (uid=0)
July25 18:24:32 demosystemd-logind[1218]:
New session 21 of user bibladmin.
July 25 18:24:40 demosudo: bibladmin :
TTY=pts/6 ; PWD=/home/bibladmin ; USER=-

root ; COMMAND=/bin/ls /root/
July 25 18:24:40 demosudo: pam_unix(sudo:ses-
sion): session opened for user root by bibladmin-
(uid=0)
July 25 18:24:40 demosudo: pam_unix(sudo:ses-
sion): session closed for user root

Operating system vulnerability scan after im-
plementation of safety mechanisms

By scanning and showing the vulnerability of
implemented systems, vulnerabilities which can
potentially be used by safety threats (malicious
programs or malicious attackers that can endanger
computer systems and information) are preventa-
tively detected [Korac 2014]. With the proactive
elimination of these vulnerabilities, preventive
protection is accomplished. Protection of the sys-
tem precisely involves prevention with detection.
Prevention includes risk assessment, access con-
trol, encryption and firewalls (Korać, Todorović
and Prlja 2017).

Vulnerability scanning is performed with the
Nexpose security audit tool from Rapid7 LLC.
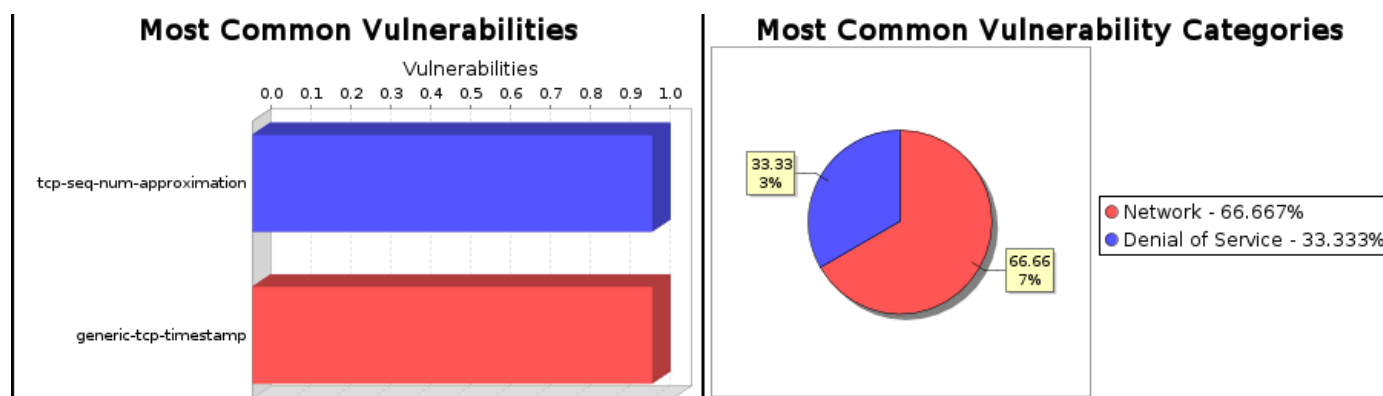
Fig. 3 Presentation of detected vulnerabilities

Site Name	Start Time	End Time	Total Time	Status
###.mi.sanu.ac.rs	July 13, 2017 19:14, CEST	July 13, 2017 19:15, CEST	1 minute	Success

The audit was performed on an active system and complete scanning was executed.

In Figure 2, two non-critical vulnerabilities found in the system scanning process are noticeable. Critical vulnerabilities have not been detected and such vulnerabilities require special attention and must be dealt with promptly. Critical vulnerabilities are used relatively easily by malicious attackers who, with the help of the exploit, can gain complete control over the affected system. There is one vulnerability on the system that is designated as severe, which is difficult to be exploited by the attacker and which does not provide access to the attacker to the server. The second vulnerability is designated as a moderate vulnerability. Moderate vulnerability types are those vulnerabilities that allow a malicious attacker to obtain information useful for planning a specific attack on the network. They need to be analysed and resolved, but they are not as urgent as critical vulnerabilities.

The detected severe vulnerability is called **tcp-seq-num-approximation**, and the moderate vulnerability is called **generic-tcp-timestamp**.

Description of the tcp-seq-num-approximation vulnerability:

When TCP uses a large window size, it enables the remote malicious attacker to hit the sequence number and thus cause denial of service (connection loss) of the established TCP connections based on the continuous injection of TCP RST packets, especially in long-lived protocol connections such as BGP.

To solve the vulnerability:

Enable TCP MD5 Signatures – the options for allowing TCP MD5 signatures are described in the RFC 2385[4] document. In this way, the risk of certain security attacks of BGP, such as TCP reset, is reduced.

Descripion of the generic-tcp-timestamp vulnerability:

The tested host corresponds with the TCP timestamp. Based on the TCP timestamp response, a malicious attacker can detect certain information such as the server's uptime, thus providing additional information to the attacker when planning

4 http://www.ietf.org/rfc/rfc2385.txt

future attacks. In addition, in certain operating systems, TCP timestamp responses differ, so the malicious attacker can also obtain the fingerprint of the OS, i.e., the OS type and OS version.

To solve the vulnerability:

Disable TCP timestamp responses on the system. Set the net.ipv4.tcp_timestamps value to 0 with the following command:

```
#sysctl -w net.ipv4.tcp_timestamps=0
```
Additionally, set the displayed value in the default sysctl configuration file (sysctl.conf) to:
```
net.ipv4.tcp_timestamps=0
```

CONCLUSION

After booting up the operating system on the server, it is necessary to set up the *demo.mi.sanu.ac.rs* web server, implement the module used for preventing brute-force attacks on the SSH server, implement the file integrity monitoring module, and start a vulnerability analysis of the booted server. The end users and system users who run different services (e.g., ssh, mysql, apache, postfix) are differentiated on the system. Each application should have its own username and its group under which it will be executed such that the processes, i.e., the relationship between the applications and the server itself, can be managed. With audit tools, you can get a picture of the condition and history of what happened on the machine. A vulnerability analysis on the demo.mi.sanu.ac.rs server was performed with the Rapid 7 Nexpose tool. The analysis found no critical vulnerabilities, which is normal, since a modern server has been installed and patched. In addition, tcp timestamp is allowed, which is standard and is not only desirable for high security systems; the demo server is not considered to be in that category because it is a public server that uses public services and public open source software such as Apache. Solutions have been proposed for all detected vulnera-bilities, if explicitly required by the organisation's security policy.

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REZIME
SIGURNOSNI ASPEKT WEB SERVERA

KLJUČNE REČI: PROVERA INTEGRITETA FA-JLOVA/DIREKTORIJUMA, SKENIRANJE RAN-JIVOSTI, SSH BRUTE-FORCE PREVENCIJA.

Ovim radom je obuhvaćen sigurnosni aspekt kada je u pitanju dizajn bezbednog web servera koji koristi određene javne servise i javni softver otvorenog koda. Izvršeno je deinstaliranje nepotrebnih aplikacija i servisa, jer nepotrebne aplikacije ili servisi mogu biti ranjivi čime se ostvaruje potencijalni vektor upada. Definisana je metrika koja je ključna za sistem. S obzirom da je suštinski deo web servera baza podataka, definisana je potrebna procesorska snaga, količina memorije, mrežna brzina i kapacitet diska, da bi taj server u svim uslovima rada mogao nesmetano da obezbedi servis. Metrika je važna u fazi kada se definišu parametri prema kojima će sistem da radi da bi se imali parametri pomoću kojih se može proveriti ispravnost rada računarskog sistema. Nakon podizanja operativnog sistema na serveru, neophodnih servisa za postavljanje web servera, implementiranja modula koji služi za sprečavanje brute-force napada na SSH server i modula za proveru integriteta fajlova, izvršena je analiza ranjivosti podignutog servera. Analizom je utvrđeno da ne postoje kritične ranjivosti, što je i normalno s obzirom je instaliran moderan server i zakrpljen (pečovan), pored toga dozvoljen je tcp timestamp koji je standardan i nije poželjan samo kod visoko bezbednih sistema, gde server demo ne spada sobzirom da je u pitanju javni server koji koristi javne servise i javan software otvorenog koda poput apachea. Za sve uočene ranjivosti predložena su i razrešavanja istih ukoliko bezbednosna politika u organizaciji izričito zahteva.

VANJA KORAĆ
Mathematical Institute SASA
Belgrade, Serbia
E-mail: vanja@mi.sanu.ac.rs

DRAGAN PRLJA
Institute for Comparative Law
Belgrade, Serbia

TARGETING CYBER THREATS BY RECOGNIZING ACTIVE AND PASSIVE MALICIOUS ATTACK TECHNIQUES AND PROTECTING INFORMATION

ABSTRACT

Attack techniques recognised in digital forensic practice and used by malicious attackers to break into a system will be described in this paper. The aim of this paper is to raise security awareness in users who are working in the Internet environment both at their organisation and at home. Measures of defence and possibilities of protection from the security challenges presented in this text will also be proposed in this work.

KEYWORDS: CYBER THREATS, SYSTEM PROTECTION, PROTECTION AGAINST ATTACKS.

Digital wellbeing is the most important thing in an organisation. For this reason, organisations are investing heavily in the protection of their systems.[1] Nowadays, it can be said that it has become a real security challenge to protect sensitive information from the competition. The competition today represents one of the most important reasons for protecting information in organisations. The novelty with regard to obtaining a competitor's information is the possibility of renting malicious attacks to steal important information (for example, business plans for a particular quarter). The competition may subsequently take advantage of these stolen pieces of information. With the emergence and expansion of the Internet, an increase in the number of interconnected devices has also led to an uncontrolled increase in the number of Internet of Things (IOT) devices. On the other hand, it has created conditions to increase the speed, number, and scope of cyber attacks. At the same time, competitive organisations tend to increase their quality of service, and increasing the quality of service also demands faster delivery of services or products. Subsequently, this has lowered the level of security, as insufficient attention is given to this subject, as this would require allowing more time to perform detailed security checks.

In literature, a malicious attacker is often equated with a hacker, but this is not totally precise. The term hacker was applied to people who are engaged in research and the development of protection for the benefit of the Community. Over time, with the possibility of extra earnings and with the increasing number of devices on the Internet, this term began to have a negative con-

notation, marking it as malicious, because certain individuals (hackers) directed their knowledge towards committing malicious attacks. The latest trend includes associations of hackers, i.e., the forming of hacker communities that have excellent informatics knowledge and skills in different fields (social engineering, hacking with the aim of compromising computer systems, post exploitation techniques). Depending on the motives and goals that trigger the hacker activity, and for the purpose of terminological demarcation, the most common division found in the literature is the following (Lanier 2018):

Black hat – these malicious hackers, i.e., malicious attackers, are motivated by financial gain and they are solely engaged in malicious activities for mercenary reasons. They break into computer systems and networks, misuse vulnerabilities on computer systems, steal user credentials, release confidential government or business documents, and spread malicious and ransomware programmes.

White hat –this type of hacking activity is also called ethical hacking and can be performed by persons employed in companies in the position of Chief Information Security Officer (CISO) or by consultants in the field who actually explore the vulnerabilities in the computer and network systems of their organisations with the aim of implementing the best possible protection.

Grey hat–this type of hacker performs the same activities as the white hat, until the moment when financial gain becomes crucial.

Script kiddie –these types of hacker activities are mainly performed by beginners hacking for entertainment or to prove themselves. In order to raise their rating as hackers they must have certain hacker experience behind them. To achieve superior hacking skills, it is necessary to gain access to certain forums or sites on the Dark Web from where they will be able to download the most up-to-date codes, scripts and exploits. In order to obtain such access, a malicious hacker must already have committed certain criminal offenses.

Suicide hackers –this category includes persons who hack computer systems, break services in organisations without a clear goal or plan, do not protect themselves and are easy to trace. The situation in Serbia is that although the number of attacks has increased dramatically in the last 12 years, those who have been involved in unlawful hacking have been at the script kiddie knowledge level, so they were soon discovered. These attacks are mostly misdemeanours, and tracking down such perpetrators is almost certain. In Serbia, the Unit for Countering High-Tech Crime (VTK) deals with this, while simpler cases are solved by the police.

Cyber terrorism –this category deals with cyber attacks with terrorist motives. It does not exclusively involve terrorism, but also the implementation of so-called website defacement with the aim of an attack on a national, racial or religious basis.

State-sponsored hackers –hacking activities performed by hackers who are working for states.[234] These hackers are actually hired by the state to conduct hacking activities (spying, social engineering, network and computer system penetration, and distribution of malicious programmes) in order to gain advantage over some other country through their access to confidential information. While some sources claim that they are most numerous in Russia, America, and China, and other sources claim that the largest number of state-sponsored hackers is actually in Ukraine,[5] the fact is that this kind of activity is the reality of today. This kind of state sponsorship actually aims to sell its services to other countries. This means that certain states are able to hire out hackers to other countries, in so-called outsource hacking.

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2 http://mackenzieinstitute.com/state-sponsored-hacking-mean-canada/

3 https://www.bestvpn.com/state-sponsored-hacking-ukraine/

4 http://www.iss.europa.eu/uploads/media/Alert_5_cyber__hacktors_.pdf

5 http://www.rferl.org/a/ukraine-hacktivist-network-cyberwar-on-kremlin/28091216.html

The unique quality of state-sponsored activities is that the state stands behind them, and this further implies an unlimited budget, and therefore resources as well.

Hacktivism– this term refers to the hacking activities of persons engaged in a particular issue or idea. They are motivated to correct what they think is wrong.[6]Their activities may also include Distributed Denial of Service (DDoS) attacks on terrorist websites, on sites of organisations accused of animal cruelty, on sites of repressive government regimes or on websites of those countries with whose policy they disagree. *Hacktivism* can sometimes be carried out with good intentions, but also provokes collateral damage, causing the innocent to also pay a price. Hacktivists also sometimes help malicious hackers in their pursuit of malicious activities because their motives are not always noble.

Therefore, it can be concluded that malicious activities are determined by the motives, goals and information required for their realisation. When it comes to the motives that lead individuals/organisations to perform a cyber attack, money, power, control, revenge, publicity, the challenge and the testing of security systems are to the fore. The objectives of the attack include attacks on organisations, individuals, states, or political or religious resources.

Since the end of the 1980s, attacks on networks and computer systems have evolved considerably. At first, they ranged from password cracking to external attacks (attacks on poorly configured firewalls, or badly configured isolated networks). By investing in third-generation (so called next-generation) firewalls, organisations have greatly reduced the possibility of an attack from the outside. On the other hand, this has led to the evolution of attack techniques, which have started being run from the inside. An example of this is when there is a malicious insider in the organisation, or when certain social skills are used to deceive the target-

ed user, who then becomes a malicious insider without being aware of it, i.e., social engineering.

In practice, we no longer need to ask if someone will attack us and whether we can be maliciously hacked, but whether our systems have already been compromised. The key factor is how "interesting" the organisation is for hackers, or when and why it will become interesting. What should be applied in practice is the advice of Eric Cole (a member of the SANS Institute), which has already become a slogan regarding cyber threats: "Prevention is ideal, but detection is a must while its speed is critical."

Security statistics on the basis of appropriate surveys by certain famous statistical companies show that over 80% of organisations have experienced an incident, and what is worrisome is that an attacker (or a malicious programme) can remain unnoticed in large organisations (which have detection and defence systems) for a longer period of time (the cited number is about 205 days in 2014 and 146 days in 2015).[7]

A malicious attack on a computer that has not been updated is extremely easy to perform from a hacker's point of view, and the next step that a malicious attacker performs is privilege escalation to administrator (for example, a user account with user privileges is hacked, and via privilege escalation this account becomes an account with administrator privileges).

