ARHEOLOGIJA I
PRIRODNE NAUKE

ARCHAEOLOGY
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Center for New Technology
Institute of Archaeology Belgrade

ARCHAEOLOGY AND SCIENCE
16
2020

Belgrade 2020

ARHEOLOGIJA I PRIRODNE NAUKE
16
2020

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THE BLACK VERSION OF WATER AND UNDERWATER ACTIVITY DROWNING, TORTURE, AND EXECUTIONS BELOW THE SEA IN ANCIENT GREECE DURING THE ARCHAIC AND CLASSICAL PERIODS (SEVENTH TO FOURTH CENTURIES BC)

ABSTRACT

Water and underwater activity was not always a fascinating aquatic experience. There have been cases where people suffered, were tortured, and ended their lives below the sea. Beyond accidental drowning cases, the sea became a grave for murderers, mutineers, impious, and piracy victims as well.

The aim of the present paper is firstly to shed light on cases where drowning was also used as an act of violence and execution in ancient Greece, and secondly to open space for the further study and research of data which have remained obscure.

KEYWORDS: DROWNING, EXECUTIONS BELOW THE SEA.

The existence of categories of divers and the anxiety to discover an early breathing apparatus suggests that the issue of diving and underwater activity was quite topical in classical times (Ioannidou, 2014[b]). In ancient Greek texts, a treasury of words was created for those engaged in diving, depending on the skills they had or the diving depths they were approaching. For example, there are at at least four terms describing divers acting below the sea's surface, then the «ἐπιπολάζοντες» (epipolázontes) who were actually swimming or keeping a position closer to the surface, possibly looking deep down in order to observe the seabed, the «ἀρνευτῆρες» (arneftíres) who went head first into water from a high point like modern divers from a diving board, and plenty of names and terms for those who fished under water (Ioannidou, 2014[b], 2012).

Last but not least, in a distinguished category, are included divers who are considered, in mod-ern meaning, to be the first underwater demolition teams, who aimed at underwater tasks in order to sabotage enemy ships (Ioannidou, 2014[b]; Hdt. 8.8; Thuc. 4. 26; Arr. An. 2. 2.21.)

Quite apart from these types of diving, there have also been cases which prove that this fascinating aquatic exercise had simultaneously a 'dark' version. Drowning, even if considered as accidental human immersion, accounts for a long list of deaths in both mythology and ancient history. A great effort to record all the names and references (n= 40,000) in a database of ancient and mythological Greek literature[1] gives us a number of incidents: n= 37,17 males (45.94%), 6 females (16,22%), and 14 reports of multiple casualties (37,84%).

Taking into consideration that cases of mythology are beyond the scope of this paper, there are

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1 Devouros, K.D. (2007). [Ancient-cognitional encyclopedia]. Unpublished raw data. See also: Avramidis, S. 2009:422.
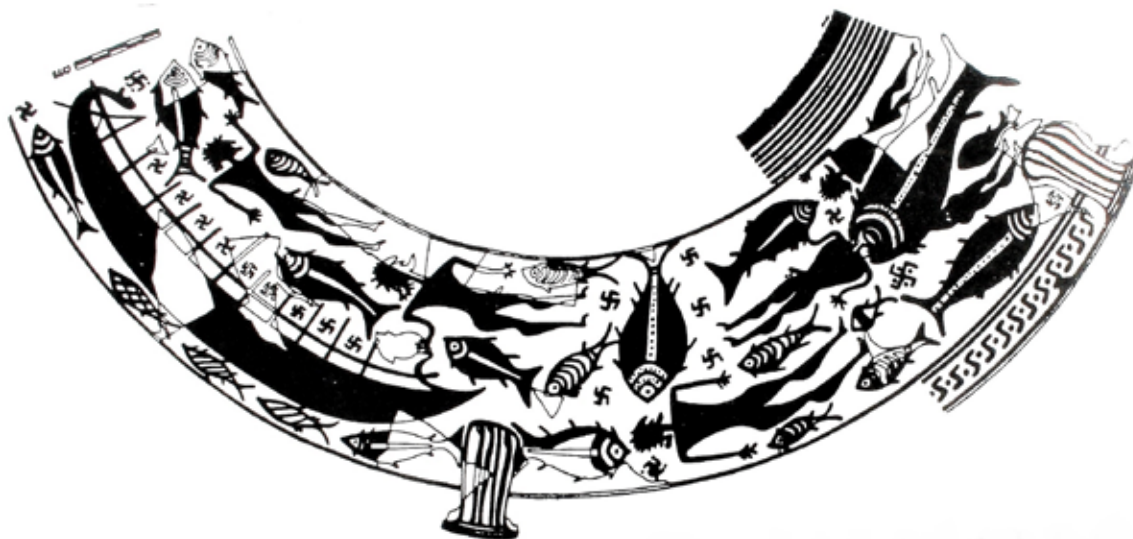
Fig. 1 Late Geometric krater from Pithekoussai, inv. 168813,
(After Stoop, ANTIQUITY AND SURVIVAL 1, 1955/56, 267) in Basch, 1987: p.188.

plenty of cases of accidental incidents of drowning in history, although we can only imagine how many more cases remain unknown. A large number of people who perished in naval battles or seagoing merchant vessels are mentioned. During the naval battle of Salamis, for example, many Persians drowned in the sea because they didn't know how to swim (Hdt. 8.89). The sinking of a cargo ship near the port of Bosphorus (fourth century BC) is, among others, a fact not commonly known. The ship was already overloaded, having an additional deck-load of one thousand hides, which proved to be the cause of the loss. More than thirty people perished besides the cargo (Dem. 34.10). Plenty of similar cases are mentioned in ancient texts. A cruel scene of a capsized ship and drowning men (Fig 1) is depicted on the well-known Late Geometric krater (end of eighth century BC) from Pithekoussai. The painter managed to present in a very brutal but realistic way how an enormous fish ate the head of one of the crewmembers. It's not difficult to imagine how many shipwrecks occurred in ancient Greek history, in open sea, and how many people were eaten by fish and other sea creatures without these cases having ever been recorded.

Individual cases of accidental drowning exist too. Hegestratos (340 BC) was trying to find his tender boat when he jumped out of the ship, but because it was night he could not see it and drowned (Dem.32.6). The death of Greek Socratic philosopher, Euclid of Megara, may appear astonishing: as he was swimming in the Alpheus river, the point of a reed ran into him, causing injury and death (D. L. 2.10.109). Quintus Curtius describes the drowning of Hector (334 BC), son of Parmenion and brother of Philotas and Nicanor. Hector was embarked on a small craft which was overloaded. The craft sank with all hands. Hector struggled for a long time with the river as it was too difficult for him to swim with his drenched clothes and his sandals tightly fastened to his feet. Tired and terrified enough, he tried to ease his breathing but he eventually died (Curt. 4.8.7-9).

The foregoing could be examined more; nevertheless we may speculate on cases where activities in an aquatic environment took place as a type of execution.

In ancient Greek texts, generally, the meaning of death in the sea is describing by the verb «ἀπεπνίγει» (apepnígei) which means 'drowned' or «ἀπωλέσθη» (apolésthi) which means 'perished'. But these verbs describe the outcome of the drowning and not the process or manner of

Figs. 2 Lecythos from Attica (480-470 BC).
Credit line: National Archaeological Museum, Athens, photo: K. Konstandopoulos Copyright © Hellenic Ministry of Culture and Sports/Archaeological Receipts Fund.

Figs. 3 Lecythos from Attica (480-470 BC).
Credit line: National Archaeological Museum, Athens, photo: K. Konstandopoulos Copyright © Hellenic Ministry of Culture and Sports/Archaeological Receipts Fund.

how a person ended up dying in the sea. The word «*καταποντισμός*» (katapontismós) appears more specifically ; it has the meaning of dropping someone from a high point to the ground or to the sea, i.e. to sink someone alive. The term «*σχοινισμός*» (schinismós = the strappado)[2], which appears much later, means to tie someone with rope and drop him to the ground or to the sea.

Beginning with the first case, the act of throwing a person into the sea alive, Herodotus offers a great example of the first action of human jettison. Xerxes King of Persia, was on board but weather conditions were rough and the boat, full of the King's soldiers, was in danger of being swamped. In order to lighten the boat and save their King, many of the soldiers threw themselves into the sea (Hdt. 8.118).

An ideal example of diving as an execution for crimes appears in a text of Plutarch, in which it is written that the murderers of Hesiod were sunk alive (Plut. Septem. 162e). Drowning was also a sentence of death for persons guilty of mutiny. Alexander the Great convicted the mutineers among his soldiers to drowning in the river (Curt. 10.4. 2-3).

Persons who committed sacred crimes faced the same punishment, too. No less than three thousand Phocians were taken captives by Phillip II of Macedon and thrown into the sea as temple-robbers (Diod. 16.35.6).

The revelation of sacred knowledge of ancient mysteries or of particular set of philosophical theories and beliefs was also a crime. Iamblichus states that the Pythagorean philosopher Hippasus (fifth century BC) was the first to publish and describe the sphere from the twelve pentagons. For his impiety he perished at sea but he nevertheless

2 Tratto di corda (Italian), estrapade (French), garrucha (Spanish).

Figs. 4 Lecythos from Attica (480-470 BC).
Credit line: National Archaeological Museum, Athens, photo: K. Konstandopoulos Copyright © Hellenic Ministry of Culture and Sports/Archaeological Receipts Fund.

received credit for the discovery (Iam. VP 18.88).

Cases of death in the water which occurred as war crimes should not be put aside, for example, during the naval battle of Sybota (433BC). After the rout of the Corcyraeans, the Corinthians turned their attention to the men who were in the sea instead of taking in tow and hauling off the hulls of the ships which had been disabled. Corinthians, cruising through the shipwrecked people, killed them one by one, even their own friends, without being able to determine who were conquering and who were being conquered (Thuc. 1.50).