Attacks are currently most commonly performed on data, i.e., information, and examples are CryptoLocker ransomware, as well as data destruction (66%).[8]

Also, according to statistics, almost a third of small and medium-sized enterprises (worldwide) have been victims of attacks for no reason other than they are in partnership with some targeted organisations. Most organisations have external

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6 https://www.it-klinika.rs/blog/vrste-hakera-i-njihovi-motivi

7 http://files.shareholder.com/downloads/AMDA-254Q5F/0x0x877466/6CADAB40-4539-4DF8-898B-2F58D3E74B51/FEYE_News_2016_2_25_General_Releases.pdf

8 https://www.symantec.com/content/dam/symantec/docs/reports/istr-23-2018-en.pdf

associates from smaller organisations (consulting, marketing, programming organisations). For example, since an attacker cannot hack an organisation that has good protection on its systems (such as a bank), the attack will be shifted to a company that does not pay enough attention to security, and which cooperates with the targeted organisation. The practice has shown that a malicious attacker is waiting for someone from this (unsafe) organisation to make a connection with, for example, a bank (through its Virtual Private Network - VPN) in order to send a previously made document to the bank, which actually contains a malicious payload.

The largest number of attacks come internally by chance (for example, a legitimate employee opens an e-mail attachment or a link and accidentally infects). When malicious content is opened, malicious code (a bot, or a Trojan) is activated, which establishes a connection to the attacker. In practice this means that the connection is made from the inside to the outside, such that the firewall itself and the Intrusion Prevention System/Intrusion Detection System (IPS/IDS) do not have any special defensive function in that case, because such traffic is mainly allowed. In that case, the defence function that can be applied is a tool that constantly scans sessions and checks at the level of session applications.

According to the Symantec report for 2015, consumer financial losses on a worldwide scale are about $158 billion ($30 billion alone for the US) just for cyber crime, and this data is not complete because a large amount of theft and embezzlement goes unnoticed or unreported, or unpublished and remains unrecorded.

The financial malware known as Tridex has managed to infect over 100 banks and steal about $65million in just 18 months, with a total theft of around $300-350 million. Similarly, so-called crypto mining financial malware targets *crypto currencies,* i.e., it attacks crypto wallets, while blockchain has not been a target of attack.

When it comes to the banking environment, over 80% of attacks come from within the bank itself. The most common targets of attacks are payment cards, comprising as much as 60% of all attacks on banks.

In Serbia, there is financial malware that does not directly target banks, does not deal with attacks on banks, and does not deal with transactions within the banking transaction system, but directly attacks the bank's clients. It is a bot, actually a Trojan, that comes to your computer in various ways: by e-mail, infected USB drives, or it is downloaded from a link, via a torrent, as a crack for a particular programme, etc.... It infiltrates the system and searches an online computer that has certain sessions installed in the form of e-banking connectivity. After finding such a computer, it moves to that computer, waiting for the user to log on to the computer or application, to insert a card and to enter a personal identification number (PIN) code. When all this is done, it activates (in general) a Hyper Text Transfer Protocol (HTTP) injection, i.e., it displays a message on the web page saying "Your transaction is being processed and this will take a while, thank you for *your patience.*" During this time, the background allows an attacker to make unauthorised transactions from that account to certain accounts of financial mules that are used to take illegally acquired money. Financial mules are mainly younger people, typically drug addicts who open accounts for an agreed upon amount but do not know the purpose or background of such transactions. Their task is, upon receipt, to take the money from their account and forward it to a specific person. When the transactions ends, this malware does something or shuts down the operating system (OS) or locks it in order to prevent any checking of the account balance, i.e., to slow down that type of check. It is interesting that this malware exists with a new version that has the ability to wait for a mobile phone (Android type) to be connected via a USB drive and then infects it with the purpose of redirecting calls and SMS texts. In practice, this means the following: at the moment the unlawful activities, i.e., transactions, are carried out, calls

to that number are redirected to some other numbers because banks, in certain cases, check or deal with the control of transactions, and when transactions that were not previously occurring, mainly from legal entities to individuals, happen (that is a trigger) then the banks call the legal entity and request verification. In cases where it cannot be verified the transaction is stopped. However, in cases of redirection to a malicious script, the fake malicious individual would confirm that everything is fine.

One of the biggest compromises of user accounts occurred at the end of 2013 and at the beginning of 2014 and affected 3 billion Yahoo user accounts. Initially, it was thought that 500 million accounts were compromised (names, e-mail addresses, birthdates and phone numbers), but more detailed analysis in 2017 found that this number was actually closer to 3 billion.[9]

In 2014, 145 million eBay user accounts or credentials were compromised.[10][11] It was found that nearly 10 million had recorded account numbers and information with the goal of being able to pay without ever entering payment information. There was a gap between the periods when it was noticed that the accounts were compromised and the moment that users were notified, during which the downloaded data could be abused.

In 2016, in mid-October, hackers compromised 412.2 million accounts of the Adult Friend Finder site. In this way, hackers collected information about names, e-mail addresses and passwords from the previous twenty years from the databases of that site.[12]

At the end of July 2017, data belonging to the Equifax organisation, the largest credit bureau in the USA, was compromised. 143 million items of personal user data such as social security numbers(SSNs), dates of birth, addresses, and even drivers license numbers were compromised, and 209,000 users' credit cards numbers were compromised.

In 2018 the data of 150 million MyFitnessPal user accounts of the UnderArmour organisation was compromised. There are indications that data such as names, e-mails and hashcode (password verification) values was compromised.[13][14]

In 2018, data from almost 50 million user accounts of Facebook was compromised[15] which is one of the biggest security failures in Facebook's history. Malicious attackers stole "access tokens", which represent a kind of security key that allows users to stay logged on to Facebook during simultaneous web sessions without the need to re-enter their login information. The possession of "access tokens" allows the malicious attacker to take full control of the victim's account, even including the possibility of logging in through third-party applications used for logging in on Facebook.[16]

A troublesome fact is that the increase in the total amount of malware on the Internet since 2009 has been drastic. The total number of malware instances in 2009 was 29.48 million, and in 2018 it has so far amounted to 836.97 million.[17] Compared to 2017, the total number of malware instances has increased by 117 million. This means that in the past year, 9.75 million malware instances occurred every month, or about 325,000

9 https://www.csoonline.com/article/2130877/data-breach/the-biggest-data-breaches-of-the-21st-century.html

10 https://www.washingtonpost.com/news/the-switch/wp/2014/05/21/ebay-asks-145-million-users-to-change-passwords-after-data-breach/

11 https://www.csoonline.com/article/2130877/data-breach/the-biggest-data-breaches-of-the-21st-century.html

12 https://www.csoonline.com/article/2130877/data-breach/the-biggest-data-breaches-of-the-21st-century.html

13 https://www.thesslstore.com/blog/2018-cyber-crime-statistics/

14 https://www.cnbc.com/2018/03/29/under-armour-stock-falls-after-company-admits-data-breach.html

15 https://www.theguardian.com/technology/2018/sep/28/facebook-50-million-user-accounts-security-berach

16 https://www.theguardian.com/technology/2018/sep/28/facebook-50-million-user-accounts-security-berach

17 https://www.av-test.org/en/statistics/malware/

new malwares are detected every day.[18] As such, it can be concluded that every day worldwide, a large number of people are engaged just in the production of malware.

Vulnerability or the possibility of infection occurs when the system or application is not patched, i.e., updated. If a computer system connects to the Internet without the latest security patches, regardless of antivirus efficiency, there is a real chance that in less than 20 seconds the computer will get infected. This is possible because in practice it is feasible to use an exploit over 5 years old, recognised by all antivirus or antimalware programmes, but encrypted by certain tools so that it gets a "capsule" around it and becomes "invisible" and, therefore, is not detected by most antivirus programmes (there are free antivirus engines that check the maliciousness of files with the most common antivirus solutions online). It is alarming that a large number of small companies do not make updates or that updates are only performed once every 3-6 months. This means that when a zero-day appears, the patch for it is published in one month on average, and if the system is updated only once in six months, from a security perspective, the update does not work at all.

Attacks are never random, they are always targeted and mostly paid in advance, as experience has shown that criminals are organised into groups as companies. Hacktool Multipurpose, which appeared in 2015, and was present near the end of 2016 (though it can no longer be found on the regular Internet but it can be found on the dark web) served to create malicious programmes where, in a very simple way, malicious functions can be visually programmed and include a shield, and where as output, a personally written malware is obtained. The thesis that high-tech criminals are organised into groups and operate as organisations is supported by the fact that this tool also had support for obtaining answers to problems related to the use of the tool. Also, new malware and ransomware have their own support.

In practice, in the event of infection, ransomware files are encrypted and information regarding the amount of money that should be paid, as well as the entire procedure, is received, and there is an active call centre with an operator providing information on payment options. After analysis of Trojan activity, such as that completed by FireEye labs[19] on Dridex,[20] one of the pioneers in financial malware, it appears that these malicious activities have their working and non-working days where activities are suspended during holidays. Therefore, there are companies dealing with malicious activities, that keep regular business hours. This thesis is supported by the fact that the platform Cybercrime-as-a-Service is mentioned more frequently. In 2018, one of the world's largest DDoS renting services "webstressor.org" was closed. This site had over 136,000 registered users. The services of this organisation could be used by users with little or no technical knowledge to launch a DDoS attack for about £10. The services of this organisation were responsible for the attack not only on the seven largest banks in Great Britain in 2017, but also on some state institutions and gaming services.[21]

In one statistic, data on the indicative amounts offered by the "Cybercrime-as-a-Service" platform is provided.

RECOGNIZING AN ATTACKER'S STEPS USING DIGITAL FORENSICS

In most cases, the first step in the planning of malicious attacks is the formation of a malicious programme, followed by reconnaissance in terms of finding a target, collecting data, scanning,

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18 These are not zero-day malware, but derivatives.

19 https://www.fireeye.com/blog/threat-research/2016/01/dridex_botnet_resume.html

20 https://www.symantec.com/connect/blogs/dridex-financial-trojan-aggressively-spread-millions-spam-emails-each-day

21 https://www.thesslstore.com/blog/2018-cyber-crime-statistics/

Cybercrime Product or Service	Price (in US Dollars)
SMS Spoofing	$20/month
Custom Spyware	$200
Hacker-for-Hire	$200+
Malware Exploit Kit	$200-$700
Blackhole Exploit Kit	$700/month or $1,500/year
Zero-Day Adobe Exploit	$30,000
Zero-Day iOS Exploit	$250,000

Source: https://www.thesslstore.com/blog/2018-cybercrime-statistics/

hacking, eavesdropping and exploiting the system through malicious software. A characteristic of most malicious attacks is enabling re-entry of a malicious attacker into the system and erasing any traces.

Creating malware - it can be said that the starting point for creating malware starts with open source applications, because the source code is open and the attacker can download and review it and then conclude with analysis of where the weaknesses of that code are. Lately, fileless malware, i.e., malware that does not have a file or payload and does not stay on machines other than in the registry, stays mostly in memory and lasts while the computer is turned on. Fileless malware is very difficult to recognise, sandbox security testing areas does not recognise it and it is increasingly in use. According to some statistics, almost a quarter of the world's malware is comprised of this type. For example, some interesting malware of this type searches to see if there is a PowerShell on a machine, sends the PowerShell a command, creates a script directly into PowerShell on the victim's computer that is connected to the Internet and loads it into memory.[22] It has the same form as any other malware, but this is a new technique in the sense that it is detected by almost no antivirus. Also, SMS malware is a novelty –an example of which is a message of the Nigerian scam type with a link where the offered reward is received

by SMS, but actually clicking the link leads to a malicious server.

After creating the malware, the next phase is the reconnaissance phase, i.e., finding and scanning the target and obtaining information about whether there is specific software/service on the server that has a certain weakness. Scanning of the OS itself is one of the first steps which a malicious attacker performs in order to determine the operating system, which open ports it has, which protocols are missing, etc. The term footprinting, besides scanning of the OS, can also include determining the type of business of an organisation, how many people are permanently employed in it, their profiles, etc. Therefore, reconnaissance is observation that involves collecting information about the organisation or the individual who is the target of the attacker. It can be active and passive. Active observation is a direct scan of the target, for example, the use of tools that directly send packets to the targeted system to find out more information about it (one of the tools is a trace route used by attackers to find out the router's IP addresses or firewalls protecting the target). Hence, an active observation involves the scanning of ports and the OS. Passive observation means the collection of data without direct contact with the target (searching of social networks and sites that carry information about the target). Logical and technical approaches for finding the target and collecting data about it are more in use, rather than the former physical modes (tracking a

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22 http://thehackernews.com/2017/02/fileless-malware-bank.html

potential target by physical surveillance). Nowadays, with Internet technology it is much easier for malicious attackers to track a potential target by using social networks to track users. For example, there are a lot of people who, due to their need to show off brag about luxuries they possess, provide information on social networks about where and when they are travelling and when they are returning from a trip. Most users are not even aware that in this way they actually provide data about their whereabouts and facilitate the job for the attackers, tipping them off as to when they are not at home. Also, attackers use social engineering methods to get as much data on the target as possible. For example, an attacker can collect data from business social networks (for example, LinkedIn) about a portfolio of specific user professions (users leave information about where they have worked, where they are working now, and on what jobs). In the case that some organisation offers employment for security administrators, the attacker can find people who worked or who are working now in that organisation with the help of LinkedIn and, through their profile, learn which services a particular organisation has implemented in their network environment. Additionally, passive observation includes listening to regular traffic in order to obtain information about possibilities and vulnerabilities when it comes to a server as a target. Passive observation generally begins with searching for information in the Domain Name System (DNS) and the Whois database. In cases where a domain in which the target system is registered is known, the attackers usually use commands such as nslookup, dig, and whois in order to obtain as much target information as possible.[23]

In forensic practice, a typical scenario of attackers' further steps is noticeable. After using active and passive hacking techniques that are often used to find a specific target of attack (IP address and exact location of the attack), the next step of the attacker is to scan vulnerabilities on

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23 http://itsecurity.telelink.com/reconnaissance/

the target. In addition to the attacker receiving information about open ports, missing protocols, and operating system version (with some tools it is possible to get information about the last installed patches), information on the vulnerabilities that are available on that system will also be obtained. *The attacker's next step is to actualize the attack, gaining access to the system by hacking in via the release of a particular exploit that abuses a found vulnerability. When attackers gain access and escalate privileges, they usually set up a persistent backdoor or maintain access malware mechanism. This means that in the event of a computer shutdown or restart, a malicious attacker can re-establish the connection to the system (in fact, a compromised computer establishes a connection to the attacker's system). In the end, the attacker will attempt to clear all traces, because traces of whatever happens on the OS are left in logs. Based on logs, it is possible to do a backtrace and on the basis of forensic analysis it is possible to identify the perpetrator of illegal activity. Since attackers try to erase log files while attempting to erase traces, it is recommended that logging take place on special log servers, as this would prevent attackers from deleting the files. In large organisations, there are usually Security Information and Event Management (SIEM) solutions or log management systems that collect logs, so an attacker can erase logs, but these logs have already been forwarded to log management. It is vital to note that it is extremely important to carefully configure the synchronisation of logs with log management. If the synchronisation time is poorly defined an attacker can use that delay, and in that period if an attacker makes a malicious script that deletes logs on a local computer in that "defined synchronisation time," the log will never reach log management and the alarm will not be activated.*

In the past couple of years, classic system hacking techniques that use classic exploitation of some vulnerability that exists on a system have returned to the field of cyber crime. As defence tech-

niques evolve, the accent is on updating mostly newer techniques, and old ones protecting certain vulnerabilities have remained without updates.

A malicious attacker is always motivated by a certain routine, knows the attack method and knows the vulnerability to abuse. When it comes to motive, money is primary, followed by terrorism, politics, or competition. The method involves the techniques and tools that a malicious attacker uses to abuse the system. Vulnerability can be logical in the sense of an unpatched or poorly configured system (poor configuration of access control).[24] Uninformed workers or users in an organisation are also considered vulnerabilities, due to poor knowledge of information security. This may be an even bigger problem than poorly configured or unpatched systems. It is therefore important that the organisation recognises the importance of security awareness training.

The most commonly used methods used by malicious attackers when it comes to networks are sniffing, spoofing, *Man*-in-the-*Middle* (MiTM) attacks, poisoning attacks, attacks on passwords (easy cracking of poor passwords), Denial of Service (DoS) attacks and attacks on devices used for defence (firewalls, IDS). Sniffing means eavesdropping. Spoofing is lying, i.e., a falsely represented identity. MiTM involves eavesdropping on the basis of insertion between two sides in communication and intercepting all traffic. MiTM is extremely dangerous, since apart from interception it allows changes to the traffic itself. In addition to the MiTM at the Hyper Text Transfer Protocol (HTTP) level, it can also be performed at the HTTP Secure (HTTPS) level. Unique to HTTPS is that it cannot be eavesdropped,[25] but a malicious attacker, by stealing cookies, can falsely present and make a session to a particular server as a legitimate user. Poisoning, as a forerunner of spoofing, is a method by which cache "poisoning"

on switches and routers is possible, with the aim of redirecting traffic to and from a malicious attacker. The target of poisoning is, in the first place, the DNS in order to direct the traffic of legitimate users to a malicious site which has been prepared in advance. For example, instead of users going to a Twitter site, the user will be redirected to a false Twitter site prepared by a malicious attacker in order to collect credentials from a particular victim. Attacks on passwords involve the extraction of hashes, from which the password will be reproduced. DoS, i.e., denial of service (and its derivatives of Distributed DoS, i.e., DDoS, and Reflected Distributed DoS, i.e., RDDoS), means the disabling of particular services by directing vast amounts of traffic to a victim.

Another type of malicious attack refers to host attacks through certain malicious applications. In this case, the aim of the criminal attacker is to gain unauthorised access to the particular system and escalate privileges to the administrative level. Also, backdoors (Trojans) are used to ensure renewed access to the compromised system. Hardware or software keyloggers (programmes that capture keystrokes) are extremely dangerous (since they are rather undetectable) especially when organisations have the ability to implement them on a legitimate level in terms of supervision, as a form of protection of their own systems, with which the employee has been acquainted when signing a contract, although this is contrary to privacy rights.

Fig. 1 CIA Triad

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24   https://www.netsparker.com/blog/web-security/logical-vs-technical-web-application-vulnerabilities/

25 SSL can legitimately be "eavesdropped" at the level of the organisation if on the so-called "wiretap" device certificates for encryption and decryption are imported.

The CIA Triad as a basis of IT security and layered protection (defence in depth)

Confidentiality – no one can reach the information except the person for whom this information is intended.

Integrity – the information itself is protected and cannot be changed.

Availability –the service is available to the person for whom it is intended at the moment it is needed.

The challenge of protecting information is to find a good balance between safety and functionality.

If something is confidential, and its integrity is protected, but not available to whom it should be available, then it is useless, while if it is available, but not safe then it is not secure. Therefore, it is necessary that all three conditions are met in order to have quality in security, but it is necessary to find the optimal balance in order not to endanger the functioning of the organisation.

As an addition to the CIA model, 3 additional measures are as follows:

Authentication –checking or identifying the user,

Access control,

Non-repudiation.

In order that a user has access to a particular file that is part of the CIA system, a user name and password are necessary, i.e., authentication is required. Access control is also required (in the sense of up to which levels the logged user can have access and what can be accessed), as well as non-repudiation, i.e., something that is appropriate actually to accountability or logging, where the trace of who had access and what has been done is visible, such that in case some problem occurs later on, it will be possible to claim with non-repudiation that a specific person did something.

Additionally, attention must be paid at all levels to security problems in order to have complete and adequate protection. The layers referred to in the Open Systems Interconnection (OSI) model range from the physical layer (wires) through the transport layer to the application layer.

At the physical layer, the starting point is that everything, all devices and all wires, can be intercepted. Data transfer methods can be intercepted, for example, in the way that if copper wire is used for data transmission malicious attackers can use vampire taps for eavesdropping (in this "clamping" procedure attackers actually create a bridge towards themselves in order to intercept communication). If unshielded twisted pair (UTP) cable is used as a physical medium, there are also vampire taps for UTP, but this is hardly feasible, since each UTP wire must be clamped individually. Generally, attackers use a transmission sniffer signal wrapping the UTP cable with the aim of eavesdropping on everything that goes through it. The defence procedure is to additionally shield a cable, i.e., to have the wires go through metal shields when they go through the wall.

At the transport layer, malicious attackers can eaves drop using software or logical methods. It is, therefore, important to implement protection on the network according to IPSec security protocol principles and via session check-ins. It is very important that when sessions are started on a server, certain security algorithms for forming session IDs are applied to the server, because the malicious attackers try to reproduce session IDs for session hijacking that is to steal the session.

At the application layer, implementation of applicative filters and applicative control over application activities is necessary. Modern protection systems have session-level controls, which means that every communication from an organisation to the outside or inside includes a check of what is being done and what is being accessed, and on the basis of different signatures it can be detected whether or not communication is normal, with the session interrupted accordingly.

CONCLUSION

In addition to providing physical security, it is necessary to set up appropriate teams for incident management and vulnerability management on critical systems and to define a time period for penetration testing. In this way the system security checking will be carried out externally. In addition to legal regulations and acts, and in order to ensure protection at all levels, organisations must use their own security procedures. Enterprise Information Security Architecture (EISA) is a standard that can help to determine the measures that have to be undertaken in order to provide security at the highest possible level. Safety policies or documentation with procedures and instructions relating to safety must be available to everyone in the organisation. In addition to all the listed methods of protection, one should always keep in mind that the weakest link in the protection system is actually the human factor. The method of obtaining sensitive (i.e., cryptographic) data by using a person who has knowledge of that data is called social engineering (Hadnagy 2011). Each individual should have a security culture, a so-called security awareness within the environment in which this person works (home or office). The purpose of security awareness is that every individual must consider that the security of the organisation also depends on his individual responsibilities (Nadeem 2018). Besides using defence tools, multiple security systems, and cryptographic mechanisms, educating people in security awareness is crucial and is one of the security factors that must be continuously implemented.

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REZIME
TARGETIRANJE SAJBER PRETNJI NA OSNOVU PREPOZNATIH ZLONAMERNIH AKTIVNIH I PASIVNIH TEHNIKA NAPADA I ZAŠTITA INFORMACIJA

KLJUČNE REČI: SAJBER PRETNJE, ZAŠTITA SISTEMA, ZAŠTITA OD NAPADA.

U ovom radu su opisane tehnike napada prepoznate u digitalnoj forenzičkoj praksi kojima se služe zlonamerni napadačida da bi izvršili upad u sistem. Razgraničen je pojam hakera i zlonamernog napadača u zavisnosti od ciljeva i motiva kojima su vođeni. Prikazani su neki od najvećih sigurnosnih propusta velikih organizacija u poslednjih 5 godina i njihova šteta u pogledu kom-

promitovanih korisničkih kredencijala. Dato je pojašnjenje u vezi sa CIA trojstvom kao osnovom IT bezbednosti zajedno sa dopunskim merama i slojevitom zaštitom. Cilj ovog rada je podizanje bezbednosne svesti kako kod korisnika koji rade u svojim organizacijama u internet okruženju tako i kod pojedinaca koji su home based orijentisani. Pored korišćenja alata za odbranu, višestrukih sistema zaštite, i upotrebi kriptografskih mehanizama, edukacija ljudi po pitanju security awerness-a je ključna i jedna od faktora bezbednosti koji mora kontinuirano da se sprovodi.

PRIKAZI - REVIEWS

LJUBICA PERINIĆ, THE NATURE AND ORIGIN OF THE CULT OF SILVANUS IN THE
ROMAN PROVINCES OF DALMATIA AND PANNONIA, IZDANJE ARCHAEOPRESS
PUBLISHING LTD, ARCHAEOPRESS ROMAN ARCHAEOLOGY 19, OXFORD 2016.

Knjiga sadrži 60 stranica osnovnog teksta, 6 stranica podataka o bibliografskim jedinicama, 59
stranica kataloga sa 460 kataloških jedinica, 130 fotografija, 5 grafičkih priloga i dve geografske
karte.

Ime rimskog boga Silvana najčešće se, u popularnoj literaturi, navodi pri kraju dugog spiska božanstava antičkog sveta, ili se u potpunosti izostavlja prilikom pregleda religije starog Rima. Suprotnost ovom pogledu predstavlja korpus od preko hiljadu natpisa koji svedoče o kultu rimskog boga poljoprivrede, šuma, lova i granica. Naravno, brojni istraživači posvetili su pažnju ovoj temi, pokušavajući da sagledaju različite aspekte kulta Silvana vezane za njegovu široku popularnost kod rimskog stanovništva, uprkos njegovom izostavljanju iz zvaničnog kulta rimske države, kao i specifičnosti kulta u različitim delovima Carstva. Veliki doprinos istraživanju ove problematike pružila je knjiga Ljubice Perinić, posvećena kultu Silvana u rimskim provincijama Dalmaciji i Panoniji.

Na prvim stranicama publikacije, autorka pruža osvrt na suštinu rimskog religijskog politeizma, naglašavajući značenje pojma *interpretatio romana*, kao svojevrsne sinteze lokalnih i rimskih bogova i navodi da se o istinskim rimskim verovanjima, zaklonjenim iza zvaničnog kulta, zapravo zna vrlo malo.

Jedan od najboljih primera potvrde ove tvrdnje predstavlja poštovanje boga Silvana, oduvek smeštenog izvan zvaničnog kulta i kalendara, bez njemu posvećenih hramova, svetkovina ili praznika. Sa druge strane, „nezvanični" status božanstva istovremeno ne ozačava i njegov manji značaj, budući da je ovaj kult, negovan u privatnim i porodičnim okvirima, predstavljao značajan aspekt duhovnosti rimskog stanovništva. U prilog ovoj tvrdnji svedoče dedikacije posvećene Silvanu, otkrivene širom Rimskog Carstva.

Temu knjige predstavlja pitanje karaktera kulta boga Silvana i njegovog nastanka u geografskim okvirima nekadašnjih rimskih provinija Dalmacije i Panonije, odnosno područja ili delove današnjih država Hrvatske, Bosne i Hercegovine, Srbije, Crne Gore, Slovenije, Austrije i Mađarske. Treba napomenuti da, ni u antičkom periodu, prostor navedenih rimskih provincija, nije bio etnički i kulturološki homogen. Nekadašnja provincija Ilirik, negde oko 10. godine nove ere, podeljena je na Dalmaciju i Panoniju, o čemu svedoči natpis otkriven u Cavtatu. Autorka navodi da je latenska Dalmacija bila naseljena etničkim zajednicama koje se mogu povezati sa Ilirima, dok su široke prostore Panonije naseljavale panonske (srodne ilirskim) i keltske etničke zajednice poput Tauriska, Breuka, Skordiska, Andezita, Boja i Erkavista. Različite etničke grupe, pod jedinstvenim centralnim rimskim državnim sistemom, ma kako se trudile da zadrže svoje posebnosti, neminovno počinju da prepliću svoje kulture, a u okviru njih, i religijska verovanja, koja su mogla da se uklope u rimsku religiju.

Na osnovu sačuvanih reljefa i natpisa posvećenih Silvanu, jasno se zaključuje da je njegov kult bio široko poštovan među stanovništvom Dalmacije i Panonije, što otvara i pitanje odnosa starosedelaca i novopridošle rimske carske kulture. Prema autorkinim navodima, u starijoj literaturi (A. von Domaszewski, R. Schneider, D. Rendić-Miočević) smatra se da na ovom prostoru imamo

primer *interpretatio romana,* gde je pod latinskim nazivom Silvan poštovano starosedelačko božanstvo, čije ime nije sačuvano. Mišljenja savremenih autora dele se u dva pravca. Prvo stanovište (P. F. Dorcey) negira postojanje lokalnih korena kod dalmatinskog i panonskog Silvana, dodatno ističući da je dalmatinski Silvan, zapravo, grčki Pan. Drugo mišljenje (A. M. Nagy) prihvata postojanje pojedinih lokalnih karakteristika kod dalmatinskog Silvana.

Autorka, Ljubica Perinić, u svom delu iznosi različita mišljenja vezana za problematiku kulta Silvana, posebno na dalmatinskom prostoru. Potom, pre izvođenja sopstvenih zaključaka, predstavlja celokupan korpus natpisa i reljefa otkrivenih na teritoriji koja predstavlje predmet knjige.

Povodom reljefa, kojima je predstavljena naročita pažnja, jasno je da se predstave Silvana u Dalmaciji i Panoniji razlikuju. Postoji konsenzus da, i u samoj Dalmaciji, predstave nisu identične u različitim delovima same provincije. U zaleđu, jezgru teritorije plemena Delmata, Silvan je predstavljen u vidu mladog i bezbradog božanstva, sa rogovima i kozjim nogama (kao grčki Pan). Na priobalnim lokalitetima prikazan je u potpunosti antropomorfno, kao star čovek sa bradom (italski tip), poput predstava iz Panonije. Na ovom mestu, autorka se opredeljuje da, u tekstu, predstave božanstva iz zaleđa provincije označava terminom „delmatski", dok će pojmom „dalmatinski" označavati spomenike iz priobalja. U Dalmaciji, Silvan je poštovan zajedno sa Dijanom i nimfama (zastupljena su samo italska imena božanstava na natpisima). Sa prostora Panonije nije poznat nijedan reljef na kome se Silvan nalazi u društvu Dijane, dok i natpisi i reljefi posvedočuju kultnu zajednicu sa nimfama.

Prvo poglavlje knjige posvećeno je kultu Silvana u Rimu, Dalmaciji i Panoniji. Na početku, autorka se osvrće na poreklo kulta, tumačeći Silvana kao latinsko božanstvo čije ime znači „onaj koji upravlja šumama", uz naglasak da se njegov protektorat ne odnosi na šume u celini, nego na njihova granična područja gde se sučeljavaju div-

ljina i civilizacija. Potom se prelazi na glavne Silvanove karakteristike, vezane za njegov izgled i kultnu praksu, zabeležene kod rimskih autora poput Horacija, Vergilija i Katona Starijeg.

Antički autori ne navode precizne genealoške veze Silvana sa drugim božanstvima. Samo se na jednom epigrafskom spomeniku Herkul naziva „Silvanovim unukom". Mlađi rimski pisci (Prob, Servije, Ovidije, Dolabela...) porede ga sa Panom i Faunom i iznose pojedine priče u kojima Silvana povezuju sa drugim mitološkim bićima, poput jedne od verzija mita o Kiparisu.