During the Peloponnesian War, the Athenian general Filoklis captured two triremes: one from Corinth and one from the island of Andros, while he threw the crews overboard (Xen. Hell. 2.1.31). Parenthetically, in the source text here, the word «καταποντισμός» doesn't appear

but «κατακρήμνιση» (katakrémnisi) does, which sometimes may confuse researchers as it is leave an explanation of the action of throwing somebody headlong down to the land and not to the sea. Actually, the word *«κατακρήμνιση»* came from the preposition «κατά» (katá) and the word *«κρημνός»* (kremnós), which means edge. So *«κρημνός»* could be any kind of edge or any kind of a point, even if down from this point there is water. We find «κατακρήμνιση» used in the ancient texts in various ways, for example from a tower (Diod. 4.31.3), from a horse (Plb. 3.116.12; Xen. Cyrop. 1.4.7. etc.) and from a trireme as mentioned above.

In the fifth book of Herodotus there is quite an interesting story of a strange punishment on board that took place in the fifth century BC. The captain of a Myndian ship was passed by the Persians through a thalamian[3] oarhole. He was placed with his head out of the keel and the rest of his body inside (Hdt. 5.33). This description leaves many questions, as it is not clear if, for example, the head of the captain was out far enough to almost reach sea level. But we can imagine that if the ship was built according to Greek prototypes of the trireme, the thalamian hole could have had a limited distance of 40 cm from the sea level[4]. Considering that a human head measures approximately 20 cm in height without the neck and putting a body as vertical as could be, then it could have been possible that the victim, tied in this position, could suffer by being upside down, feeling the waves crashing onto his face and entering the sea water into his nose and mouth.

What really surprises us is that there are no references to strappado in ancient Greek texts, but it is commonly known that this kind of torture was imposed from the times of the Inquisition, and as a naval punishment many centuries later. The

3 Its the oarhole of the lowest file of a three-level ancient Greek galley.

4 Coates, J.F., *The Trieres, its design and constrauction*, "TROPIS I", 1st International Symposium on Ship Construction in Antiquity, Hellenic Institute for the Preservation of Nautical Tradition, (1985), 83.
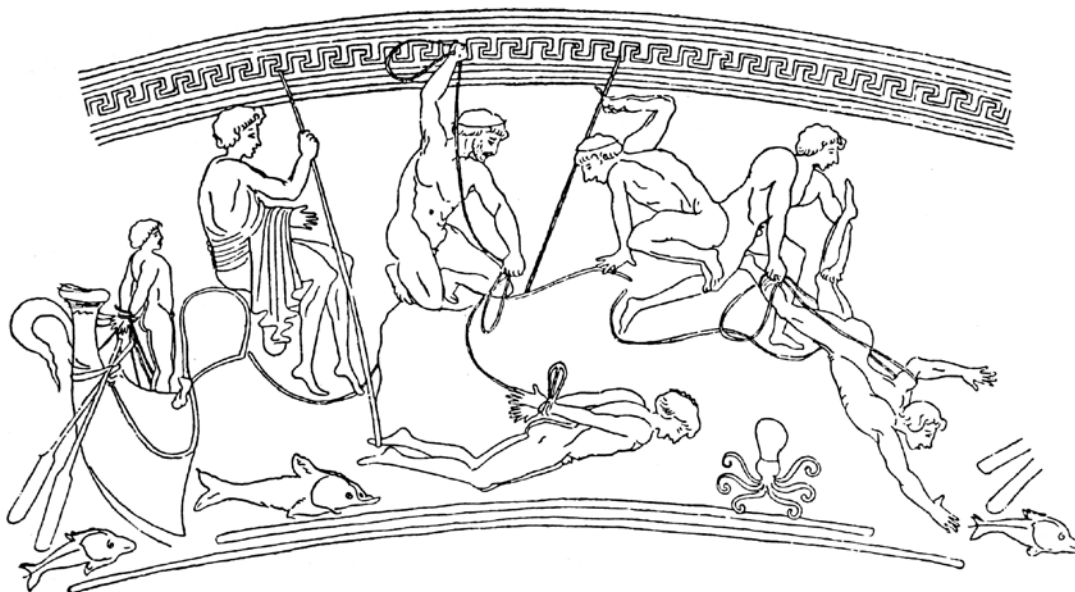
Fig. 5 Lecythos from Attica (480-470 BC) after Ormerod (1924) in Basch, L., Le muse imaginaire de la marine antique, Institute Hellenique pour la Préservation de la Tradition Nautique, (1987), 270.

lack of any concrete information about strappado taking place at sea in the classical period is well illustrated on an Attica lecythos of the fifth century BC[5] (figs. 2-5). In this depiction, four men on a ship represent the crew. The figure wearing clothes, perhaps the one who is first in hierarchy, is observing the rest of the crew doing strappado to two men while a third one (perhaps the helmsman) is tied to the prow. The evidence of the tied helmsman guides our thoughts to the assumption that this scene may represent an act of piracy. The scene may also represent another naval punishment, known as keelhauling or keel raking[6]. In an act of keelhauling, a line passed under the ship to snatch the offender off the yard arm, and pull him under the ship to the other side. We can imagine how painful that could have been as the accumulated barnacles on the hull shredded the flesh and most victims couldn't have survived.

In any case, the use of ropes for dropping these two men into the sea corresponds to strappado or to keelhauling, whether this took place as a punishment for an undisciplined crew or as an act of piracy (Ioannidou 2017).

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5 Lecythos from Attica (480-470 BC). National Museum of Athens, no 487. Photo from Basch (1987): 270.

6 Was naval punishment on board ships said to have originated with the Dutch but adopted by other navies in the 15th and 16th centuries (Nathaniel Boteler, A dialogic Discourse Concerning Marine Affairs, 1634).

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REZIME
CRNA VERZIJA VODE I PODVODNIH AKTIVNOSTI: DAVLJENJE, MUČENJA I POGUBLJENJA ISPOD POVRŠINE MORA U ANTIČKOJ GRČKOJ TOKOM ARHAJSKOG I KLASIČNOG PERIODA (VII–IV VEK PRE N. E.)

KLJUČNE REČI: DAVLJENJE, POGUBLJENJA ISPOD POVRŠINE MORA.

Vodene i podvodne aktivnosti nisu uvek bile privlačno vodeno iskustvo. Bilo je slučajeva kada su ljudi patili, bili mučeni ili su okončali svoje živote ispod površine mora. Pored slučajeva slučajnog davljenja, more je postalo grob ubica, pobunjenika, bezbožnika, ali i žrtava pirata.

U radu smo pokušali da rasvetlimo slučajeve kada je davljenje bilo korišćeno kao čin nasilja ili metod pogubljenja u antičkoj Grčkoj i drugo, da otvori prostor za dalje proučavanje i istraživanje podataka koji su ostali nerazjašnjeni.

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LETTERS CAPTURED OR LOST DURING MILITARY OPERATIONS IN CLASSICAL GREECE (FIFTH TO FOURTH CENTURIES BC)

ABSTRACT

In many cases, letters, which were sent between opponents during military operations in ancient Greece, have never reached their addresses. Some of them were lost and others were captured by enemies. This could have happened before, during, or at the end of a war conflict. Whatever the time, cases of lost or captured documents were an important factor for the subsequent attitude of belligerents.

The task of information transmission during military operations in Classical Greece demanded special attention. Generally, information transmission was obtained either through letters or orally. Often, systems of collecting data were the function of people that were not trained for these activities (merchants, actors, singers, doctors etc). These people generally supported low-grade information and they could easily channel misleading material (Ioannidou 2010: 22-29; Gerolymatos 2011: 30) but in some cases they could be examples of important military data which they picked up during travels (Russel 2002: 92).

Ensuring adequate, safe, and effective means of conveying information, as well as its secrecy was totally dependent on sending trusted people. These people were ready, if needed, to pass through dangerous situations in order to reach their destination and deliver their documents. Usually the sender and recipient had previously agreed, somehow, for a system to be followed (Aen. Tact. 31, 31). When the message was written in a letter, then the correspondents often followed the deposit method by dropping it off at some mutually agreed point . The recipient was notified through a third person that appeared e.g. in town to buy or sell something. The letter was delivered to the known location by that third person.

«*Καὶ οὕτως οὔτε ὁ φέρων οἶδεν ὅτῳ ἠνέχθη οὔτε ὁ λαβὼν γνωστὸς ἔσται ὅτι ἔχει*» (Aen. Tact. 31.31.4).[In this way the messenger did not know to whom the letter was finally brought, nor would it be known whether the recipient had actually received it.]

For keeping confidentiality, the transmission of information utilised ingenious tricks, which often served as alternative ways of communication so as to reduce potential enemy interception, and offered valuable services (Ioannidou 2010: 22-29; 2016: 108-115).

Aeneas Tacticus (fourth c. BC) advised that written messages could, among other things, be forwarded written on tin and sewn into the soles of the messenger's shoes, written on tree leaves

tied with a bandage over a wound that the messenger had on his foot, or, again, written on the bridle of a horse, or even in thin, wrapped lead sheets that women wore on their ears instead of earrings. Furthermore, reference is made to the usage of courier dogs:

«*Ἀπαγαγόντες δέσμιον περιέθηκαν περὶ τὸν αὐχένα ἱμάντα, ἐν ᾧ ἐπιστολὴ ἐνέρραπτο. Εἶτα ἀφῆκαν νυκτός ἤ μεθ' ἡμέραν πρὸς ὅν ἐξ ἀνάγκης ἔμελλεν ἥξειν ὅθεν ἀπήχθη*» (Aene. Tact. 31, 32).

[…and fasted round their necks a strap in which a letter was sewn. Then, either by night or by day, they let them go and find their way home, which they were sure to do].

But, despite the efforts to secure transmission of information, there were cases where messengers were captured. If the information was oral (memorized by the messanger)[1] then maybe it would never come out from the captured messenger, even if he knew that he might die. If was written in a letter, then the valuable documents passed immediately to the foe's hands as Captured Enemy Documents (CED).

CED are the most reliable source of information and can provide vital data about the enemy's plans, the state of his condition, his combat worthiness, his order of battle, tactics, methods, codes etc. (Ioannidou 2016: 111)

The best-known CED in classical texts is the letter that the Lacedaemonians sent after their defeat and the loss of their admiral Mindarus in the naval battle of Cyzicus (410 BC). This letter, well known for its laconic style, never reached the Lacedaemon because they had fallen to the Athenians:

«*Ἔρρει τὰ κᾶλα. Μίνδαρος ἀπεσσύα. Πεινῶντι τὦνδρες. Ἀπορίομες τί χρὴ δρᾶν*» (Xen. Hell. 1, 1, 23).

[The ships are gone. Mindarus is dead. The men are starving. We know not what to do].

During the winter of 425 BC the Athenians captured the Persian Artaphernes, who was traveling to Lacedaemon as an envoy of the High King. Artaphernes was going to deliver letters from the

High King to the Spartans. The letters, written in Assyrian characters, were captured by the Athenians; they translated them and revealed, inter alia, the relations between Sparta and Persia. Persia had not understood what the Spartans wanted from them so they asked the Spartans to be more specific and to send their ambassadors accompanied by Artaphernes.[2]

The following trick, applied by a general from Skione,[3] Timoxenos, and the Persian Artabazus,[4] is also interesting. Timoxenos agreed with Artabazus to deliver to him Poteidaia by betrayal. After they had first planned to designate two specific points, one in the city and one in the camp, they sent their messages by using bows. They wrote their text on a papyrus piece and wound it around the notches of the arrow. We might never have learned about this plot if Artabazus had not missed his shot. It is said that because of the wind direction and the misapplication of the arrow wings he wounded a Poteidaian soldier by accident.

«*...βάλλει ἀνδρὸς Ποτιδαιάτου τὸν ὦμον, τὸν δὲ βληθέντα περιέδραμεν ὄχλος, οἷα φιλεῖ γίγνεσθαι ἐν τῷ πολέμῳ· αὐτίκα δὲ τὸ τόξευμα λαβόντες ἔφερον ἐπὶ τοὺς στρατηγούς, καὶ οὗτος καταφανὴς ἐγένετο ἡ πρᾶξις*» (Hdt. 8. 128; Aen. Tact. 31. 25).

[…and hit a Potidaean in the shoulder. As often happens in war, a crowd ran up to the wounded man: and they at once seized the arrow and took it to the generals, so that the plot was discovered].

The Spartan admiral Lysander sent letters to Pausanias, who was based at Plataea (395 BC). Through these letters he notified him that, among other things, he had to meet him at Haliartos (Boeotia). The letters never arrived at their des-

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tination. On the contrary, they were received as CED by the Thebans because the courier was captured in a spying ambush (Plut. Lys. 28).

The importance of CED, however, can be used for the benefit of those who lost them on purpose. If a letter of paramount importance deliberately reaches the enemy's hands, then he, believing that he owns CED, will not proceed to evaluate the information but will accept it as reliable (Ioannidou 2010: 22; 2016: 108-115).

We can derive a relevant example from Polyainus, which refers to the Macedonian King Philip, father of Alexander the Great. At the time, Philip was campaigning against Amphissa (338 BC); the Athenians and Thebans had occupied the straights of Thermopylae beforehand in order to make them impregnable. Philip sent a fake letter to Antipatrus in Macedonia, saying that he had postponed the campaign and that he was supposedly hastening to Thrace because of an insurrection that had broken out there. When the messenger carrying the letter passed near the straights, the Athenian generals arrested him, read the message and without making an evaluation or verification of the information, having confidence that they possessed a reliable source, they abandoned their strong positions. Philip passed through the unguarded passage, defeated the enemy generals who had pulled out, and thus conquered Amphissa (Polyaenus 4. 2. 8).

The trick of making fake letters was quite frequent in ancient times. For example, Alexander the Great, when in Yrkania,[5] wanted to know who from his immediate environment was saying good words about him and who was not. He told his men to write letters to their families, as he would, too. When the senders had made a distance of 3 posting stations,[6] Alexander ordered them to come

back. He opened the letters and learned the beliefs of his men (Polyaenus, 4. 3. 19; Diod. 17. 80).

Those who failed to accept or read their letters in time proceeded to misinterpretation of the information, while others suffered the negative outcome of a battle or even fell victim to murder.

«Ἀστυάνακτι δὴ τυράννῳ Λαμψάκου πεμφθείσης ἐπιστολῆς ἐν ᾗ γραμμένα ἦν μηνύοντα τὴν ἐπιβουλὴν ἀφ᾽ ἧς ἀνηρέθη, παρὰ τὸ μὴ εὐθὺς ἀνοῖξαι καὶ ἀναγνῶναι τὰ γεγραμμένα ἀλλὰ ἀμελήσαντος αὐτοῦ, πρὸς ἄλλοις δὲ γενομένου πρότερον, διεφθάρη, τὴν ἐπιστολὴν ἔχων περὶ τοὺς δακτύλους» (Aen. Tact. 31. 34).

[A letter was sent to Astyanax, tyrant of Lampsacus, containing information of the plot which proved fatal to him: since, however, he did not open it at once and read the contents, but took no notice and attended to other business first, he was murdered with the letter unopened in his fingers].

In History there are cases where the message inadvertently got lost and never reached its destination. Plenty of them remain unknown in history. Some are testified to by others. Such a story is told by Plutarch about Timokrates (Plut. Dio. 26. 7. 10), who in his backpack had a letter that was to be delivered to Dionysius of Syracuse. During the journey, he slept overnight in a forest at the edge of the road. In his backpack he had a piece of meat, whose smell attracted a wolf. The wolf, in his attempt to grab the meat, took the backpack together with it. When Timokrates woke up and realized what had happened, he wandered a long time searching for the backpack, until he decided that it was better for him to disappear.

The importance of collecting and transmitting information was great from the most ancient times, since it would have had crucial importance in decisions and designs which in turn would furnish an adequate assessment of the situation i.e. the basis for Operational Planning. Lost or captured documents made their own factor in military history. Some of them could affect the outcome of a battle. From the texts of ancient writers we derive really surprising information that calls for

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5 Satrapy of ancient Persia, located in the territories of the present day Gilan, Mazandaran and Golestan provinces of Iran and part of Turkmenistan.

6 Stations of the Royal Road, an ancient highway rebuild by the Persian King Darious the Great (Darius I), in the 5th century BC. This route, having hundreds of posting stations, was used by couriers to deliver messages to the Persian capital.

further study and research, making this sector extremely fascinating.

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REZIME
PISMA KOJA SU BILA ZAROBLJENA ILI IZGUBLJENA TOKOM VOJNIH OPERACIJA U KLASIČNOJ GRČKOJ (V–IV VEK PRE N. E.)

KLJUČNE REČI: ANTIČKA GRČKA, PISMA, ANTIČKI GRČKI ORUŽANI SUKOBI, ANTIČKA DOKUMENTA TOKOM RATA.

U mnogim slučajevima se dešavalo da pisma koja su učesnici u ratnim sukobima slali tokom ratnih operacija u antičkoj Grčkoj nikada ne stignu do svojih primalaca. Neka od njih su bila izgubljena, dok su druga pala u ruke neprijateljima. Ovo je moglo da se desi pre, tokom ili na kraju ratnog sukoba. U kojem god trenutku da se to dešavalo, slučajevi izgubljenih ili zarobljenih dokumenata bili su bitan činilac za budući odnos zaraćenih strana.

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LATE ROMAN BUILDING AT THE ČAIR-CASTRUM SITE: CONTRIBUTION TO THE STUDY OF THE PROFANE ARCHITECTURE OF VIMINACIUM

ABSTRACT

A late Roman horizon comprised of multiple units was investigated in the area of a defensive ditch during the excavations of the western gate zone of Viminacium's legionary camp in 2018. The subject of this paper, marked as building 7 in the internal documentation, was among them. Building 7 was located to the southwest of the gate, and it is oriented parallel to the western rampart of the camp. It was built after the filling of the defensive ditch, over the layers of its filling, using different techniques and materials. According (mostly) to coins, the building is dated to the fourth century. Small finds in the building point to everyday and economic activities, except for several finds of weaponry. In a broader context and in relation to other structures discovered in the extramuros zone of the western rampart, building 7 can be interpreted as an economic structure that was part of a larger craftsmanship complex.

INTRODUCTION

Roman Viminacium was founded in the first century A.D., at a strategically important location near the former confluence of the Mlava and Danube rivers. At that time, the Roman legions *VII Claudia* and *IV Flavia* built a military fortification there, and soon a civilian settlement was founded in its immediate vicinity. Over time, the importance and role that Viminacium had in the province of Moesia Superior grew, so that this fortification became a permanent camp of VII Claudia legion. The settlement received the status of *municipium* during the reign of Emperor Hadrian, and from the middle of the second century it was recorded as the capital of the Moesia Superior province. The city also flourished in the third century, beginning with the reign of Septimius Severus, while during the reign of Gordian III it gained the status of colony. Viminacium also existed throughout the late Roman period, when it was recorded as the capital of the province of Moesia Prima and the episcopal see. Viminacium disappeared under the onslaught of barbarian tribes in the middle of the fifth century (Korać, Golubović and Mrđić, 2018: 42, 44-45; Mirković 1968: 56, 68-69; Mirković 1986: 21-27). Archaeological data indicate that the city and the camp itself were not rebuilt after that, but life continued in its immediate vicinity in the early Middle Ages.