Razvoj kulta Silvana ostaje nejasan, kao i pretpostavke o njegovim etrursko-italskim korenima. Iz trenutne perspektive, Silvan je izvesno rimsko božanstvo, čije ime je najverovatnije izvedeno iz imenice *silva, ae, f.* U vreme Katona Starijeg (II–I vek pre nove ere), poštovan je u šumama, sa kojima je ostao povezan i u narednim vekovima. Ipak, naglašeno je i da postoje autori (npr. H. Klotz), koji negiraju povezanost Silvana sa imenicom *silva,* smatrajući da je reč o zaštitniku obrađenih polja i zemlje u procesu kultivizacije, a ne šuma. Navodi se i inspirativno razmišljanje, koje iznosi P. F. Dorcey, da se Silvan, u periodu Carstva, mogao po funkcijama i/ili imenu razlikovati od božanstva poštovanog u ranijim epohama, pa je stanovništvo, koji je živelo pri kraju perioda Republike i/ili u osvitu Carstva, jednostavno moglo zaboraviti prvobitno značenje njegovog imena i tada božanstvo povezati sa šumama. Na ovom mestu, logično je pokušati povezati Silvana sa etrurskim božanstvom Selvansom, ali izuzev sličnosti imena, druge paralele nije moguće izvući između ova dva mitološka bića.

Na samim počecima poštovanja kulta, kao što nam svedoče antički autori (Ovidije, Plinije Stariji, Sv. Avgustin), božanstvo nije imalo formiran izgled u obliku humanoidne forme. Razvoj njegovog kulta, u periodu rane Republike, ostaje nedoumica, budući da ga najstariji poznati zapis pominje tek 39. godine pre nove ere. Sačuvane ikonografske predstave postoje isključivo iz perioda Carstva. Potrebno je naglasiti da Silvanu nisu

posvećivani javni spomenici u vremenima koja prethode Carstvu, nisu mu priređivani praznici, niti je imao sveštenstvo organizovano na „nacionalnom" nivou, a smatra se i da njegov kult nije bio privlačan višim klasama.

I pored svega, Silvan ostaje široko poštovano božanstvo, čija popularnost opstaje i tokom epohe poznog Carstva, kada i „poznatija" božanstva rimskog panteona počinju da gube svoj nekadašnji značaj. U svakom slučaju, saznanja o Silvanu koja potiču iz prvih vekova nove ere, mogu da posluže samo kao vodič za razumevanje karaktera božanstva iz ranog republikanskog perioda.

Autorka potom predstavlja spomenike kulta Sivana iz Rima i Italije. Do sada je poznato preko 250 natpisa i na desetine skulptura i reljefa iz grada Rima i gotovo dve stotine iz ostalog dela Italije. Više od trećine natpisa nose posvetu *Silvano Sancto*, dok većina ostalih dedikacija ima toponimske karakteristike. Na votivnim spomenicima, Silvan je poštovan zajedno sa velikim brojem božanstava (Jupiter, Dijana, Bona Dea, Minerva, Junona...) i genija. Po ukupnom broju posveta, u samom Rimu, od njega je zastupljeniji jedino Jupiter Optimus Maksimus.

Potvrđeno je postojanje Silvanovih svetilišta, hramova i svetih gajeva u Rimu, što ukazuje i na prisustvo sveštenstva posvećenog ovom kultu, ali ne postoje potvrde da je bilo koje zdanje podignuto od strane države. Prvi javni spomenik, na kome je prikazan Silvan, predstavlja Trajanov slavoluk u Beneventu, podignut 114. godine. Predstava Silvana, u okviru ceremonije prinošenja žrtve ovom božanstvu, prikazana je i na Konstantinovom slavoluku, podignutom 315. godine, u čast careve pobede nad Maksencijem, kod Mulvijskog mosta, tri godine ranije.

Prva predstava Silvana na novcu javlja se na Trajanovom kovanju, datovanom u 112–116. godinu. Silvan je predstavljen i na reversu bronzanog medaljona, sa predstavom cara Antonina Pija na aversu. Treba naglasiti da oba navedena kovanja nisu bila namenjena za redovnu cirkulaciju novca.

Na prostorima Italije, Silvan je predstavljan dvojako: obučen u tuniku, sa ogrtačem ispunjenim šišarkama ili voćem ili kao neodevena predstava. Širom carstva, obe navedene varijante zastupljene su približno podjednako, izuzev u Panoniji i Dakiji gde preovladava odevena predstava božanstva.

Najčešće prikazivani Silvanov atribut je voćarski nož, *falx,* kao i bor, koji je mogao biti predstavljen u formi celog stabla, grane ili šišarke. Na reljefima, Silvan je najčešće predstavljan sa granom u ruci ili sa krunom od borovih grančica na glavi, često u društvu psa, što naglašava njegov patronat nad divljinom, šumama, poljoprivredom, ali i granicama i međama.

Autorka skreće pažnju i na Silvanu, družbenicu sa kojojm je Silvan često povezan na votivnim spomenicima i reljefima, naglašavajući da je izvesno reč o nimfi, ali da epigrafski i ikonografski podaci ne pružaju dovoljno podataka da bi se izveo zaključak kojoj vrsti nimfi ona pripada.

Bez obzira na to koliko su nejasni koreni Silvanovog kulta, on, tokom II veka, u zapadnim delovima Carstva, dostiže veliku popularnost, koja se naročito širi u narednih stotinjak godina. Poštovanje kulta Silvana u Dalmaciji i Panoniji svedoči o spoju tradicionalnih rimskih i starosedelačkih religijskih, ikonografskih i umetničkih ideja i stavova.

Na početku izlaganja o kultu Silvana u Dalmaciji, autorka predočava da nijedan kult lokalnih zajednica u unutrašnjosti Balkana nije dosegao domete mitoloških sadržaja božanstava grčko-rimskog panteona. Epigrafski spomenici sačuvali su imena nekoliko starosedelačkih božanstava (Medaurus, Andinus, Vidas, Thana), čiji su umetnički prikazi povezani sa srodnim bogovima poput Silvana, Dijane, nimfi... Pomenuta božanstva često su prikazivana zajedno, a najznačajnije među njima, ili bar najzastupljenije, bilo je mitološko biće identifikovano sa Silvanom kroz proces *interpretatio romana.* U nastavku teksta, autorka predtstavlja tumačenja brojnih istraživača (D. Rendić-Miočević, A. Von Domaszewski, R. Schneider, D. Maršić, N. Cambi, P. F. Dorcey, J. Lulić, D. Džino...) koji sučeljavaju mišljenja vezana za odnos italskog i starosedelačkog Silvana.

Svi poznati Silvanovi epiteti u Dalmaciji su latinski i nijedan od njih ne pokazuje ni tragove mogućih lokalnih korena. Sa druge strane, ikonografska predstava italskog Silvana nije prihvaćena u Dalmaciji, na čijem prostoru se božanstvo predstavlja u formi grčkog Pana, sa njegovim atributima, poput peduma i siringe, kao zamena za voćarski nož i borovu granu. U skladu sa prilagođavanjem Panovoj ikonografiji, Silvan gubi potpunu humanoidnu formu, dodatkom kozjih nogu, ušiju i rogova. Na ovom mestu treba imati u vidu da Silvan i Pan, iako poseduju određeni broj zajedničkih karakteristika, nastavljaju da budu poštovani kao dva zasebna božanstva.

U Panoniji, Silvan predstavlja najpopularnije božanstvo, odmah iza Jupitera Optimusa Maksimusa, koga, po broju posvećenih spomenika, čak i nadmašuje u gradovima Karnuntumu i Akvinkumu. Mnogi autori, na prvom mestu A. von Domaszewski, smatraju da je izvorni Silvan bio starosedelačko panonsko božanstvo. Sa druge strane, P. F. Dorcey smatra da je reč o božanstvu sa veoma malo, ako ih uopšte i ima, lokalnih karakteristika.

Spomenici posvećeni Silvanu u Panoniji, u najvećem broju, potiču iz rimskih naselja, najčešće smeštenih duž limesa. Gotovo polovina spomenika potiče iz Karnuntuma i Akvinkuma, dok ostale kultne centre čine Brigecio, Skarabantia, Savaria i Vinobona, svi na severu, dok se na jugu Panonije značaj Silvanovog kulta primećuje u okolini Siska, Topuskog i Daruvara. Panonski Silvan je poštovan zajedno sa rimskim bogovima i, veoma retko, lokalnim božanstvima poput Kvadrive. Jedino božanstvo sa kojim se Silvan (ikonografski) poistovećuje je Pan i to na izolovanom spomeniku, možda posvećenom od strane iseljenika iz Dalmacije.

Autorka publikacije, Ljubica Perinić, smatra da, za sada, nema dovoljno snažnih argumenata da se podrži mišljenje starijih istraživača da se, pod imenima lokalinih božanstava Vidasa i Thane, nalaze pandani Silvana i Dijane. Sa druge strane, verovatno je da jedan od Silvanovih epiteta, *Maglae* ili *Maglaenus,* potiče iz keltskog jezika. Svi ostali Silvanovi epiteti iz Panonije su latinski,

sa mogućim izuzetkom epiteta *Viator.*

Nalazi kamenih reljefa sa predstavama Silvana u Panoniji, takođe, većinom potiču sa limesa. Kao i u slučaju natpisa, ni na reljefima se ne uočavaju značajniji uticaji starosedelačkih kultova ili stanovništva.

Panonski Silvan obično je predstavljen obučen u kratku tuniku, sa čizmama na nogama, sa ili bez ogrtača (u kome nije obavezno prisustvo voća). U jednoj ruci mu se nalazi voćarski nož, a u drugoj granu drveta, baš kao i njegov italski pandan. Ponekad na glavi nosi frigijsku kapu, što je čest motiv u Dakiji.

Najveći broj votivnih spomenika i reljefa posvećenih Silvanu u Panoniji datuju se u vreme vladavine Septimija Severa. Neki autori smatraju ovog vladara za velikog promotera kulta Silvana u Panoniji, do mere da ga je uzdigao do uloge zvaničnog simbola provincije, koja ga je prva priznala za imperatora.

Broj poznatih spomenika posvećenih Silvanu zaista je manji do vladavine dinastije Severa, ali autorka, Ljubica Perinić, skreće pažnju na činjenicu da su, tokom markomanskih ratova, bili razoreni veliki gradovi, poput Akvinkuma, Brigecija i Karnuntuma, kada je mogao biti uništen veliki broj natpisa i reljefa, među kojima je moralo biti i onih posvećenih Silvanu.

Drugo poglavlje knjige posvećeno je dedikantima i Silvanovim epitetima. Autorka iznosi podatak da su dedikanti retko ostavljali podatke o svojim zanimanjima i društvenom statusu na votivnim natpisima. Među dedikantima, koji su smatrali za potrebno da na spomeniku predstave tu vrstu ličnih podataka, su vojnici i neki pripadnici viših staleža (auguri i dekurioni). Autorka, ipak, smatra da kult Silvana nije bio široko rašíren među pripadnicima najviših društvenih staleža. Sa druge strane, postoje spomenici koji posvedočuju zahvalnost koju su prema Silvanu osećali robovi i oslobođenici.

Sa prostora Dalmacije poznato je 29 spomenika posvećenih Silvanu, na kojima imenu božanstva nije pridodat neki od epiteta. Kao jedinstven Silvanov epitet javlja se *Communis,* dok neki au-

tori navode i natpise sa akronimom *V*, koji autori čitaju kao *Vilicus* ili *Viator*, što ne predstavlja pouzdano razrešenje.

Iz Panonije, u okviru kategorije spomenika bez epiteta, imamo 75 natpisa. U ovoj provinciji, za razliku od Dalmacije, srećemo veći broj spomenika sa epitetima koji se ređe povezuju sa Silvanom, kao što su: *Magla, Magnus, Bellator, Consercator, Anticessor, Erbarius* i *Viator*. U svakom slučaju, na teritorijama dve provincije, koje predstavljaju temu istraživanja u ovoj publikaciji, najzastupljeniji se epiteti *Augustus, Silvester* i *Domesticus*. Autorka, potom, predstavlja reljefne spomenike posvećene Silvanovom kultu i deli ih na tri osnovne grupe: samostalne predstave Silvana, Silvan sa nimfama i Silvan sa drugim božanstvima.

U narednom poglavlju pružen je osvrt na proces *interpretatio romana* i rimski verski sinkretizam, uz neizbežni osvrt na refleksije ovih procesa na razvoj kulta Silvana u Dalmaciji i Panoniji. Autorka, na početku, predstavlja osnovna značenja pojma *interpretatio romana* (prvi put zabeleženog još u Tacitovoj *Germaniji*), uz naglašavanje različitih interpretacija koje su izražavali brojni istraživači prilikom pokušaja preciznijih definisanja ovog procesa, pri čemu i dalje ostaju otvorena brojna pitanja. Na primeru Silvana, naglašene su razlike u ikonografskom predstavljanju, kao i u preovlađujućim epitetima (u Dalmaciji Silvan Silvester, dok je u Panoniji zastupljeniji Silvan Domesticus) koji svedoče o tokovim asimilacije i intergracije u okviru koegzistencije dva naroda i sistema, kroz proces romanizacije koji, neizbežno, dovodi do kreiranja potpuno nove religijske prakse. Kao uticaj rimskog verskog sinkretizma, uočavaju se elementi do tada neuobičajeni za Silvana, a samo božanstvo se često zajedno poštuje i prepliće sa brojnim pripadnicima rimskog panteona (Prijap, Liber, Merkur, Mitra, Atis...).

Poglavlje o Silvanovim svetilištima podeljeno je na dva dela, posvećena svetim mestima ovog kulta u Dalmaciji i Panoniji. Na početku izlaganja autorka, nakon kratkog, ali veoma edukativnog, osvrta na interpretacije značenja latinske reči *templum,* predočava pitanja o vidovima poštovanja kulta Silvana u svetilištima, odnosno svetim mestima u prirodi i hramovima, uz naglašavanje razlike između konstatovane situacije u navedenim provincijama.

Na prostoru Dalmacije, utvrđeno je postojanje tri osnovna tipa Silvanovih svetilišta. Najznačajnija su svetilišta na otvorenom prostoru. sa predstavom božanstva uklesanom u stenu, a zastupljena su i svetilišta u pećinama i edikule. U Panoniji situacija je drugačija, jer nije utvrđeno postojanje svetilišta na otvorenom prostoru, a dokumentovano je postojanje hramova (autorka podvlači mišljenje mađarskih istraživača koji smatraju da je u Panoniji, do II veka nove ere, reč *templum,* potvrđena na natpisima, nije označavala veći kompleks, nego manje svetilište). Na osnovu natpisa i osnove građevinskog objekta, u Karnuntumu je utvrđeno postojanje hrama u kome je poštovan kult Silvana (možda zajedno sa još nekim božanstvima). Koncentracija votivnih napisa i drugih nalaza ukazuje na postojanje i drugih svetilišta u Panoniji (Topusko, Dunabogdanj, Daruvar, Siscia, Aqua Balissae, Mursa). Na stranicama poglavlja, autorka precizno navodi i situaciju i okolnosti nalaza na svakoj lokaciji mogućeg svetilišta na području istraživanja, stvarajući, u skladu sa trenutnim saznanjima, precizan pregled i raspored mogućih svetilišta.

U završnim razmatranjima, autorka Ljubica Perinić, autorka se ponovo osvrće na pitanje interpretacije starosedelačkih božanstava preko imena grčko-rimskih bogova i njihov karakter i kult verskim sinkretizmom povezan sa antičkim panteonom. Posebno se skreće pažnja na Delmate, čiji prostor čini jezgro rimske Dalmacije gde su se održali uticaji starosedelačke kulture, uključujući i njihovo najznačajnije božanstvo, Silvana, ikonografski izraženo po uzoru na grčko-arkadskog Pana, sa pozajmljenim imenom italskog božanstva. Potom se navodi Silvanova kultna zajednica, na prvom mestu boginja identifikovana sa Dijanom i nimfe, čiji zajedničke predstave pružaju delimičan pogled i na drevni starosedelački folklor. Navodi se da su epiteti, koje nosi božanstvo, is-

ključivo rimski, i sve se uklapa u sliku gde starosedelačko stanovništvo, kroz proces romanizacije, prihvata rimski panteon, dok, sa druge strane, Italici i ostali naseljenici, na prvom mestu orijentalci, počinju da poštuju i lokalna božanstva.

Naglašava se da većina reljefa sa usvojenom ikonografskom predstavom Silvana u Dalmaciji potiče sa teritorije koju su naseljavali Delmati, između morske obale i masiva Dinare. Posebno se skreće pažnja na mišljenja, na prvom mestu D. Rendić Miočevića, da je, na delmatskim predstavama, predstavljeno njihovo vrhovno božanstvo, čija je povezanost sa italskim Silvanom, mogla biti samo po imenu, koje je, moguće, označavalo suštinu lokalnog boga šuma.

Nakon toga, opširno se izlaže pitanje identifikacije božanstava, na natpisu iz Topuskog zabeleženih pod imenima Vidas i Thana, odnosno mogućnosti njihovog poistovećivanja sa italskim božanskim parom koji su činili Silvan i Dijana. Autorka napominje da su, verovatno, zabeležena ber još dva imena starosedelačkog božanstva, potonjeg Silvana, zabeležena u skraćenoj formi, jer su bila dobro poznata tadašnjem stanovištvu. To su Silvan *Messor* (moguća skraćenica od *Messorius, Messorianus, Messorina...*) i *Cor.* (ovde, verovatno, nije reč o poznatom Jupiterovom epitetu *Cohortalis*).

Prema autorkinom stavu, razvoj delmatskog Silvana može se ilustrovati kombinacijom sledećih faktora: grčkog Pana (indoevropski koreni), delmatskog „Pana" nepoznatog imena i ikonografije (takođe indoevropski koreni), uticaja grčke ikonografije (teriomorfizam), italskog Silvana (pozajmljeno ime, ali ne i ikonografija), antropomorfnog Silvana i italske ikonografije.

Autorka iznosi mišljenje da ne postoje razlozi zvog kojih Delmate ne bi bile u mogućnosti da izraze svoja božanstva, na isti način kao i druge istovremene populacije na području Mediterana. Silvan, njihov bog prirode, nije morao biti identičan sa Panom, iako je sa njim delio neke ikonografke elemente. Možda su Delmate, jednostavno, mogle da zamisle svog Silvana u formama koje su se poklapale sa načinom na koji su Arkađani predstavljali Pana. Sa dolaskom Rimljana, Delmate su naučile da izražavaju svoje ideje, na rimski način, putem latinskog jezika i kamenih spomenika.

Na prostorima rimske Panonije, počev od 193. godine i uspostavljanja dinastije Severa, Panonci starosedeoci počinju da proširuju svoj lokalni „panteon", ne samo jednostavnim prihvatanjem rimskih bogova, nego i isticanjem karakteristika svojih božanstava i kultova kako bi se oni lakše mogli približiti rimskim verovanjima. Gledano kroz ovaj, vrlo verovatni pogled, otvaraju se mogućnosti da panonski kultovi, razvijani u rimskom periodu, uključujući tu i Silvanov, iako ne poseduju lokalne odlike, u svojoj osnovi mogu imati starosedelačke korene. Treba naglastiti da se Silvan na dva spomenika, iz Siska i Karnuntuma, javlja sa neitalskim epitetom *Magla*. Ostali Silvanovi epiteti su nesumnjivo italski: *Domesticus, Augustus, Silvester, Herbarius* i *Orientalis* (sa značenjem koje označava čuvara i zaštitnika granica i međa).

Silvan, posle Jupitera, predstavlja najpopularnije božanstvo u Panoniji. On je veoma retko, na spomenicima, poštovan zajedno sa ostalim tradicionalnim božanstvima rimskog panteona, a još ređe u društvu bogova orijentalnog porekla. Imajući u vidu da i orijentalni kultovi u Panoniji procvetavaju u vreme vladavine dinastije Severa, navedeni podatak ukazuju da se kult Silvana na ovim prostorima ne može povezivati samo sa vladavinom ove dinastije. U retkim izuzecima poštovan je zajedno sa božanstvima sličnog karaktera, poput Silvane (ili Kvadrive).

Veliko prisustvo spomenika posvećenih Silvanu, naveo je pojedine istraživače na zaključak da je on predstavljao zvaničan simbol provincije Panonije. Takođe, postoji mišljenje da je kult Silvana u zapadnim delovima Panonije, pod Flavijima, Antoninima i, posebno, Severima, podstao deo zvanične religije, što potvrđuju brojni spomenici iz II i III veka. Autorka, ipak, skreće pažnju na činjenicu da je većina ovih spomenika podignuta u privatnim svetilištima, od strane dedikanata skromnog porekla. Značajan broj spomenika posvećen je na porodičnim poljoprivrednim imanjima, koja su procve-

tala tokom epohe Severa, što je moglo predstavljati bitan podsticaj za širenje kulta Silvana.

I pored velike povezanosti kulta Silvana sa poljoprivredom, najveći broj spomenika pronađen je u okviru naselja podizanih u blizini vojničkih logora, duž toka Dunava. Na ovom mestu, naglašava se da je Silvan bio najpopularnije božanstvo i među Panoncima, posebno među zajednicama koje su imale direktnu komunikaciju sa vojskom. Ipak, razvoju kulta najviše su doprineli Italici, gde je znatan broj predstavljao pripadnike vojnih jedinica (23% natpisa, na kojima se može odrediti društveni status dedikanta, u Panoniji pripada vojnicima, dok u Dalmaciji njihova zastupljenost iznosi 7,1%), koji su mogli doprineti širenju kulta i u susednim provincijama, Gornjoj Meziji i Dakiji. Dalji tekst završnih razmatranja posvećen je specifičnostima kulta u obe provincije obrađene u publikaciji.

Kao zaključak, autorka navodi da kult Silvana, u osnovi privatnog karaktera, predstavlja najbolji primer rimskog narodnog i popularnog kulta i pruža pogled i na život nižih klasa, uključujući i robove i oslobođenike. Silvan predstavlja drevno rimsko božanstvo čiji koreni, i do danas, ostaju nesagledivi. Ostaje otvoreno pitanje zbog čega je jedno božanstvo, široko prihvaćeno i tradicionalno, ostalo izvan zvaničnog religijskog sistema, kada to nije bio slučaj i sa pojedinim božanstvima stranog porekla, poput Kibele ili Izide. Sa druge strane, nesporni su dokazi da, čak i kada je kult „zvaničnih" božanstva počeo da opada, Silvanov kult se dodatno razvijao. Silvan nije bio posebno prihvaćem od strane rimske aristokratije, koja je neka druga božanstva prihvatala kao zaštitnike poljoprivrede, šume ili stada, mada je i u tim krugovima izvesno poštovana njegova autentičnost i drevnost. Silvan je pronašao svoje mesto među nižim klasama i manje školovanim stanovništvom, zbog čega pojedini sačuvani zapisi o njemu, ponikli iz pera edukovanih autora, možda mogu nositi i crtu nerazumevanja određenih karakteristika.

Kult Silvana nije imao zvanično sveštenstvo, koji bi formalizovalo rituale i odredilo pravila poštovanja božanstva. U najvećoj meri, razlozi za poštovanje Silvana bili su privatne prirode, što znači da je on obezbeđivao različite vrsta pomoći i ispunjavao raznovrsne potrebe ljudi, često povezane sa svakodnevnim životom, što često nije bio slučaj sa delovanjem strogih zvaničnih božanstava, poštovanih u okviru državnog kulta.

Razumljivo je da je kult Silvana počinjao da gubi određene ruralne karakteristike, nakon što je više generacija njegovih poštovalaca prešlo na gradski način života i počelo da zaboravlja istinske ruralne karakteristike, koje počinju da bivaju romantizovane i idealizovane. Na ovaj način, odvojen od svog izvornog ruralnog okruženja, Silvan prilagođava neke vrste svog karaktera i postaje zaštitnik kuće, porodice i lične svojine, istovremeno neprestano podsećajući poštovaoce na zajedničke korene, kako njih samih, tako i njihovog zaštitnika. Interpretacije na Silvanovim natpisima i reljefima, prvenstveno u Italiji i Panoniji, pružaju pogled na način na koji su stanovnici gradova zamišljali život na selu. Sa druge strane, spomenici iz Dalmacije, pogotovu oni iz unutrašnjosti provincije, odslikavaju direktnu povezanost sa ruralnim zajednicama.

Krajem I veka nove ere nastaje nova situacija u Dalmaciji, koja se odrazila i na razvoj kulta Silvana. Nakon 86. godine, Dalmacija postaje *provincia inermis,* dok ni rimski državni aparat nije imao tako snažan položaj u unutrašnjosti procivije kao što je to bio slučaj u Panoniji, pa i u gradovima na dalmatinskoj obali.

Na relativno izolovanom području u unutrašnjosti Dalmacije, otkriva se slika ruralnog Silvana u svom prirodnom okruženju, koja ilustruje posebnost delmatskog tipa ovog božanstva. Delmatski Silvan je izvorno, prema autorkinom mišljenu, najverovatnije bio starosedelačko božanstvo prirode, koje je vremenom počelo da se vizuelno predstavlja u formi grčkog Pana, a ponelo ime rimskog božanstva. Autorka izražava opravdanu sumnju da bi rimski Silvan mogao doseći takav stepen popularnosti kod starosedelačkog stanovništva, da među njima već nije postojala tradicija poštovanja neke vrste božanstva prirode.

Navedeno razmišljane autorka dodatno produbljuje u finalnom zaključku svoga dela, u kome iznosi mišljenje da je Silvan, kakav je bio poštovan kod Delmata, zapravo predstavljao simbol otpora protiv rimske vlasti. Ako bi se ovaj zaključak pokazao kao ispravan, može se postaviti pitanje da li sličan slučaj možemo imati i na prostoru Panonije. Autorka, potom, jednostavno odgovara da Silvan nije predstavljao simbol otpora kod Panonaca, ali odmah zatim parafrazira poznatu izreku po kojoj *nepostojanje dokaza nije dokaz nepostojanja*!

Završni deo knjige predstavlja katalog, gde su, putem sistematski obrađenih kataloških jedinica i fotografija značajnog broja nalaza, navedeni spomenici kulta Silvana iz Dalmacije i Panonije. Katalog se sastoji od 340 votivnih natpisa i 120 reljefnih spomenika (uključujući i reljefno-epigraske spomenike, statuete i figurine). Podeljen je na dva osnovna dela: Dalmaciju i Panoniju. Svaki deo dalje je raščlanjen na dve podgrupe: natpise i reljefe. Natpisi su dalje, na osnovu epiteta, podeljeni na pet celina: Silvan (bez epiteta i sa ređe zastupljenim epitetima), Silvan Augustus, Silvan Silvester, Silvan Domesticus i Silvan i druga božanstva. Reljefi su, na osnovu prikazanih božanstava, raščlanjeni na četiri celine: Silvan samostalno, Silvan i nimfe, Silvan i Dijana i Silvan i druga božanstva.

Autorsko delo Ljubice Perinić predstavlja značajan istraživački poduhvat, na čijim stranicama je predstavljena precizno izložena problematika, kvalitetna analiza i sinteza dosadašnjih saznanja i publikovane literature, originalni i inspirativni zaključci i kompletan spisak kataloških jedinica spomenika Silvanovog kulta u Dalmaciji i Panoniji, što predstavljenu monografiju preporučuje kao nezaobilaznu literaturu za sve istraživače antičke religije, arheologije i kulture.

Ljubiša VASILJEVIĆ

SMILJA JOVIĆ, JULIJANA PEŠIĆ, VLADIMIR STOJANOVIĆ, VLADIMIR STEVANOVIĆ, TAJNE ARHEOLOŠKIH DEPOA – MUZEJSKE AKVIZICIJE / ARCHAEOLOGICAL AC-QUISITIONS (KATALOG ISTOIMENE IZLOŽBE), IZDANJE NARODNI MUZEJ LESKO-VAC, LESKOVAC 2017.

Publikacija sadrži 143 stranice (uvodni deo i šest tematskih celina) i 314 kataloških jedinica (55 je ilustrovano fotografijama).

Autorski tim Narodnog muzeja Leskovac, u sastavu Smilja Jović, Julijana Pešić, Vladimir Stojanović i Vladimir Stevanović dobitnik je prestižne nagrade "Mihailo Valtrović", koju dodeljuje Muzejsko društvo Srbije (MDS) za izuzetne rezultate u stručnom i/ili naučnom radu u očuvanju, tumačenju i prezentaciji kulturnih dobara, koji predstavljaju istaknuti doprinos razvoju kulture u Srbiji, odnosno za „izložbu godine" u 2017. godini.

Isti autorski tim potpisuje katalog izložbe u kome su na inspirativan i prijemčiv način, ali i uz poštovanje svih muzeoloških i arheoloških standarda, opisani aspekti rada arheološkog odeljenja leskovačkog muzeja. Na izložbi su predstavljeni arheološki nalazi, nabavljeni na različite načine, od osnivanja Narodnog muzeja Leskovac, do današnjih dana. Veliki broj izloženih eksponata pohranjen je u depoima muzeja i po prvi put je predstavljen stručnoj i široj javnosti. Treba naglasiti i da je veliki broj predmeta na izložbi otkriven prilikom relativno skorih arheoloških istraživanja lokaliteta Kamenitica u Maloj Kopašnici, Hisar u Leskovcu i crkvi Svetog Jovana Preteče u selu Jašunja.

U uvodnom delu publikacije, nakon objašnjenja značenja termina *akvizicija*, predstavljena je tradicija prikupljanja i čuvanja arheoloških nalaza u leskovačkom kraju, koja započinje 1926/27. godine. Navedene, preciznije rečeno školske, godine, u okviru Đačkog istorijskog društva Vulović, osnovanog u okviru Gimnazije, započeto je prikupljanje nalaza na Caričinom gradu, Skobaljić gradu i Hisaru. Otkriveni nalazi poslužili su kao osnova za formiranje numizmatičke i zbirke oružja i keramike. Nažalost, prikupljeni nalazi stradali su, zajedno sa zgradom Gimnazije, u bombardovanju 1944. godine.

Novo poglavlje u prikuplanju nalaza započinje sa osnivanjem – tada Gradskog – muzeja, 1948. godine. Tada se organizuju i prve arheološke zbirke, u početku od predmeta dobijenih putem poklona, na prvom mestu od svestranog istraživača Sergija Dimitrijevića, a potom i drugih ljubitelja starina, dok je jedan deo eksponata nabavljan otkupom. Potom otpočinju i arheološka istraživanja brojnih lokaliteta u leskovačkom kraju, koje je Muzej sprovodio najčešće u saradnji sa drugim institucijama, na prvom mestu Arheološkim institutom. Autori naglašavaju prva iskopavanja izvedena na lokalitetima Progon–Čuka u Grabovnici i Gradcu kod Zlokućana, a potom i istraživanja nekropola u selu Vrapcu (praistorijska), Maloj Kopašnici (rimska) i Gazdaru i Pečenjevcu (srednjovekovne nekropole). Arheološki su istraživana i nalazišta na Skobaljić gradu, Hisaru i kod jašunjskih manastira, u porti crkve Svetog Jovana Preteče. Posebno mestu zauzimaju istraživanja Caričinog grada koja, sa izvesnim prekidima, traju od 1912. godine do danas.