Fig. 1 Aerial view of the excavated area in front of the western gate
(building 7 is in the lower right corner of the photo)

Archaeological investigations of Viminacium began at the end of the 19th century, and they were conducted on multiple occasions during the 20th century. A new series of multidisciplinary investigations began on various locations at the beginning of the 21st century, in 2002 to be more precise. Apart from excavations, geophysical prospection was carried out on some of its parts (Korać, Golubović and Mrđić 2018: 54-55). Protective excavations, followed by systematic excavations, have continuously been carried out in the area of the VII Claudius's legion's camp since 2016. These latest excavations have mostly focused on the northwestern section of the fortification and its immediate surroundings; they have also been carried out in the area of *principia* in the middle part of the fortification since 2020. Two main phases of the construction of the camp were identified during excavations of the ramparts and gates, of which the older phase dates back to the time of the Flavian dynasty, and the younger to the second century, most likely to the time of Emperor Trajan. Several different units were explored in this area - parts of the northern and western ramparts with accompanying towers, parts of the defensive ditch that surrounded it, the western and northern gates of the camp, part of the *via principalis,* and the street that extended from it. A sewage system, part of the *thermae*, a fountain, and several buildings were discovered in the interior of the camp, while in the *extramuros* zone, a smaller necropolis, several economic buildings, and buildings of unknown use were explored, mostly over the filled defensive ditch.[1]

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1 Preliminary results of the excavations have been published in several issues of „Arheologija u Srbiji" - Nikolić, Stojić, Marjanović 2018, Nikolić et al. 2019, Nikolić, Stojić, Marjanović 2020.
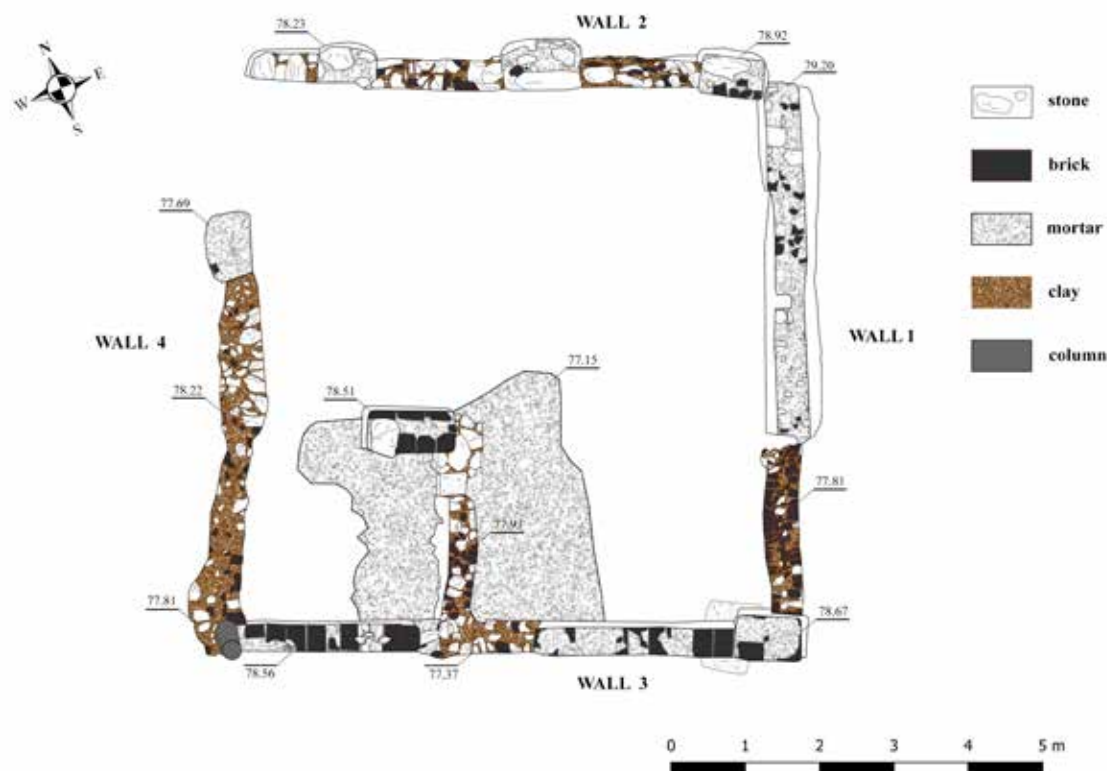
Plan 1 Layout plan of the *building 7* (by M.Milovanović)

Excavations were also carried out in the area in front of the western gate of the fortification (Fig. 1) where, in addition to a smaller necropolis, several buildings from the late Roman horizon were discovered during the campaign of 2018 (Nikolić, Stojić i Marjanović 2020). These units were erected mostly in the area of the defensive ditch after it was filled up, and they are located to the north and south of the pathway that led from the western gate of the camp to the city. Seven buildings, built mostly using the drywall technique, were investigated, as well as five kilns. The discovered units indicate the predominantly economic character of this area in late antiquity. The subject of this paper is one of the late Roman buildings investigated in the area of the western gate of the camp, marked in the internal documentation as *Building 7*.[2]

BUILDING 7

Building 7 was discovered to the southwest of the western gate of the military camp, at a distance of about 8 m from the western rampart (*extramuros*) (Fig. 2). The building is located above the defensive ditch and is parallel to the ramparts of the camp.

Building 7 has an irregular rectangular, almost square base, whose external dimensions are 8.10 / 7.70 x 7.75 / 6.90 m (Plan 1). The walls of the building are not structurally connected, but the sides lean on each other, and their highest preserved height is 1.27 m. Since the building was erected in the area above the defensive ditch, the foundations were not laid in sterile soil, but in layers of its filling. Various materials were used in the construction of the building - fragments of bricks, *tegulae* and *imbrices*, schist stone and limestone

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2 Since the building stretched over two different trenches, it was investigated on two occasions. Excavations of the eastern part of the building were led by Saša Redžić and Mladen Jovičić, while the western part of the building was researched by Snežana Nikolić, Goran Stojić and Milica

Marjanović. It should be noted that a part of wall 2 collapsed due to unfavorable atmospheric conditions during the intermission between the two excavations.

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Fig. 2 Bulding 7, view from the west

blocks, sporadically "crvenka",[3] while lime mortar and clay were used as binding material. A larger area with mortar and small rubble was discovered inside the building. It could have been a floor or the base on which it was set. The walls of the building were built using different techniques and materials, so in order to describe the method of construction, it is necessary to describe each wall of the building in detail.

Wall 1 is oriented north-south (Fig. 3), its length is 7.70 m, and its width varies from 0.40 m to 0.50 m. It was built of brick and broken schist, while lime mortar was used as binding material. The construction of the wall itself can be divided into three parts, i.e. three unequal segments.

The first, southern segment of the wall is represented by pilaster 5. The pilaster has a rectangular base, and dimensions of 0.85 m x 0.60 m. It was

3 „Crvenka" (red clay) is a raw material, exploited locally in Stari Kostolac. It is a kind of naturally burnt soil, sometimes described as a "natural brick" (Nikolić 2013: 27–28).

built of bricks with lime mortar, and its preserved height is 1.27 m (without the foundation zone).

The second segment of the wall was built using the drywall technique, from horizontally laid and sloping bricks, arranged next to each other, while clay was used as binding material. On the south side, the segment rests on the northern edge of pilaster 5, while on the north side it borders a groove for a wooden beam 1. Its length is 2.25 m, width about 0.45 m, while the preserved height does not exceed 0.60 m.

The third segment of the wall was built of pieces of schist stone, bricks and sporadically "crvenka", tied with mortar. It extends from the groove for the wooden beam 1 towards the northern end of the wall, i.e. pilaster 9. The length of the segment is 4.85 m, width about 0.42 m (0.49 m at the pilaster), and the preserved height is 1.20 / 1.35 m. In this segment, there are two "grooves" for wooden beams of rectangular cross-section, 0.20 m and 0.23 m wide, and the distance between them is 1.70 m. The so-called pilaster 9 is at the

Fig. 3 Wall 1 (eastern wall), view from the west

northern end of this segment. It is structurally connected to the rest of the segment, but it stands out from the rest of the wall in terms of its shape and massive size. The dimensions of the pilaster are 1.45 x 0.49 m, it is oriented north-south, and it was built of mortar-bound bricks. On the outer, east side, the third segment is covered with a strong layer of plaster.

The foundation zone of wall 1 is of a somewhat better construction quality below pilaster 9 and it consists of fragmented bricks, *tegulae,* and schist bound with clay, about 0.40 m high. Below the second segment, the foundation zone could only be represented by the unplastered lower part of the wall whose height is about 0.10-0.15 m.

Wall 2 is oriented east-west, from pilaster 9 in the east to the edge of wall 4 in the west (Fig. 4). Its length is 6.90 m, and the preserved height does not exceed 1.15 m (without the foundation zone). It was built of crushed schist, limestone, and brick fragments, while lime mortar and yellow clay were used as binding material. The construction of the wall itself consists of three pilasters and the rest of the wall is made using the drywall technique. Pilasters 1, 2 and 3 are rectangular at their bases, measuring 1.00-0.75 m x 0.50-0.40 m, built of schist and brick fragments, while lime mortar was used as binding material. The space between the pilasters and the western end of the wall itself, were built of broken schist, fragments of bricks and *tegulae*, which could have been arranged horizontally in irregular rows or slantwise. Yellow clay was used as binding material in spaces between pilasters.

The foundation zone is clearly visible only beneath the pilasters, while under the walls it was found only in the part of the wall near pilaster 9. The upper part of the wall is separated from the foundation by horizontally arranged fragments of *tegulae* and schist. The foundation zone below the eastern part of the wall consists of pieces of schist, fragments of bricks and *tegulae* bound with clay, and its height is about 0.40 m.

Wall 3 is oriented east-west, from the end of wall 1 in the east to the edge of wall 4 in the west

Fig. 4 Wall 2 (northern wall); upper- view from the south, lower-view from the north

(Fig. 5). Its length is 7.75 m and width is about 0.38 m. It was built of bricks, mostly arranged in regular rows, while slate is also used sporadically. Lime mortar was used as binding material. The wall consists of pilaster 5 described above at the south-east corner, and the rest of the structure, which leans on it and extends further west. At the western end of the wall there is a fragmented stone column, whose diameter is about 0.30 m, and which is preserved at a height of 1.10 m. This column was in secondary use and was used as building material, instead of a pilaster in the

corner of the room. The entrance to *building 7* is located in the central part of this wall, at a distance of about 2.70 m from pilaster 5. The sides of the entrance were made at right angles, and the threshold is 1.53 m long and about 0.38 m wide.