Katalog se sastoji iz dva dela. Prvi deo čine šest temetskih celina, koje su autori smatrali upečatljivim i postojećim nalazima dokumentovanim, temama za prezentaciju određenih aspekata arheološkog nasleđa leskovačkog kraja. Svakoj celini prethodi legenda kojom se opisuje tema, dok je posebno predstavljeno 55 nalaza koji, po mišljenju autora, predstavljaju najreprezentativnije eksponate zastupljene na izložbi. Ovi nalazi prezentovani su detaljnim opisom, fotografijom i iscrpnim spiskom literature u kojoj su zabeleženi. Drugi deo kataloga sadrži preostalih 259 kataloških jedinica sa tekstualnim odrednicama.

Prva predstavljena celina posvećena je pitanju sahranjivanja u bronzano doba, koje se u leskovačkom kraju može pratiti na osnovu nalaza

nekropola brnjičke kulturne grupe, registrovanim na lokalitetima u Vrapcu, Gubavcu i Togočevcu. Celina je ilustrovana fotografijama šest urni sa navedenih lokaliteta.

Druga celina, *Kult u praistoriji,* predstavlje materijalnu baštinu praistorijskih kultova, ogledanu kroz antropomorfne i zoomorfne figurine, žrtvenike i srodne nalaze. Ilustrovana je fotografijama nalaza sa lokaliteta Stubla, Gradac u Zlokućanima, Progon–Čuka u Maloj Grabovnici i nepoznatih lokaliteta.

Predmeti za igru iz arheoloških zbirki, naziv je treće celine sa temom ne tako često zastupljenom u literaturi. Za razliku od prethodnih tema, ova celina nije uže hronološki određena, nego su u njoj zastupljeni nalazi iz perioda praistorije, antike i srednjeg veka. Priča započinje minijaturnim praistorijskim keramičkim posudama-igračkama, imitacijama kuhinjske keramike, potom nas podseća na igračke iz istog perioda koje su izrađivali odrasli majstori, ali i sama deca, dok se navodi da se u zbirkama leskovačkog muzeja nalaze i drugi predmeti korišćeni za igru i zabavu poput astragala, kocki, žetona, opeka namenjenih za društvene igre... Kroz ilustrovani deo celine predstavljene su minijaturne posude iz Vinarca, praistorijski točak-igračka sa lokaliteta Hisar u Leskovcu, rimske i ranovizantijske kockice za igru iz Male Kopašnice i Caričinog grada, astragali i žetoni za igru iz raznih vremenskih perioda otkriveni u Caričinom gradu i Hisaru i opeka sa ucrtanom šemom za društvenu igru („mica“).

Arheologiju je teško zamisliti bez keramike, pa tako je sledeća celina obradila temu *Grnčarija iz arheoloških zbirki.* Posude su, uz uvažavanje hronološkog principa, predstavljene po njihovoj funkciji. Kuhinjska keramika iz bronzanog doba prezentovana je posudama otkrivenim na lokalitetu Hisar, iz rimskog perioda sa Pazarišta u Maloj Kopašnici i iz ranovizantijskog perioda sa lokaliteta Caričin grad. Srednjovekovna trpezna grnčarija prikazana je nalazima sa lokaliteta crkve Svetog Jovana Preteče u Jašunji, a keramika korišćena tokom sepulkralnog kulta sa rimske ne-

kropole Kamenitica u Maloj Kopašnici.

Posebna pažnja skreće se na temu *Sahranjivanje i ishrana u bronzano doba na Hisaru,* posvećene jednom periodu života lokaliteta, smeštenog iznad samog Leskovca, naseljenog od neolita do današnjih dana. Tokom poznog bronzanog doba se, na ovom nalazištu, stanovalo u poluzemunicama i pravogaonim nadzemnim kućama, nalik današnjim čatmarama. Navedene su posvedočene poljoprivredne kulture (ječam, proso, pšenica, mahunarke...) i nalazi predmeta namenjenih za pripremanje hrane (lonci, pehari, žrvnjevi...).

Završna celina posvećena je nakitu iz arheoloških zbirki, koji se u Narodnom muzeju Leskovac čuvaju u okviru praistorijske, anitičke (najbrojnija kolekcija, sa osnovom u nalazima sa nekropole u Maloj Kopašnici) i srednjovekovne zbirke, kao i zbirkama Caričin grad i Hisar. Za ilustraciju celine izabrane su praistorijska koštana igla sa Hisara, više nalaza zlatnih naušnica, srebrne fibule, bronzana pojasna oprema, bronzana narukvica i ogrlica od perli (staklena pasta i pozlata) iz Male Kopašnice, narukvica sa predstavom Bogorodice Orante (VI vek) sa Caričinog grada, ranovizantijska bronzana narukvica sa istog lokaliteta, bronzane fibule i pojasna oprema (V−VI vek) iz Gradašnice i Caričinog grada i srednjovekovna bronzana trakasta narukvica iz Gradašnice.

Drugi deo publikacije, kao što je već navedeno, posvećen je katalogu predmeta (detaljno opisanim), koji nisu ilustrovani fotografijama.

Autorski tim kreativno je zamislio temu izložbe i kataloga i na nju uspešno odgovorio, kreirajući publikaciju, pripremljenu na moderan i pristupačan način koja će biti nezamenljiva literatura svih istraživača arheologije ne samo leskovačkog kraja, nego i mnogo šireg prostora.

Ljubiša VASILJEVIĆ

UREĐIVAČKA POLITIKA ČASOPISA ARHEOLOGIJA I PRIRODNE NAUKE

Časopis *Arheologija i prirodne nauke* posvećen je temama iz naučnih oblasti: arheologije, istorije arhitekture, istorije umetnosti, antropologije, arheozoologije, arheobotanike, geofizike, računarskog inženjerstva i ostalih srodnih disciplina.

Časopis *Arheologija i prirodne nauke* je kao samostalno izdanje počeo da izlazi 2005. godine kao glasilo Centra za nove tehnologije Viminacium i Arheološkog instituta iz Beograda.

Časopis *Arheologija i prirodne nauke* objavljuje originalne, prethodno neobjavljene radove: originalne naučne radove, pregledne radove, izveštaje sa iskopavanja, kritike i prikaze.

Časopis *Arheologija i prirodne nauke* je dostupan u režimu otvorenog pristupa.

Jezici na kojima se mogu predati članci su engleski, nemački ili francuski. Ukoliko je rad napisan na engleskom jeziku, rezime može biti na srpskom (za domaće autore) ili engleskom (za strane autore), dok kod članaka predatih na nemačkom ili francuskom, rezimei moraju biti na engleskom jeziku.

Rukopisi za štampanje u časopisu predaju se sekretaru redakcije, a prema Uputstvu za autore o načinu pripreme članka.

Časopis *Arheologija i prirodne nauke* izlazi jedanput godišnje.

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Redakcija časopisa *Arheologija i prirodne nauke* donosi konačnu odluku o tome koji će se rukopisi objaviti. Prilikom donošenja odluke redakcija se rukovodi uređivačkom politikom vodeći računa o zakonskim propisima koji se odnose na klevetu, kršenja autorskih prava i plagiranje.

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Rad treba da sadrži dovoljno detalja i referenci kako bi se recenzentima, a potom i čitaocima omogućilo da provere tvrdnje koje su u njemu iznesene. Namerno iznošenje netačnih tvrdnji predstavlja kršenje etičkih standarda. Prikazi, kritike i stručni članci moraju biti precizni i objektivni. Ovi radovi se takođe recenziraju i odluku o njihovom prihvatanju donosi redakcija, na osnovu pozitivnih recenzija.

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Rukopisi kod kojih postoje jasne indicije da se radi o plagijatu biće automatski odbijeni i autorima će biti privremeno zabranjeno da objavljuju u časopisu *Arheologija i prirodne nauke*.

Ako se ustanovi da je rad koji je objavljen u časopisu plagijat, isti će biti povučen u skladu sa procedurom opisanom pod *Povlačenje već objavljenih radova*, a autorima će biti privremeno zabranjeno da objavljuju u časopisu *Arheologija i prirodne nauke*.

Sukob interesa

Autori su dužni da u radu ukažu na finansijske ili bilo koje druge sukobe interesa koji bi mogli da utiču na iznesene rezultate i interpretacije.

Greške u objavljenim radovima

U slučaju da autori otkriju važnu grešku u svom radu nakon njegovog objavljivanja, dužni su da momentalno o tome obaveste urednika ili izdavača i da sa njima sarađuju kako bi se rad povukao ili ispravio.

Predavanjem rukopisa redakciji *Arheologija i prirodne nauke* autori se obavezuju na poštovanje navedenih obaveza.

OBAVEZE RECENZENATA

Recenzenti su dužni da stručno, argumentovano, nepristrasno i u zadatim rokovima dostave uredniku ocenu naučne vrednosti rukopisa.

Recenzenti evaluiraju radove u odnosu na usklađenost teme rada sa profilom časopisa, relevantnost istraživane oblasti i primenjenih metoda, originalnost i naučnu relevantnost podataka iznesenih u rukopisu, stil naučnog izlaganja i opremljenost teksta naučnim aparatom.

Recenzent koji ima osnovane sumnje ili saznanja o kršenju etičkih standarda od strane autora dužan je da o tome obavesti urednika. Recenzent treba da prepozna važne objavljene radove koje autori nisu citirali. On treba da upozori urednika i na bitne sličnosti i podudarnosti između rukopisa koji se razmatra i bilo kojeg drugog objavljenog rada ili rukopisa koji je u postupku recenzije u nekom drugom časopisu, ako o tome ima lična saznanja. Ako ima saznanja da je isti rukopis razmatra u više časopisa u isto vreme, recenzent je dužan da o tome obavesti urednika.

Recenzent ne sme da bude u sukobu interesa sa autorima ili finansijerom istraživanja. Ukoliko postoji sukob interesa, recenzent je dužan da o tome momentalno obavesti urednika.

Recenzent koji sebe smatra nekompetentnim za temu ili oblast kojom se rukopis bavi dužan je da o tome obavesti urednika.

Recenzija mora biti objektivna. Komentari koji se tiču ličnosti autora smatraju se neprimerenim. Sud recenzenata mora biti jasan i potkrepljen argumentima.

Rukopisi koji su poslati recenzentu smatraju se poverljivim dokumentima. Recenzenti ne smeju da koriste neobjavljen materijal iz predatih rukopisa za svoja istraživanja bez izričite pisane dozvole autora, a informacije i ideje iznesene u predatim rukopisima moraju se čuvati kao poverljive i ne smeju se koristiti za sticanje lične koristi.

POSTUPAK RECENZIJE

Primljeni radovi podležu recenziji. Cilj recenzije je da redakciji pomogne u donošenju odluke o tome da li rad treba prihvatiti ili odbiti i da kroz proces komunikacije sa autorima poboljša kvalitet rukopisa.

Svaki rad predat redakciji časopisa *Arheolo-gija i prirodne nauke* dobija po dva recenzenta. Recenzenti su istaknuti istraživači, u naučnom zvanju istom ili višem od autora rukopisa, kompetentni u oblasti kojom se rukopis bavi. Predlog recenzenata daje redakcija, a usvaja glavni i odgovorni urednik.

Rukopisi se recenziraju po sistemu *double-blind*, koji podrazumeva anonimnu recenziju: identitet autora je nepoznat recenzentima i obrnuto.

Recenzent je dužan da recenziju pošalje redakciji najkasnije u roku od 30 dana nakon prijema rukopisa. Recenzenti za svoj rad ne dobijaju honorare.

Ukoliko recenzenti traže izmene u rukopisu, autori su dužni da u roku od 30 dana redakciji vrate izmenjen rukopis, ili ukoliko ne izmene, uz rukopis dostave argumentovano obrazloženje zašto izmena nije učinjena. Isto važi i za radove koji nisu pripremljeni u skladu sa uputstvom za autore.

Odluku o prihvatanju rukopisa za štampu donosi redakcija časopisa **Arheologija i prirodne nauke** većinom glasova na predlog recenzenata, a u skladu sa izmenama na rukopisu koje su autori izvršili ili u skladu sa dostavljenim obrazloženjem.

Nakon konačnog formiranja sadržaja broja, rukopisi idu na lekturu, a potom se šalju grafičkom dizajneru koji treba da uradi prelom za štampu. Pre odlaska u štampu rade se još dve korekture u PDF formatu. Konačno odobrenje za štampanje časopisa **Arheologija i prirodne nauke** daje glavni i odgovorni urednik. Rukopis celog broja u štampariji treba da bude do 30. novembra.

Predloženi recenzenti od strane redakcije, dobijaju recenzentski obrazac koji sadrži niz pitanja na koja treba odgovoriti, a koja recenzentima ukazuju koji su to aspekti koje treba obuhvatiti kako bi se donela odluka o sudbini jednog rukopisa. U završnom delu obrasca, recenzenti moraju da navedu svoja zapažanja i predloge kako da se podneti rukopis poboljša. Identitet recenzenata ostaje nepoznat autorima pre, tokom i nakon postupka recenzije. Autorima se preporučuje da prilikom pisanja radova izbegavaju formulacije koje bi mogle otkriti njihov identitet. Redakcija garantuje da će pre slanja rukopisa na recenziju iz njega biti uklonjeni lični podaci autora (pre svega, ime i afilijacija) i da će se preduzeti sve razumne mere kako bi identitet autora ostao nepoznat recenzentima do okončanja postupka recenzije.

Izbor recenzenata spada u diskreciona prava redakcije. Recenzenti moraju da raspolažu relevantnim znanjima u vezi sa oblašću kojom se rukopis

bavi i poželjno je da to ne budu autori koji su u skorije vreme objavljivali publikacije zajedno (kao koautori) sa bilo kojim od autora podnesenog rada.

Tokom čitavog procesa, recenzenti deluju nezavisno jedni od drugih. Recenzentima nije poznat identitet drugih recenzenata. Ako odluke recenzenata nisu iste (prihvatiti / odbiti), glavni urednik može da traži mišljenje drugih recenzenata.

Tokom postupka recenzije urednik može da zahteva od autora da dostave dodatne informacije, ako su one potrebne za donošenje suda o naučnom doprinosu rukopisa. Urednik i recenzenti moraju da čuvaju takve informacije kao poverljive i ne smeju ih koristiti za sticanje lične koristi.

Redakcija je dužna da obezbedi kontrolu kvaliteta recenzije. U slučaju da autori imaju ozbiljne i osnovane zamerke na račun recenzije, redakcija će proveriti da li je recenzija objektivna i da li zadovoljava akademske standarde. Ako se pojavi sumnja u objektivnost ili kvalitet recenzije, urednik će tražiti mišljenje drugih recenzenata.

RAZREŠAVANJE SPORNIH SITUACIJA

Svaki pojedinac ili institucija mogu u bilo kom trenutku da uredniku i/ili redakciji prijave saznanja o kršenju etičkih standarda i drugim nepravilnostima i da o tome dostave neophodne informacije/dokaze.

Provera iznesenih navoda i dokaza
● Urednik će u dogovoru sa redakcijom odlučiti o pokretanju postupka koji ima za cilj proveru iznesenih navoda i dokaza.
● Tokom tog postupka svi izneseni dokazi smatraće se poverljivim materijalom i biće predočeni samo onim licima koja su direktno uključena u postupak.
● Licima za koja se sumnja da su prekršila etičke standarde biće data mogućnost da odgovore na optužbe iznesene protiv njih.
● Ako se ustanovi da je zaista došlo do nepravilnosti, proceniće se da li ih treba okarakterisati ako manji prekršaj ili grubo kršenje etičkih standarda.

Manji prekršaj
Situacije okarakterisane kao manji prekršaj rešavaće se u direktnoj komunickaciji sa licima koja su prekršaj učinila, bez uključivanja trećih lica, npr.:
● obaveštavanjem autora/recenzenata da je došlo do manjeg prekršaja koji je proistekao iz nerazumevanja ili pogrešne primene akademskih standarda;
● pismo upozorenja autoru/recenzentu koji je učnio manji prekršaj.

Grubo kršenje etičkih standarda
Odluke u vezi sa grubim kršenjem etičkih standarda donosi urednik u saradnji sa redakcijom i, ako je to potrebno, malom grupom stručnjaka. Mere koje će preduzeti mogu biti sledeće (i mogu se primenjivati pojedinačno ili istovremeno):
● objavljivanje saopštenja ili uvodnika u kom se opisuje slučaj kršenja etičkih standarda;
● slanje službenog obaveštenja rukovodiocima ili poslodavcima autora/recenzenta;
● povlačenje objavljenog rada u skladu sa procedurom opisanom pod *Povlačenje već objavljenih radova*;
● autorima će biti zabranjeno da tokom određenog perioda šalju radove u časopis;
● upoznavanje relevantnih stručnih organizacija ili nadležnih organa sa slučajem kako bi mogli da preduzmu odgovarajuće mere.

Prilikom razrešavanja spornih situacija redakcija časopisa se rukovodi smernicama i preporukama Odbora za etiku u izdavaštvu (Committee on Publication Ethics – COPE): http://publicationethics.org/resources/.

POVLAČENJE VEĆ OBJAVLJENIH RADOVA

U slučaju kršenja prava izdavača, nosilaca autorskih prava ili autora, povrede profesionalnih etičkih kodeksa, tj. u slučaju slanja istog rukopisa u više časopisa u isto vreme, lažne tvrdnje o autorstvu, plagijata, manipulacije podacima u cilju prevare, kao i u svim drugim slučajevima grubog kršenja etikih standarda, objavljeni rad se mora povući. U nekim slučajevima već objavljeni rad se može povući i kako bi se ispravile naknadno uočene greške.

Standardi za razrešavanje situacija kada mora doći do povlačenja rada definisani su od strane biblioteka i naučnih tela, a ista praksa je usvojena i od strane časopisa *Arheologija i prirodne nauke*:

u elektronskoj verziji izvornog članka (onog koji se povlači) uspostavlja se veza (HTML link) sa obaveštenjem o povlačenju. Povučeni članak se čuva u izvornoj formi, ali sa vodenim žigom na PDF dokumentu, na svakoj stranici, koji ukazuje da je članak povučen (RETRACTED).

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Časopis *Arheologija i prirodne nauke* je dostupan u režimu otvorenog pristupa. Članci objavljeni u časopisu mogu se besplatno preuzeti sa sajta i koristiti u skladu sa licencom Creative Commons — Autorstvo-Nekomercijalno-Bez prerada 3.0 Srbija (https://creativecommons.org/licenses/by-nc-nd/3.0/rs/.

Postupak predavanja rukopisa, recenzija i objavljivanje radova su besplatni.

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Časopis *Arheologija i prirodne nauke* omogućava autorima da prihvaćena, recenzirana verzija rukopisa, kao i finalna, objavljena verzija u PDF formatu deponuju u institucionalni repozitorijum i/ili nekomercijalne baze podataka, ili da rad objave na ličnim veb stranicama (uključujući i profile ne društvenim mrežema za naučnike, kao što su ResearchGate, Academia.edu itd.) i/ili na sajtu institucije u kojoj su zaposleni, a u skladu sa odredbama licence Creative Commons Autorstvo-Nekomercijalno-Bez prerada 3.0 Srbija (http://creativecommons.org/licenses/by-nc-nd/3.0/rs/), u bilo koje vreme nakon objavljivanja u časopisu. Pri tome se moraju navesti osnovni bibliografski podaci o članku objavljenom u časopisu (autori, naslov rada, naslov časopisa, volumen, sveska, pagincaija), a mora se navesti i digitalni identifikator objekta – DOI objavljenog članka u formi HTML linka.

AUTORSKA PRAVA

Kada je rukopis prihvaćen za objavljivanje, autori prenose autorska prava na izdavača.

Na izdavača se prenose sledeća prava na rukopis, uključujući i dodatne materijale, i sve delove, izvode ili elemente rukopisa:

- pravo da reprodukuje i distribuira rukopis u štampanom obliku, uključujući i štampanje na zahtev;
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- pravo da rukopis učini dostupnim javnosti ili zatvorenim grupama korisnika na osnovu pojedinačnih zahteva za upotrebu na monitoru ili drugim čitačima (uključujući i čitače elektonskih knjiga), i u štampanoj formi za korisnike, bilo putem interneta, onlajn servisa, ili putem internih ili eksternih mreža.

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Izneseni stavovi u objavljenim radovima ne izražavaju stavove urednika i članova redakcije časopisa. Autori preuzimaju pravnu i moralnu odgovornost za ideje iznesene u svojim radovima. Izdavač neće snositi nikakvu odgovornost u slučaju ispostavljanja bilo kakvih zahteva za naknadu štete.

Redakcija časopisa *Arheologija i prirodne nauke* odlučila je da primenom *Akta o uređivanju naučnih časopisa* Ministarstva za nauku i tehnološki razvoj Republike Srbije, kojim se uređuje opremanje naučnih časopisa u celini, unapredi dosadašnji kvalitet časopisa i na taj način doprinese njegovom potpunijem uključivanju u međunarodni sistem razmene naučnih informacija.

UPUTSTVO AUTORIMA O NAČINU PRIPREME ČLANKA
ZA ČASOPIS ARHEOLOGIJA I PIRODNE NAUKE

Redakcija časopisa *Arheologija i prirodne nauke* odlučila je da primenom *Akta o uređivanju naučnih časopisa* Ministarstva za nauku i tehnološki razvoj Republike Srbije, kojim se uređuje opremanje naučnih časopisa u celini, unapredi dosadašnji kvalitet časopisa i na taj način doprinese njegovom potpunijem uključivanju u međunarodni sistem razmene naučnih informacija.

Časopis *Arheologija i prirodne nauke* posvećen je temama iz naučnih oblasti arheologije, istorije arhitekture, istorije umetnosti, antropologije, arheozoologije, arheobotanike, geofizike, računarskog inženjerstva i ostalih naučnih disciplina i tehnika.

Časopis *Arheologija i prirodne nauke* objavljuje originalne, prethodno neobjavljene radove: originalne naučne radove, pregledne radove, izveštaje sa iskopavanja, kritike i prikaze.

Jezici na kojima se mogu predati članci su engleski, nemački ili francuski. Ukoliko je rad napisan na engleskom jeziku, rezime može biti na srpskom (za domaće autore) ili engleskom (za strane autore), dok kod članaka predatih na nemačkom ili francuskom, rezimei moraju biti na engleskom jeziku.

Članci koji se predaju redakciji časopisa *Arheologija i prirodne nauke* moraju biti opremljeni na standardni način. Svaki tekst koji se predaje treba da sadrži: naslov; ime autora; naziv ustanove (afilijacija); apstrakt; ključne reči; osnovni tekst; rezime; grafičke priloge sa listom ilustracija; bibliografiju; kontakt podatke.

1. Naslov treba da bude kratak i jasan, i da što vernije opiše sadržaj članka. U naslovu treba da se koriste reči prikladne za indeksiranje i pretraživanje. Ako takvih reči nema u naslovu, poželjno je da se naslovu pridoda podnaslov. Naslov se piše u petom ili šestom redu ispod gornje margine velikim masnim (bold) slovima veličine 14 (pts).

2. Autor ili autori članka treba da navedu svoje puno ime i prezime.

3. Autor ili autori treba da navedu zvaničan naziv i sedište ustanove u kojoj su zaposleni, a eventualno naziv i sedište ustanove u kojoj su obavili istraživanja čije rezultate sada objavljuju. Kod složenih intstitucija navodi se ukupan naziv (na pr.: Univerzitet u Beogradu, Filozofski fakultet, Odeljenje za arheologiju, Beograd).

4. Apstrakt je kratak prikaz sadržaja članka (100-250 reči). Poželjno je da sadrže termine koji se često koriste za indeksiranje i pretraživanje članaka. Apstrakt treba da pruži podatke o cilju istraživanja, metodi, rezultatima istraživanja i zaključku. Apstrakte treba priložiti dvojezično (na srpskom jeziku, engleskom ili nekom drugom jeziku raširene upotrebe). Za sažetke na stranim jezicima nužno je obezbediti kvalifikovanu lekturu, odnosno gramatičku i pravopisnu ispravnost.

5. Ključne reči treba da budu termini koji najbolje opisuju sadržaj članka za potrebe indeksiranja i pretraživanja. Treba ih navoditi na osnovu nekog međunarodnog izvora (popisa, rečnika, tezaurusa) koji je najšire prihvaćen, kao što je lista ključnih reči Web of Science. Broj ključnih reči ne treba da bude veći od 10.

6. Članci ne bi trebalo da prelaze dva autorska tabaka (32 strane), u formatu A4 uključujući napomene i ilustrativni deo. Tekst treba uraditi kompjuterski u fontu Times New Roman ili Arial (12 pts), MS Office Word 97 ili novijim, sa proredom 1,5 i marginama 2,54cm. Osnovni tekst ne sme da sadrži ilustracije, već se one se predaju kao posebni fajlovi.

7. Rukopisi se predaju isključivo na srpskom jeziku u ćiriličnoj verziji pisma (sa podrškom Serbian (Cyrillic). Ukoliko autor želi da rad pisan na srpskom jeziku preda za štampu u verziji prevedenoj na engleski ili neki drugi jezik raširene upotrebe u međunarodnoj komunikaciji, dužan je da navede ime prevodioca, odnosno lektora koji je tekst priredio za štampu na stranom jeziku. Pored toga, radu pisanom na nekom od stranih jezika treba dodati apstrakt i rezime na srpskom jeziku. Reči, navodi i naslovi pisani na nekom od stranih jezika treba da budu napisani u svom izvornom obliku.

Napomene mogu biti sastavni deo osnovnog teksta. Treba da sadrže manje važne podatke ili odgovarajuća objašnjenja. One nisu zamena za citiranu literaturu. (Poseban odeljak ovog Uputstva govori o načinu citiranja koji treba primenjivati prilikom pisanja tekstova).

8. Rezime treba da sadrži isto što i apstrakt, ali u proširenom obimu koji ne bi smeo da prelazi 1/10 obima osnovnog teksta. Posebno je poželjno

da rezime bude u strukturalnom obliku. Za tekstove predate na engleskom jeziku, rezimei treba da budu predati na srpskom jeziku. Za tekstove predate na nemačkom ili francuskom, predati rezimei treba da budu na engleskom jeziku. Pored samog teksta rezimea na odgovarajućem jeziku treba predati naslov rada, ključne reči, kao i afilijaciju autora.

9. Grafički prilozi (fotografije, table, skice, grafikoni itd.) treba da budu dati na jednoobrazan način. Skenirane priloge treba priložiti u rezoluciji 600 dpi/inch, a fotografije u rezoluciji najmanje 300 dpi/inch u formatima TIFF, PSD ili JPG. Grafički prilozi se predaju kao poseban deo rada i ne treba da budu u sastavu osnovnog teksta. Naslove i tekstualne sadržaje ilustrativnih priloga treba priložiti dvojezično (na jeziku rada, na engleskom ili nekom drugom jeziku raširene upotrebe).

10. Citirirana literatura obuhvata bibliografske izvore (članke, monografije itd.) i u radu se navodi u vidu referenci u fusnotama i spiska literature / bibliografije na kraju teksta. Ona je je sastavni deo svakog naučnog rada, sa precizno navedenim bibliografskim jedinicama (referencama) koje su citirane. Literatura se navodi na dosledan način, redosledom koji zavisi od standarda navođenja u tekstu i koji je preciziran ovim uputstvom. Literatura se u bibliografiji ispisuje na jeziku i pismu na kome je objavljena. U slučajevima kada je publikacija štampana dvojezično, sve podatke treba navesti dvojezično takođe, ili ukoliko je rezime štampan na drugom jeziku, onda navesti naslov rezimea na tom jeziku.

Način navođenja u bibliografiji:
Popović, I. 2009
Gilt Fibula with Christogram from Imperial Palace in Sirmium (Резиме: Позлаћена фибула са христограмом из царске палате у Сирмијуму) *Starinar* LVII (2007): 101-112.

Publikacije štampane ćiriličnim, grčkim ili bilo kojim drugim nelatiničnim pismom, transkribuju se na latinicu u skladu sa standardima Američkog bibliotečkog društva i Kongresne biblioteke SAD (http://www.loc.gov/catdir/cpso/roman.html), npr:
Citat u tekstu/fusnoti: (Поповић 1988: 67)
Način navođenja u bibliografiji:
Поповић, И. 1988
Античко оруђе од гвожђа у Србији, Београд: Народни музеј.
(Popović, I. 1988
Antičko oruđe od gvožđa u Srbiji, Beograd: Narodni muzej).

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1. Autorizovane knjige
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u tekstu: (Popović 2006)
u literaturi:
Prezime, Inicijal imena. Godina
Naslov monografije (u kurzivu), **Mesto izdanja: Izdavač.**

Popović, I. 2006
Roma aeterna inter Savum et Danubium, Works of Roman Art from the Petrović-Vasić Collection, Belgrade: Archaeological Institute.

- Potrebno je navesti i naziv serije i broj:
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.

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u tekstu: (Popović i Borić-Brešković 1994: 16-18)
u Literaturi:
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. četiri i više autora

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2. Autorizovane knjige sa pridodatim imenom urednika

u tekstu: (Jeremić 2009: 40)
u Literaturi:
Jeremić, G. 2009
Saldum, Roman and Early Byzantine Fortification, ed. S. Perić, Cahiers des Portes de Fer, Monographies 6, Belgrade: Institute of Archaeology.

3. Priređene knjige (umesto autora - urednik, priređivač, prevodilac) - (ur.), (ed., eds.), (prev.).

u tekstu: (Поповић 1994)
u Literaturi:
Поповић, И. (ur.) 1994
Античко сребро у Србији, Београд: Народни музеј.
u tekstu: (Morris 2002)
u Literaturi:
Morris, I. (ed.) 2002
Classical Greece-Ancient Histories and Modern Archaeologies, Cambridge: Cambridge University Press.
u tekstu: (Hurst and Owen 2005)
u Literaturi
Hurst, H. and Owen. S.(eds) 2005
Ancient Colonizations-Analogy, Similarity and Difference, London: Duckworth.
u tekstu: (Радојчић 1960)
u Literaturi:
Радојчић, Н. (prev.) 1960
Законик цара Стефана Душана 1349. и 1354, Београд: Српска академија наука и уметности.