Special attention was paid to the construction of the foundation zone of wall 3, whose height is about 0.50-0.60 m. Three levels of stacked stone and bricks can be distinguished on the western side of the foundation zone, where the lowest level is made of smaller fragments of bricks, *tegulae* and schist stone bound with yellow clay (individ-

Fig. 5 Wall 3 (southern wall), view from the north

Fig. 6 Wall 4 (western wall), view from the west

ual pieces of bricks and *tegulae* are in a slanting position), the second or central part of slightly larger pieces of schist and limestone bound with yellow clay, and the third or highest part was built of larger pieces of limestone (fragments of limestone blocks) bound with lime mortar. The eastern side of the foundation zone was built of pieces of schist, fragments of *tegulae* and bricks of approximately the same size, and the different levels of stacking are not clearly visible. In the eastern part of the foundation zone of wall 3 and pilaster 5, a larger block of limestone, measuring 0.61 x 0.86 x 0.32 m, was inserted, as well as pieces of bricks and slate bound with clay.

Wall 4 is oriented north-south, from the end of wall 2 in the north to the end of wall 3 in the south (Fig. 6). Its length is 8.10 m, the width varies from 0.40 to 0.60 m, and the highest preserved height is 1.15 m. Like wall 1, wall 4 can also be divided into segments, i.e. four segments, built of broken slate, fragments of bricks, *tegulae* and *imbrices*. The first segment is located at the southern end of the wall and was founded somewhat shallower, it has a light yellow clay as binding material, and its northern side rests on the second segment. In its southern part, there are 7 rows of bricks, above which a part of the already mentioned stone pillar was placed horizontally, with a preserved height of 1.10 m. The second segment is the best-preserved part of the wall, which extends from segment 1 to pilaster 8, over the length of 2.60 m. It was founded a little deeper, and dark yellow clay was used as a binding material. Pilaster 8 certainly represents the best built part of the wall. It has a rectangular base, it is oriented north-south, and is located at a distance of 2.30 m from the northwest corner of the building. The dimensions of the pilaster are 0.85 x 0.60 m, the preserved height is about 0.80 m (with the foundation zone). It was built of broken schist, fragments of bricks and *tegulae*, while lime mortar was used as binding material. The last, fourth segment of the wall, about 2.30 m long, has not been preserved. This wall was certainly built using a poorer technique and poorer material,

Fig. 7 Pilaster 4, view from the north

which caused it to lean to the east.

Wall 4 is mostly poorly founded, and its foundation zone is only 0.20-0.30 m, except for the foundation of pilaster 8. The foundation was built of brick fragments and pieces of schist bound with yellow clay. The foundation zone of pilaster 8, as well as other pilasters, was built of broken slate and fragments of bricks and *tegulae,* bound with mortar.

In the central part of the western half of the building is its best built part, **pilaster 4** (Fig. 7). The pilaster has a rectangular base and it is oriented east-west. Its dimensions are 1.18 m x 0.57 m, the preserved height is 1.22 m (without the foundation zone) and it was built of 13 rows of bricks bound with mortar. There is a limestone block on the column itself, which could indicate the way the upper part of the column was built. The height of the pilaster with the limestone block on it is about 1.50 m. The bricks used in the construction of the column are 0.39 x 0.27 x 0.055 m in size.

Fig. 8 Wall 5, view from the west

The foundation zone of pilaster 4, with a height of 1.26 m, is the most deeply founded element of the building. The foundation consists of three levels: the first or the highest part, which consists of smaller blocks of limestone, the second or central part, which consists of pieces of schist, and the third or lowest part, which was made of brick and schist fragments bound with yellow clay. Based on the position, massive size, and depth of the foundation, it can be concluded that the purpose of pilaster 4 was to support the roof or the floor.

The only inner wall, **wall 5**, is oriented north-south, from the entrance to the building on wall 3 to the south, to pilaster 4 to the north (Fig. 8). Its dimensions are 2.95 m x 0.35 m, and the preserved height is 0.65 m. It was built of brick and schist using the drywall technique, and differs in its construction technique from wall 3 and pilaster 4 on which it rests. It most likely belongs to the younger phase, or perhaps to some partitioning done later. A smaller space in the southwestern part of the building was created with this added wall.

The **floor** of the building was discovered in the central part of the building and in its southern half. The floor is irregular in shape, with maximum dimensions of 4.80 x 3.90 m, and consists of a sporadically flattened layer of lime mortar, 5-10 cm thick. The substructure of the floor is most likely a surface made of pieces of limestone, schist, brick and lime mortar, which was discovered at a slightly lower level and on a larger surface. The height at which the floor is located corresponds to the level of the threshold and the upper level of the foundation zone of the walls, so this level is defined as the level of use of the building.

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The building itself was mostly built using high-quality materials, such as whole and fragmented bricks, *tegulae* and *imbrices*, limestone blocks and broken schist bound with mortar. In addition, *spolia* were used, such as a stone column

Fig. 9 Head of a female statue

in the southwest corner of the building, parts of the head of a female statue (Fig. 9) and a limestone block with two grooves in the southeast corner. It can be concluded that the masons used all available resources. Two different construction techniques were used in the construction of walls 2 and 4 – binding material in some parts is clay, while other parts were built using mortar. It was probably unnecessary to erect entire walls, half-buried (or buried?) with the use of mortar for economic reasons or lack of materials. However, certain walls had to be of stronger construction in order to increase the integrity of the entire building, or to support the wooden beams of the roof construction (or the upper floor?). It should be noted that no traces of any wooden construction were detected on walls 2, 3 and 4. The only elements that indicate the existence of a wooden structure are the grooves for the beams on wall 1. This leads to the conclusion that the beams were placed vertically and carried the roof structure.

The building technique of wall 3, as well as that of pilasters 4 and 5, indicates simultaneous construction, while the same could be concluded for pilasters 1, 2, 3 and 8. Most of wall 4 and the space between the pilasters of wall 2 were built using clay, most likely simultaneously. The only segment that completely stands out regarding its construction technique is the second segment of wall 1. In this case, part of the wall is built of a completely different material, using a completely different construction technique and the most accessible and cheapest binding material - clay. It can be concluded that this segment of the wall is an obvious modification from a later period. Although built using more modest materials, it is noticeable that the fragments of *tegulae*, *imbrices* and bricks are carefully and neatly arranged.

The walls of the building were not founded in sterile soil, but in a layer that served as the filling of the defensive ditch. The lack of more massive foundations was partially compensated by the high construction quality of individual walls and columns. The foundation zones of the walls were of different quality and height, from 0.30 to 0.70 m. Wall 1 was built above the east side of the defensive ditch, and it can be said to have been erected on the most stable terrain. The lowest point of its foundation zone is only 0.05-0.20 m above the sterile soil. Other walls and columns were erected on a much more unstable part of the ditch filling. An interesting solution was noted

on the example of wall 3, where the statics of the structure were supported by the use of the spolia - a larger block of limestone, with one of its parts placed under pilaster 5, and the other one under the eastern part of the wall. In this way, a certain constructive connection between the two separated wall segments was achieved, while the foundation itself was strengthened.

Wall 1 was partially buried, which can be seen from the height to which the outside face of the wall was plastered. In addition to this, it is noted that the larger pieces of schist face the inner side of the building on wall 2, whereas on the outside they were arranged without a particular order. It is noticeable that pilasters 1, 2 and 3 were properly and (mostly) evenly plastered on the inside, while on their outer side there are no visible traces of flattening of the applied lime mortar. The partially preserved wall 4 has pieces of schist facing the inner side with their flat part, while the mortar on the outside of pilaster 8 is not polished, the same being true for pilasters 1, 2 and 3. It can be concluded that walls 2 and 4 were buried at least up to the level of the preserved height, while wall 1 was buried only up to the level which had no traces of plastering. As far as the building level is concerned, it should be emphasized that the level of the floor inside the building is about 2 m below the level of the main street used in late antiquity.

Although window openings were not noticed, it can be assumed that windows were placed on wall 3. It was the wall of the highest quality, and it most likely provided the greatest amount of light. In addition, if we accept the possibility that walls 2 and 4 were mostly buried, and that wall 1 was facing a neighboring building to the east in its immediate vicinity, the only remaining wall which could have had windows is wall 3. The current state of exploration of the area south of *building 7* allows the conclusion that no building was located on that side. The presence of fragments of window glass (cat. No. 19) in the southern half of the building supports the assumption that the windows were located on wall 3.

SMALL FINDS

A large number of small finds were discovered in the layers inside the building.[4] The most numerous finds from the horizon of use of this building are certainly animal bones and fragments of ceramic vessels. Among other finds, metal objects are dominant, the most numerous of which are coins. In addition to 20 specimens of coins, 23 other small finds were discovered in the building (Fig. 10-11).

Discovered specimens of bronze coins date from the beginning to the seventh decade of the fourth century. Below the floor level, most specimens are dated to the fourth century, and the coins from the period 335/341 AD are dated the most accurately. The coins above the floor level point to the fact that the building was in use in the middle of the fourth century, because the latest date is the year 361. This could indicate the time of construction of the building during the fourth or fifth decade of the fourth century, and shows that it was used for only a couple of decades, after which it was abandoned.

Four finds of iron weaponry were discovered in the building - one arrowhead and three spear-butts. The arrowhead (cat. No. 1) has a flat, leaf-shaped head with a tang. The arrowheads with a flat head of triangular, deltoid and rhomboid shape and tang instead of a socket, were found in the late Roman and early Byzantine horizons of the sites in the Iron Gates area (Špehar 2010: 130). The spear-butts (cat. Nos. 2-4) are conical in shape, in the form of a socket with a pointed tip, and have remains of wood in the interior. The spear-butts are one of the basic elements of the Roman spear - the iron reinforcement of the back end of the spear. This pointed tip served for sticking the spear into the ground, but also as a secondary weapon in case of emergency or damage to the spearhead (Bishop and Coulston 2006:

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4 Only small finds located inside the building, in its lower layers i.e. from the horizon of its use, were taken into account, while the finds from the layer accumulated after the cessation of the building's use, were not included in the paper.

Fig. 10 Small finds

Fig. 11 Small finds

53). The finds of the weapons can be explained by the presence of an army (especially veterans) in the immediate vicinity of the facility. It should be emphasized that due to great social changes in late antiquity, the army and economic-agricultural activities were not strictly separated.

Other items mainly point to household activities, and these are primarily items for everyday use. An iron chain, a kettle / bucket handle, an iron knife, a fragment of a millstone, and several iron tools could be interpreted as household items. Two segments of an iron chain (cat. No. 5), composed of elongated links of rectangular cross-section, have been preserved. Chains had multiple purposes in antiquity, and they were mostly used for economic activities - for tying up animals, for hanging vessels above the hearth, as parts of a plow, etc. According to its dimensions, it can be assumed that our example could have been used for hanging a kettle over the fire (Петровић 1996: 22). The iron handle with folded ends (cat. No. 6) could have belonged to a smaller iron cauldron, or a wooden bucket for drawing water, etc. Similar specimens were discovered in the late Roman horizons of the sites in the Iron Gates area (Špehar 2010: 115). The single-edged knife (cat. No. 7) belongs to objects with a variety of uses and could have been used both in the kitchen and in a number of other activities. The fragment of the millstone (cat. No. 17) was probably the upper part of a hand mill – *catillus*. This type of millstone - a conical millstone with parallel upper and lower sides, is broadly dated to the period from the second to the fourth/fifth century (Jovićić 2019: 193, type IV). Although it could have been used for its main function - grinding grains, it is not excluded that this item was used as a building material in secondary use. Fragments of millstones were often used as spolia, for the construction of parts of the walls, which is also the case in other buildings of late Roman architecture of Viminacium (Nikolić, Stojić i Marjanović, 2018a: 62-63, 67). Three iron tools of unknown purpose were discovered in the building, two of which were probably parts of a larger object (cat. No. 8-10). A massive nail with a pyramidal head (cat. No. 11) was singled out. It was probably used in construction, as well as a circular massive iron object (cat. No. 12), which has not yet been precisely identified. These finds may indicate potential economic activities in the building.

Three bronze objects were also discovered - a button, a lock escutcheon and a crossbow fibula. The double button (cat. No. 13) consists of a flat head and a foot, which were decorated with concentric circles; these two segments are connected by a short axis. Buttons appear in similar forms throughout the Empire, and can have both a decorative and a utilitarian function. These items have a wide application in buttoning clothes, belt sets, or parts of a horse harness (Redžić 2013: 303, 311). Based on the shorter length of the axis, it can be assumed that our specimen was most likely used for buttoning clothes. The rectangular lock escutcheon (cat. No. 14) has two smaller rectangular keyholes and four perforations for fastening to the base. The lock escutcheons were applied to the outer side of the lock and were placed on a wooden base. Depending on the dimensions, they could have been used for locking small caskets or boxes, cabinets, chests or doors (Busuladžić 2018: 134). The specimen of the fibula (cat. No. 15) belongs to the type of crossbow fibulae, which originated from similar, T fibula with a hinge. Crossbow fibulae appeared at the end of the third century and were in use during the fourth and the fifth centuries, and recorded on the territory of the entire Empire. The decorations that appear on the arch and the foot are various, and the motif of circles on the foot, noticed also on our specimen, is quite prevalent. Most of the fibulae of this type discovered at Viminacium are dated to the fourth century (Redžić 2007: 65-66). The ceramic oil lamp with olive-green glaze (cat. No. 16) belongs to the group of late Roman glazed lamps, a type of cup-shaped lamp. They appear in several similar variants, and their main feature is a much wider opening for oil on the disc and nozzle and a surface with glaze of different shades of yellow, brown and green. This type of lamp appears in the third century, and there are specimens dating to the

middle of the fifth century, and even to the early Byzantine period (Korać 2018: 381, Крунић 2011: 300). The largest number of specimens of this type of lamp from Viminacium is dated to the fourth century (Korać 2018: 381-382). Several fragments of window glass (cat. No. 19) with flattened edges were found in the southern part of the building, which may indicate the position of the window on wall 3. Fragments of three glass vessels, belonging to characteristic late antique types, were also discovered. A fragment of a cup (cat. No. 20) with an elongated hemispherical recipient and a slightly indented rim with a straight edge has an ornament in the form of dark blue drops grouped in a cluster. This type of cup can be dated to late antiquity, mostly to the period of the fourth century, both in form and decoration (Ružić 1994: 46). A fragment of the outward folded rim made of transparent olive-green glass (cat. No. 21) probably belonged to some form of a jar with a spherical recipient. Jars of this type had an outward folded rim, spherical recipient, and a flat or annular base. They were ordinary household items, but they were also sometimes used as urns. This form appears from the second century, and was in use until the end of the fourth century (Isings 1957: 111, form 94). A shallow bowl with a flat rim (cat. No. 22) is made of dark blue opaque glass, and on the inside the remains of a white glass threads ornament are visible. Unfortunately, only a small fragment of the rim and the recipient has been preserved, so neither the shape nor the decoration of this vessel can be determined more precisely. The only find made of bone is a hairpin (cat. No. 23) with a rounded, unaccentuated head and a damaged tip. This type of hairpin is not chronologically indicative, and there is a possibility that it is a larger pin with a damaged head and a worn tip. These finds could be for personal use and everyday life, but they do not indicate any specific activity.

Finally, we should mention a fragment of a marble statue of a woman (cat. No. 18), which is not from the layer of use of the building, but was used as spolia and built into wall 3.[5] It is the head

of a younger woman made of white marble, probably part of a larger, standing figure. Only a small part of the sculpture has been preserved, outside the original context, so it can only be assumed that it does not belong to the world of late antiquity.

CONCLUDING REMARKS

Archaeological excavations have shown that a defensive ditch stretched between the military camp and the civilian settlement of Viminacium. The city was surrounded by ramparts as early as the last decades of the second century. Due to increasingly unstable conditions during the middle and second half of the third century, the ditch was closed on the north side with a massive wall (Nikolić, Stojić i Marjanović, 2018: 74-75). In this way, the defense structures of the military camp and the civilian settlement were connected, a larger defended area was obtained, and thus the ditch became redundant. Shortly after the wall was erected, the ditch was filled with earth, and the space along the western rampart was given a completely different purpose. We can assume that due to the danger of barbarian incursions, part of the population sought security within the ramparts. With the increase in the number of inhabitants in the city, there was a need for free space for the construction of new buildings. Seven civilian buildings and five circular kilns were discovered above the investigated part of the defensive ditch. They were most likely economic buildings, although we cannot rule out the possibility that they were also used for housing. They were built of available materials with a noticeable decline in construction techniques compared to the previous period.

Spolia were used in the construction and treated as ordinary construction material, regardless of their aesthetic qualities, which did not affect the place of their installation. The gradual degradation and ruralization of the city is also indicated by the appearance of burials within the city walls. Individ-

5 The fragment of the sculpture was discovered during the   conservation of parts of wall 3.

uals buried in 36 graves in the area in front of the western ramparts of the military camp, probably belonged to the Roman population, as indicated by the grave goods and the type of grave construction.

After a detailed analysis, it can be concluded that *building 7* is a relatively small, late Roman building, built of high-quality materials and erected in a prominent place, near the military camp and one of the main streets. Some parts of the walls, especially the pilasters, indicate knowledge of the ancient construction technique, so it can be said that they are of exceptional quality, well-founded, and skillfully made. On the other hand, it is surprising that there is no constructive connection between the walls, as is the extremely poor quality of some of their parts. It seems that several masons participated in the construction of the building, and that all available materials were used, including the spolia. It is noteworthy that the building lacks any heating system; there are no remnants of a hypocaust, stoves, or even hearths in it. The use of more luxurious architectural elements was not noticed. There were no decoration techniques (floor tiles, mosaic, wall painting), which we could expect in an urban environment. There were no luxury specimens or imports among the small finds, because they were mainly utilitarian objects, indicating usual everyday or economic activities. Analysis of the small finds supports the assumption that the building was of a public character, although the possibility that it was used for housing a smaller number of people cannot be completely ruled out. Coins and other chronologically indicative finds point to the middle of the fourth century as the time of erection and use of the building.

Based on all the above-stated about *building 7*, and taking into account the mentioned buildings and kilns in its vicinity, it can be said that it was most likely an economic building, part of a larger craftsmanship complex on one of the main streets of the late Roman Viminacium. For better understanding of the late Roman architecture of Viminacium, as well as the economic conditions in the city in the second half of the fourth and the first decades of the fifth century, additional research of the civilian settlement and its surroundings is necessary.

CATALOGUE

1. Arrowhead, Pl.I/1
Material: Iron
Dimensions: length 8,7 cm, width 2,1 cm
Documentation Center Viminacium, C-3014
Analogies: Ušće Porečke reke – Špehar 2010: 130, kat. 711, T. XXXIX/711
- Iron arrowhead consisting of a flat leaf-shaped blade and a tang of rectangular cross-section.

2. Spear-butt, Pl.I/3
Material: Iron
Dimensions: length 12,6 cm, width 1,8 cm
Documentation Center Viminacium, C-2086
Analogies: numerous analogies throughout the Roman empire-not chronologically determinable
-Conical iron spear-butt in the shape of a pointed socket, with a small slot on the joint. Remnants of wood are visible inside.

3. Spear-butt, Pl.I/4
Material: Iron
Dimensions: length 14 cm, width 2 cm
Documentation Center Viminacium, C-2116
Analogies: numerous analogies throughout the Roman empire-not chronologically determinable
- Conical iron spear-butt in the shape of a pointed socket, with remnants of wood inside.

4. Spear-butt, Pl.I/2
Material: Iron
Dimensions: 5,6 x 1,5 cm
Documentation Center Viminacium, C-2992
Analogies: numerous analogies throughout the Roman empire-not chronologically determinable
- Conical iron spear-butt in the shape of a pointed socket, with remnants of wood inside.

5. Chain, Pl.I/5
Material: Iron
Dimensions: hoop length 7-9 cm, hoop width 5-6 mm
Documentation Center Viminacium, C-2071
Analogies: Surčin - Петровић 1996: 22, кат. 52, сл. 8/52
- Iron chain consisting of seven hoops of rectangular cross-section, which are joined by corrosion.

6. Cauldron handle, Pl.II/1
Material: Iron
Dimensions: length 30,5 cm, stripe width 0,9-1,2 cm
Documentation Center Viminacium, C-2093
Analogies: Sip - Špehar 2010: 115, kat. 569, T. XXXIV/569; Rtkovo-Glamija I - Špehar 2010: 115, kat. 570, T. XXXIV/570
- Cauldron handle made of a curved rod of a rhomboid cross-section. Both ends of the handle are looped.