4. Knjiga bez naznačenog autora
u tekstu: (Anon. 1985)
u Literaturi:
Anon. 1985
Anonymi Peri strategias, The Anonymous Byzantine Treatise on Strategy, *Three Byzantine Military Treatise* (trans. G.T. Dennis), Washington DC.

5. Istovremeno citiranje i navođenje više knjiga istog autora

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u tekstu: (Поповић 2002: 23-26; Popović 2006: 33)
u Literaturi:
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. pisanih iste godine
u tekstu: (Dawkins 1996a; Dawkins 1996b)
u Literaturi:
Dawkins, R. 1996a
Climbing Mount Improbale, London: Viking.
Dawkins, R. 1996b
River out of Eden, London: Pfoenix.

6. Citiranje i navođenja poglavlja i odeljka u knjizi (zborniku radova)
u tekstu: (Петровић 1997: 87-90)
u Literaturi:
Петровић, Б. 1997
Накит, у: *Античка бронза Сингидунума,* ур. С. Круниħ, Београд: Музеј града, 85-117.
u tekstu: (Samson 1970: 44-68)
u Literaturi:
Samson, C. 1970
Problems of information studies in history, in: *Humanities information research*, S. Stone, ed., Sheffield: CRUS, 44-68.

7. Prevedene knjige
u Literaturi:
Bajron, Dž. G. 2005 (1812)
Čajld Harold, predgovor Z. Paunović, prevod i predgovor N. Tučev, Beograd: Zavod za udžbenike i nastavna sredstva.

8. Knjige i članci objavljeni u elektronskom obliku
u tekstu: (Fishman 2005: 11)
u Literaturi:
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 RADOVI OBJAVLJENI U ZBORNICI-MA, AKTIMA KONGRESA I SLIČNO

Prezime, Inicijal imena. Godina
Naslov rada, *Naslov zbornika (kurziv)*, ur. Inicijal imena. Prezime, Mesto izdanja: Izdavač, broj strane.

Брукнер, О. 1987
Импортована и панонска керамичка продукција са аспекта друштвено-економских промена, у: *Почеци романизације у југоисточном делу провинције Паноније*, ур. М. Стојанов: Нови Сад: Матица српска, 25-44.

Potrebno je navesti i podatke o seriji:
Петровић, П. 1997
Римљани на Тимоку, у: *Археологија источне Србије* (Научни скуп Археологија источне Србије, Београд-Доњи Милановац, децембар 1995*)*, ур. М. Лазић, Центар за археолошка истраживања 18: Београд: Филозофски факултет, 115-131.

III PERIODIKA

Prezime, Inicijal imena. Godina
Naslov rada, *Naziv časopisa (*kurziv) broj časopisa: broj strane.

Бајаловић-Хаџи-Пешић, М. 2001
Налази хабанске и постхабанске керамике у Србији, *Годишњак града Београда* 47-48 (2000-2001): 107–121.
- Za časopise čiji su nazivi slični, iza naziva časopisa u zagradi treba navesti mesto izdanja:
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.

- *Старинар* се, зависно од године издања, наводи пуним називом:
godine 1884-1895 *Старинар Српског археолошког друштва*
godine 1906-1914 [novog reda] *Старинар* (н.р.)
godine 1922-1942 [treća serija] *Старинар* (т.с.)
godine 1950-2010 [nova serija] *Старинар* (т.с.)

- Ukoliko se godina izlaženja i godina za koju časopis izlazi razlikuju, navesti i drugu godinu u zagradi:
Жеравица, З., и Жеравица, Л. 1979
Средњовековно насеље у Поповици код Неготина, *Старинар* (н.с.) 28-29 (1977-1978): 201–211.

Rad u štampi / u pripremi
- (u štampi), u tekstu na engleskom jeziku (in press)
- (u pripremi), u tekstu na engleskom jeziku (forthcoming).

u tekstu: (Јовановић, u štampi)
u literaturi:
Јовановић, А. (u štampi)
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.

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u literaturi:
Ilić, O. 2005
Ranohrišćanski pokretni nalazi na području dijeceze Dakije od IV do početka VII veka, Magistarski rad, Filozofski fakultet, Univerzitet u Beogradu.

Patch, D. C. 1991
The Origin and Early Development of Urbanism in Ancient Egypt: A regional Study, Ph.D thesis, University of Pennsylvania.

VI Popularni magazini/časopisi i novinski članci
u tekstu: Кашанин, М. 1929
u literaturi:
Кашанин, М. 1929
Музеј савремене уметности, *Политика, 23. јул, 7-8.*

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olivera.arh011@gmail.com

Redakcija časopisa
ARHEOLOGIJA I PRIRODNE NAUKE

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•	The accused will always be given the chance to respond to any charges made against them.
•	If it is judged at the end of the investigation that misconduct has occurred, then it will be classified as either minor or serious.

Minor misconduct
Minor misconduct will be dealt directly with those involved without involving any other parties, e.g.:
•	Communicating to authors/reviewers whenever a minor issue involving misunderstanding or misapplication of academic standards has occurred.
•	A warning letter to an author or reviewer regarding fairly minor misconduct.

Major misconduct
The Editor-in-Chief, in consultation with the Editorial Board, and, when appropriate, further consultation with a small group of experts should make any decision regarding the course of action to be taken using the evidence available. The possible outcomes are as follows (these can be used separately or jointly):
•	Publication of a formal announcement or editorial describing the misconduct.
•	Informing the author's (or reviewer's) head of department or employer of any misconduct by means of a formal letter.
•	The formal, announced retraction of publications from the journal in accordance with the Retraction Policy (see below).

- A ban on submissions from an individual for a defined period.
- Referring a case to a professional organization or legal authority for further investigation and action.

When dealing with unethical behaviour, the Editorial Staff will rely on the guidelines and recommendations provided by the Committee on Publication Ethics (COPE): http://publication-ethics.org/resources/.

RETRACTION POLICY

Legal limitations of the publisher, copyright holder or author(s), infringements of professional ethical codes, such as multiple submissions, bogus claims of authorship, plagiarism, fraudulent use of data or any major misconduct require retraction of an article. Occasionally a retraction can be used to correct errors in submission or publication. The main reason for withdrawal or retraction is to correct the mistake while preserving the integrity of science; it is not to punish the author.

Standards for dealing with retractions have been developed by a number of library and scholarly bodies, and this practice has been adopted for article retraction by *Arheologija i prirodne nauke* (*Archaeology and Science*): in the electronic version of the retraction note, a link is made to the original article. In the electronic version of the original article, a link is made to the retraction note where it is clearly stated that the article has been retracted. The original article is retained unchanged, save for a watermark on the PDF indicating on each page that it is "retracted."

OPEN ACCESS POLICY

Arheologija i prirodne nauke (*Archaeology and Science*) is an Open Access Journal. All articles can be downloaded free of charge and used in accordance with the licence Creative Commons — **Attribution-NonCommercial-NoDerivs** 3.0 Serbia (https://creativecommons.org/licenses/by-nc-nd/3.0/rs/.

The submission, review and publishing procedures are free of charge.

SELF-ARCHIVING POLICY

The journal *Arheologija i prirodne nauke* (*Archaeology and Science*) allows authors to deposit the accepted, reviewed version of the manuscript, as well as final, published PDF version of the paper in an institutional repository and non-commercial subject-based repositories, or to publish it on Author's personal website (including social networking sites, such as ResearchGate, Academia.edu, etc.) and/or departmental website, and in accordance with the licence **Attribution-Non-Commercial-NoDerivs** 3.0 Serbia (http://creativecommons.org/licenses/by-nc-nd/3.0/rs/), at any time after publication. Full bibliographic information (authors, article title, journal title, volume, issue, pages) about the original publication must be provided and a link must be made to the article's DOI.

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DISLAIMER

The views expressed in the published works do not express the views of the Editors and Editorial Staff. The authors take legal and moral responsibility for the ideas expressed in the articles. Publisher shall have no liability in the event of issuance of any claims for damages. The Publisher will not be held legally responsible should there be any claims for compensation.

SUBMISSION INSTRUCTIONS FOR THE JOURNAL ARHEOLOGIJA I PRIRODNE NAUKE (ARCHAEOLOGY AND SCIENCE)

Editorial staff of the periodical *Arheologija i prirodne nauke* (*Archaeology and Science*) decided to apply *Akta o uređivanju naučnih časopisa* (*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.

The journal *Arheologija i prirodne nauke* (*Archaeology and Science*) is dedicated to topics in the areas of: archaeology, architecture, history of arts, anthropology, archaeozoology, archaeobotany, geophysics, computer engineering and similar scholarly disciplines.

The journal *Arheologija i prirodne nauke* (*Archaeology and Science*) publishes original papers that have not been published previously: original scientific articles, scientific reviews, excavation reports, book reviews, critical reviews.

Articles can be submitted in English, German or French. If the paper is written in English, summary can be in Serbian (for authors from Serbia) or English (for international authors), while articles submitted in German or French need to have a summary in English.

Papers submitted to the editorial staff of the periodical *Arheologija i prirodne nauke* (*Archaeology and Science*) 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 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. The summary must have the same content as the abstract, only expanded, but not longer than 1/10 of the paper's overall size. It is strongly advised to write the summary in a structural form. Papers submitted in English must have the summary in Serbian (for Serbian authors) or English (for foreign authors). Papers in German or French must have the summary in English. As well as the summary text, the title of the paper, the key words and the author's affiliation should be written in the appropriate language.

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. The bibliography should include bibliographic sources (articles, monographs etc.). Within the paper it should be quoted with references in the footnotes and as a list of literature/bibliography at the end of the manuscript. The bibliography represents a part of every scientific paper, with precisely quoted bibliographical references. The list of used sources should follow a unique pattern, in a sequence based on the quoting standards determined by these instructions. The bibliography must be presented in the language and alphabet in which each source has been published. In cases when the publication is published bilingually, all data should also be written bilingually. In cases where the summary is written in another language, then the title of the summary should be written in the same language.

In the list of references: **Popović, I. 2009**

Gilt Fibula with Christogram from the Imperial Palace in Sirmium (Резиме: Позлаћена фибула са христограмом из царске палате у Сирмијуму) *Starinar* LVII (2007): 101-112.

Publications published in Cyrillic, Greek or any other non Latin alphabet should be transliterated into the Latin alphabet in accordance with the standards of The American Library Association and The Library of Congress of the United States (http://www.loc.gov/catdir/cpso/roman.html), for example:

Quotation within a footnote: (Поповић 1988: 67)

In the list of references: **Поповић, И. 1988**
Античко оруђе од гвожђа у Србији, Београд: Народни музеј.

(Popović, I. 1988
Antičko oruđe od gvožđa u Srbiji, Beograd: Narodni muzej).

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 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.

Paper in print / forthcoming
- (in print), within papers written in English (in print)
- (forthcoming), within papers written in English (forthcoming).

within main text: (Јовановић, in print)
in bibliography:
Јовановић, А. (in print)
Бор и околина у античком периоду, у: *Бор и околина у праисторији, антици и средњем веку*, ур. М. Лазић, Бор и Београд: Музеј рударства и металургије и Филозофски факултет.

Papers overtaken from the internet, from electronic periodicals, are quoted in the same way as printed papers, only there is a full web-address written at the end with http://...

V Doctoral and master theses
Instead of place of editing and editor, the full name of faculty/university is given, where the thesis was conducted.
within main text: (Ilić, 2005)
in bibliography:
Ilić, O. 2005
Ranohrišćanski pokretni nalazi na području dijeceze Dakije od IV do početka VII veka, Magistarska teza, Filozofski fakultet, Univerzitet u Beogradu.

within main text: (Patch, 1991)
in bibliography:
Patch, D. C. 1991
The Origin and Early Development of Urbanism in Ancient Egypt: A regional Study, Ph.D thesis, University of Pennsylvania.

VI Articles from newspapers
within main text: (Кашанин, 1929)
in bibliography:
Кашанин, М. 1929, Музеј савремене уметности, *Политика, 23. јул, 7-8.*

Main text
Quoting bibliography in the main text according to the pattern (author's surname and year: page number, footnote, figure, table):
(Papazoglu 1969: 52, sl. 4/1, T. 18-4-6)
(Babović 1984: 68; Moritz 1978: 68, figs. 40-41; Tasić 1997: 84, sl. 21)
- Additional data within brackets can be written after a dash:
(Swoboda-Milanović 1958: 55, Taf. 18/24 – olovne pločice).
- The same work of the same author in the next quotation can be quoted abbrevated *ibidem* (*ibid.*: page number).
- The second work of the same author in the next quoting, if there are no quotations in between, is quoted as (*idem* year: page number): (Faltings 1998a: 367; *idem* 1998b: 31–32).
- In papers written in Serbian language, the transcribed exact pronounciation of a foreign author's name is written within the main text, without brackets, but the original name is written in quotation: ...Vencel (Wenzel 1965: T. HS/4).
- If the author, work and page number are the same as in the previous quotation, they are quoted as *loc. cit.* (lat. *loco citato*) – quoted place.
- Abbrevation *cf.* (lat. *confer*) - compare
- Abbrevation *e.g.* (lat. *exempli gratia*) - for example
- Abbrevation *i.e.* (lat. *id est*) - actually.

12. All of the quoted refferences are listed after alphabetic order, if written in English or some other foreign language, initial's order withing author's surname or the initial letter within the quoted title (if the author or editor are not stated).

SUBMITTING PAPERS

13. While submitting, the author should write his/her full contact address in a separate file: address of the institution and e-mail address. If there are several authors, only the contact address of the first author should be written. Author is also obligated to name title and code of the project, i.e. name of the programme under which the artice came to being, as well as the name of the institution which financed the project.

14. Each of the submitted papers will be forwarded to anonymous reviewers by the editorial board. For further information concerning the peer review process and the editorial board's, re-

viewer's and author's obligations and duties, authors can refer to the EDITORIAL POLICY of the ***Arheologija i prirodne nauke* (*Archaeology and Science*)** journal.

15. Manuscripts accepted for printing should be submitted to the editorial secretary. Apart from printed version, papers should be submitted in electronic form, on a CD.

- Printed version should be written as follows: 1. title of work; 2. name, middle initial and surname of the author; 3. author's affiliation; 4. abstract; 5. key words; 6. text body; 7. resume; 8. bibliography; 9. illustrations; 10. captions; 11. author's address (address or e-mail address).

- Digital version should be divided into several files: 1. Word file with the first six parts of paper (1. title; 2. author's name, middle initial and surname; 3. author's affiliation; 4. abstract; 5. key words; 6. text body); 2. Word file with resume; 3. Word file with quoted bibliography; 4. Folder with graphic illustrations; 5. Word file with captions (billingual, Serbian and English or some other language); 6. Word file with author's address.

Manuscripts shall be accepted only if they are written and submitted according to the rules stated above. Shold author not agree to the requests of the editorial staff, does not accept remarks of the reviewers or the proof-reader, paper shall not be printed. It is not allowed to change papers after reviews have been submitted, unless they are in accordance with these remarks. Editorial staff holds the right to demand illustrations of lesser quality to be replaced with illustrations of better quality if necessarry.

For additional explanations, please contact the secretary Oliveri Ilić, PhD (address: Arheološki institut, Kneza Mihaila 35/IV 11000 Beograd; phone: 381 (0)11 2637 191 or send an e-mail to: o.ilic@ai.sanu.ac.rs. olivera.arh011@gmail.com

<div align="right">

Editorial staff of
ARHEOLOGIJA I PRIRODNE NAUKE
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