7. Knife, Pl.I/6
Material: Iron
Dimensions: length 12,2 cm, width 2 cm
Documentation Center Viminacium, C-2088
Analogies: numerous analogies throughout the Roman empire-not chronologically determinable
-A single-edged iron knife with a part of a tang remaining. The blade is straight, with a slightly curved cutting edge and flat dorsal side. The lower part of the blade turns into a tang (broken) for planting a handle.

8. Tool, Pl.I/7
Material: Iron
Dimensions: length 7,2 cm, width 2,8 cm
Documentation Center Viminacium, C-2097
Analogies: /
-Twofold iron tool of unknown use, consisting of two fan-shaped pieces of uneven size.

9. Tool, Pl.II/2
Material: Iron
Dimensions: length 12 cm, width 1,7 cm
Documentation Center Viminacium, C-2134
Analogies: /
Iron tool of unknown use, shaped as an elongated hoop with a damaged extension on one end.

10. Tool, Pl.II/3
Material: Iron
Dimensions: length 12,7 cm, diameter 1,9 cm
Documentation Center Viminacium, C-2979
Analogies: /
Iron tool of unknown use, consisting of an axis with two circular parts at both ends.

11. Nail, Pl.II/4
Material: Iron
Dimensions: length 21 cm
Documentation Center Viminacium, C-3011
Analogies: numerous analogies throughout the Roman empire-not chronologically determinable
- Iron nail with a pyramidal head.

12. Object, Pl.II/5
Material: Iron
Dimensions: diameter 6 cm, thickness 4-7 mm
Documentation Center Viminacium, C-3012
Analogies: /
- Circular iron object of unknown use.

13. Button, Pl.III/3
Material: Bronze
Dimensions: diameter 2,3 cm, width 1,1 cm
Documentation Center Viminacium, C-2101
Analogies: *Viminacium* - Redžić 2013: 311, 312, Tip XXIV, Varijanta 2, kat. 777-779 (od poslednje trećine II do druge trećine III veka); Žujince-Crkvište - Redžić 2013: 311, Tip XXIV, Varijanta 2, kat. 776 (od poslednje trećine II do druge trećine III veka)
-Bronze button consisting of a flat circular head, flat circular foot, and an axis between them. The head and the foot are decorated with concentric circles.

14. Lock escutcheon, Pl.III/1
Material: Bronze
Dimensions: 6,9 x 6,2 cm
Documentation Center Viminacium, C-3013
Analogies: *Singidunum-castrum* – Крунић, 1997: 221, кат. 354 (III век); Lepenica - Kiseljak – Busuladžić, 2018: 143, cat. No. 201, Plate 19/8
-Square escutcheon of a lock, made of a thin bronze sheet. There are four small perforations in corners for affixing to the wooden door, and two rectangular apertures in the center.

15. Fibula, Pl.III/2
Material: Bronze
Dimensions: length 6,4 cm, width 4,9 cm
Documentation Center Viminacium, C-3017
Analogies: *Felix Romuliana* – Petković, 2010: 127, cat. No. 10 (the beginning of the IV century); *Viminacium* – Redžić, 2007: 65,66, 68, TIP XXX-VI, Varijanta 3, kat. 387-389 (IV vek)
-Bronze crossbow fibula with an arched semi-circular bow of a triangular cross-section, and a rectangular flat foot. The head of the fibula has a wide transverse bar with three onion-shaped bulbs. The foot is decorated with concentric circles.

16. Lamp, Pl.III/4
Material: Ceramic
Dimensions: 9,7 x 6 cm; length 9,7 cm, disc diameter 6 cm, base diameter 3,3 cm.
Documentation Center Viminacium, C-2090
Analogies: *Viminacium* - Korać 2018: 381-382; type Viminacium XXII, Variant 1 (late III and IV century); *Singidunum*- Крунић 2011: 300, тип XXIX
-Lamp with a circular discus with a slightly accentuated rim, oval nozzle additionally modeled by hand, a flat base and a vertical handle. The edge of the filling hole is vertically modeled. Two opposed air holes are placed on the discus. The lamp is reddish fired with traces of an olive green glaze.

17. Millstone, Fig.11
Material: Quartzite
Dimensions: 21 x 16 cm, thickness 5,2 cm, diameter 31 cm
Documentation Center Viminacium, C-2095
Analogies: *Sirmium* – Jovičić 2019: 193, Tip IV, kat. 99, T.VII/99 (prva polovina IV veka); *Felix Romuliana* – Jovičić 2019: 193, Tip IV, kat. 101, T.VIII/101 (kasnoantički i ranovizantijski period)
- Fragment of a conical *catillus* - upper part of a hand mill, made of a greyish quartzite. The central aperture is only partially preserved. The upper side is flat, rising straight from the edge towards the aperture, while the lower side is concave and parallel with the upper one.

18. Sculpture – head of a woman, Pl.III/6
Material: Marble
Dimensions: 17x17x16 cm
Documentation Center Viminacium, C-4151
Analogies: /
-Fragmented head of a young woman, part of a sculpture made of white marble with light gray veins. The lower part of the face, as well as back of the coiffure, is considerably damaged. The head is shown frontally, with slightly accentuated and gentle facial features - almond-shaped eyes, eyebrows, and part of the nose are still visible. The coiffure is modeled with shallow, slightly wavy grooves. On the top of the head, the hair is divided in the middle by a parting, and it is combed towards both sides. Locks curled backwards frame the face, and they are separated from the combed part by a ribbon. The hair on the back of the head is in a bun, which is partially damaged.

19. Window glass, Pl.IV/1
Material: Glass
Dimensions: 8,2 x 8,4 (biggest fragment), thickness 1-3 mm
Documentation Center Viminacium, C- 3015
Analogies:/
Several fragments of flat glass with a rounded edge (possibly window glass), transparent, of light blue color.

20. Cup, Pl.IV/2

Material: Glass

Dimensions: rim diameter 11 cm

Documentation Center Viminacium, C-2986

Analogies: *Ad Miliaria* (Batina) - Ružić 1994: 46, tip VII/10b, kat. 779, T.XXXIII/5 (IV vek)

Fragmented cup with a flat-edged, slightly indented rim and an elongated, hemispherical recipient. It is made of transparent olive green glass, with a decoration of several small navy blue drops grouped in a cluster.

21. Jar, Pl.IV/4

Material: Glass

Dimensions: rim diameter 12,5 cm

Documentation Center Viminacium, C-3023, C-2983

Analogies: Isings 1957: 111, form 94 (2nd to 4th century)

Two fragments of a glass vessel, possibly a jar, made of transparent olive green glass. Remaining part is wide funneled rim with rounded edge, folded outward.

22. Bowl, Pl.IV/3

Material: Glass

Dimensions: rim diameter 22 cm (?)

Documentation Center Viminacium, C-3016

Analogies: /

A shallow bowl with flat rim. It is made of opaque dark navy glass, with remnants of a white decoration on the inner side.

23. Pin/hairpin, Pl.III/5

Material: Bone

Dimensions: length 9,5 cm

Documentation Center Viminacium, C-2096

Analogies: /

Bone pin with a slightly rounded head and a damaged tip.

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REZIME
KASNOANTIČKI OBJEKAT NA LOKALITETU ČAIR-CASTRUM – PRILOG PROUČAVANJU PROFANE ARHITEKTURE VIMINACIJUMA

KLJUČNE REČI: KASNA ANTIKA, IV VEK, MEZIJA PRIMA, VIMINACIJUM, KASNOANTIČKA ARHITEKTURA, POKRETNI NALAZI.

Prilikom iskopavanja zone zapadne kapije legijskog logora na Viminacijumu, 2018. godine je na prostoru odbrambenog rova istražen kasnoantički horizont sa više različitih celina. Tom prilikom otkriven je deo manje nekropole, sedam građevina i pet kružnih peći. Ove celine su podignute pretežno na prostoru odbrambenog rova, nakon njegovog zatrpavanja, a nalaze se severno i južno od komunikacije koja je vodila od zapadne kapije logora ka gradu. Jedna od istraženih građevina je predmet ovog rada, obeležena u dokumentaciji kao objekat 7. Objekat je lociran jugozapadno od kapije i južno od glavne komunikacije koja je vodila od logora ka gradu, na udaljenosti od oko 8 m od zapadnog bedema (*extra muros*). Ima nepravilnu pravougaonu, gotovo kvadratnu osnovu, čije spoljašnje dimenzije iznose 8,10/7,70 x 7,75/6,90 m. Zidovi nisu bili konstruktivno povezani već bočnim stranama naležu jedan na drugog, a njihova najviša očuvana visina iznosi 1,20 m. U izgradnji objekta korišćeni su različiti materijali - fragmenti opeka, tegula i imbreksa, kamena škriljca i blokova od krečnjaka, sporadično i crvenke, a uočena je i upotreba spolija; kao vezivni materijal korišćeni su krečni malter i glina. Na zidovima su uočene prepravke, a u unutrašnjosti i jedan manji pregradni zid, koji predstavlja kasniju dogradnju. Objekat je datovan u IV vek, pre svega na osnovu novca. Pokretni nalazi ukazuju na svakodnevne i ekonomske aktivnosti, izuzev nekoliko primeraka oružja. U širem kontekstu i u odnosu na ostale građevine otkrivene u istoj zoni, objekat 7 se može protumačiti kao ekonomski objekat koji je bio deo nekog većeg zanatskog kompleksa.

* * *

1   2   3   4

5   6   7

Plate 1

Plate 2

Plate 3

Plate 4

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IMAGES OF THE AMPHITHEATRE – USE OF PHOTOGRAMMETRY IN EXCAVATIONS OF THE VIMINACIUM AMPHITHEATRE

ABSTRACT

Photogrammetry is the science and technology of obtaining information about physical objects and the environment using 2D photographs. Recent technological advancements allowed the method to become accessible and quite valuable in the studies of cultural heritage. The method was introduced into the field procedures of archaeological research of Viminacium in 2012. The goal of this paper is to demonstrate the usage of photogrammetry during investigations of the amphitheatre and to exemplify its applicability and benefits for future archaeological excavations. Based on our experience, the method proved to be easy to use and incorporate into existing procedures, especially as it was significantly faster and economical compared to the traditional documenting techniques. Obtained 3D models can fulfill various needs, from the creation of regular archaeological documentation to the visualization and presentation of the results of research.

KEYWORDS: VIMINACIUM, AMPHITHEATRE, PHOTOGRAMMETRY, 3D MODELING, FIELD METHODS.

INTRODUCTION

Archaeological excavations are a destructive process, so it is a researcher's obligation to document excavated features in the best possible way. Traditional methods require precise mapping of units, either by taking hand measurements or with the use of specialized tools – a theodolite, total station, or laser scanners. These standard measuring methods are both time and financially consuming, which presents a problem, since the pace of excavation often requires fast, precise, and economical recording of a vast number of features. The development of new technologies used in photogrammetry has allowed the creation of high-resolution 3D documentation which can be used during excavations for analysis of artefacts, or mapping of remains in the landscape. This method was used during recent excavations on the amphitheatre of Viminacium. Both aerial and terrestrial photogrammetry were used for the creation of highly detailed standard 2D technical documentation, and also digital 3D reconstructions of the excavated structures and features. Immediately, photogrammetry

became a standard documenting technique, which gradually replaced older traditional ways of recording features. The purpose of this paper is to exemplify our experience with the method, its benefits and its faults, as well as its potential application.

PHOTOGRAMMETRY IN ARCHAEOLOGY

Photogrammetry[1] is an art, science and technology of obtaining reliable information about physical objects and the environment through the process of recording, measuring and interpreting photographic images and patterns of recorded radiant electromagnetic energy and other phenomena (Aber, Marzolff, Ries 2010: 23).

The beginnings of photogrammetry can be traced to the middle of the 19th century. Throughout the last century it saw many advancements (*cf.* Wallace 2016: 16–25; Schenk 2005: 7–9; Kraus 2007: 3–9), but, albeit it being useful, until recently its application in archaeology was rather limited.[2] This was mainly due to the complex (mechanical and optical) processing procedures. The advent of digital photography, the development of higher capacity storage devices, increase in computational power (Douglass, Lin, Chodoronek 2015: 138) and the improvement of analytical methods, based on computer solving of mathematical algorithms, facilitated the significant leap in advancement and application of this technique. So, it evolved from being a completely analog, optical-mechanical tool, to digital photogrammetry (softcopy), based on the digital images and computer vision (Aber, Marzolff, Ries 2010: 23).

The basic principle of modern, digital photogrammetry is the analysis of 2D photographic recordings for the purpose of creating a 3D reconstruction of an object or terrain in a digital or graphical form (Luhmann *et al.* 2011: 2). The

reconstruction can be used for obtaining precise data and measurements, such as quantification of distances, heights, areas and volume, or for the creation of topographical maps, digital elevation models (DEM) and orthography (Aber, Marzolff, Ries 2010: 23).

Recent hardware and software developments facilitated the accessibility of this method. Most significant were the inventions of stronger processors and graphic cards, in combination with modern digital photography processing software with automatic procedures for determining the spatial orientation and the overlapping of images. These advancements enabled a fast, simple, and direct way of obtaining the results, without requiring detailed knowledge about the technical aspects of the method (Verhoeven, Docter 2013).

Usage of photogrammetry significantly simplified recording of the features and increased the speed of archaeological excavations. Its potential, benefits and wide application were proven in numerous examples, so in recent years it has become an unavoidable part of the excavation process.

In the recent period, the mentioned method has been added to archaeological practice in Serbia. Stereo-photogrammetry was used on the sites Caričin Grad and Gamzigrad in the last two decades of the 20th century (Иванишевић, Бугарски, Булатовић 2015: 55), while a stereoscopic analysis of orthographic images of the archaeological site Viminacium was done in the early 21st century (Korać, Pavlović, Mrđić 2006). The first modern, digital photogrammetric recording was conducted in 2003, during underwater excavations of the remains of Trajan's bridge on the Danube (Karović, Mihajlović, Vučković 2008). The interest in this method re-intensified in recent times. In 2012 it became a standard documentation technique on Viminacium[3] and in 2014 it was introduced to the

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1 General literature regarding photogrammetry *cf.* Linder 2003; Linder 2009; McGlone et al. 2004.

2 For various types and applications of photogrammetry *cf.* Luhmann *et al.* 2011: 4-6; Kraus 2007: 2.

3 The usage of the photogrammetric method in the archaeological excavations of Viminacium was presented by Ž. Jovanović during the annual meeting of the Archaeological institute „Arheologija u Srbiji 2012-2013, pregled istraživanja", held in Viminacium on the 27th of November 2013.

Fig. 1 The Viminacium amphitheatre (documentation of the Institute of Archaeology, Belgrade).

excavations of Caričin Grad. Since then, the use of photogrammetry became widespread on the other sites in Serbia.[4] The application of these techniques set a new standard in the documentation, presentation and visualization of our cultural heritage (Иванишевић, Бугарски, 2015; Иванишевић, Стаменковић, Јовановић 2017).

PHOTOGRAMMETRIC IMAGING OF THE AMPHITHEATRE OF VIMINACIUM

The Viminacium amphitheatre is located in the northeastern corner of the city, 60 m away from

the northwestern corner of the legionary fortress. The archaeological excavations of the amphitheatre started in 2007 and they lasted until 2017 (Nikolić, Bogdanović 2015; Богдановић, Рогић, Вуковић-Богдановић 2018). During the mentioned period, almost the whole building was unearthed (Fig. 1). The pace of the work on excavation of the amphitheatre and the requirements for efficient methods of gathering data influenced the experimental use of the photogrammetry in 2012, and it soon became part of the standard documentation practices on the entire site.

METHODS OF GATHERING AND PROCESSING DATA

Terrestrial and aerial photogrammetry, as two basic approaches of photogrammetry (Aber, Marzolff, Ries 2010: 23), were used during the excavation of the amphitheatre. Close range terrestrial imagery was used for documenting complex

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4 The most notable example is the project ArchaeoLandscapes Europe that resulted from the cooperation between the Institute of Archaeology from Belgrade, the Ludwig Boltzmann Institute from Vienna, the Austrian Academy of Sciences and Römisch-Germanisches Zentralmuseum from Mainz. The program involved photogrammetric imaging of sites on the Danube bank and sites in the Southern Serbia and the Raška region (Бугарски, Иванишевић 2014).

Fig. 2 Terrestrial photogrammetry (documentation of the Institute of Archaeology, Belgrade).

features, as well as for obtaining more detailed models. Aerial imagery, or rather unmanned aerial vehicle (UAV) photogrammetry (*cf.* Eisenbeiß 2009: 2) was conducted over the wider areas with a large number of features. Regardless of the data gathering method, the workflow comprised two steps: in-field image collection and in-office data processing (Douglass *et al.* 2015: 140).

In-field data gathering

In-field data acquisition is executed by gathering a series of conventional images of the "scene[5]", taken with digital cameras. For terrestrial measurements, we used NIKON D5000 and NIKON D5200 cameras with standard and wide-angle lenses (Fig. 2). A 2,55–3,00 m long monopod was also used for documenting less accessible features. The

Phantom 3 professional drone[6] was used for aerial imaging (Fig. 3). The UAV comes equipped with a SONY FC300X camera that has a maximal resolution of 12-megapixels. The quality and the resolution of the images directly influence the quality of the model and time of its creation. For this reason, all the cameras were set up in auto photography mode with an 8-megabyte resolution for aerial and 9–12-megabyte resolution for terrestrial imaging. All obtained images were in JPEG format, which proved optimal for later reviewing.

The recording was done in accordance with the advance of the excavation and the atmospheric conditions. As already determined, lighting was the most important factor for the quality of the model (Wallace 2016: 30). Ideally, photographing was done when the light was consistent, during overcast days or at dusk and dawn, because sunlight creates shadows of photographed multifaced features, which could potentially decrease the accuracy of the model. Although models created under high noon sunlight also proved adequate, direct sunlight was avoided whenever possible. Additionally, weather conditions that could endanger the stability of the aircraft, such as wind or rain, had to be taken into account when conducting aerial filming.

A few rules were devised in order to ensure a complete, highly detailed model and to eradicate the risk of user errors in the case of individual shots. The camera was moved in accordance with the photographed feature/scene. Optimally, consecutive photographs needed to have between 60 and 80 % overlap, with each part of the scene visible on at least 3 images.

Georeferencing of the scene was done with the use of ground control points that were placed around the scene. Adequate choice of position and the precise measuring of these points is one of the

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5 The term "scene" as defined by M. Douglas, S. Lyn and M. Chodoronek (2015: 140) denotes the landscape, item, or a feature that is of interest to the archaeologist.

6 The drone has a maximal horizontal speed of 25 m/s and a vertical speed of 5 m/s. The maximal distance between the operator and the drone is c. 500 m in an urban environment or up to 1 km in an open field. The drone is powered by two pairs of batteries, which enable it to stay in the air for approximately 15 minutes.

Fig. 3 Aerial photogrammetry (documentation of the Institute of Archaeology, Belgrade).

most important ways of improving the precision of the model itself. TRIMBLE GPS 5800 mobile rover, set on the real-time kinematic (RTK) method was used for measuring the points. A local GPS base station exists on the site, with the primary function of generating RTK corrections for mobile GPS rovers. Applying these corrections increases the precision of reference points to an error of just 1–3 cm. Exporting of absolute coordinates taken on the field is performed using the supporting software TRIMBLE GEOMATICS OFFICE *(TGO 1.60)*.

In-office data processing

The second step in the creation of a model is in-office data processing. The process starts by choosing suitable photographs or rather removing the ones that are blurry or out of focus. Selected images are then imported into a 3D rendering and modeling software package AGISOFT PHOTOSCAN. The numerous advantages of this software suite has caused it to become one of the

most popular programs used for the creation of models.[7] It is characterized by user-friendliness, automated processes, high quality results, short rendering time, and great customization possibilities. Our experience has shown that the most useful options are automatic recognition of reference points and the possibility of their hand input for georeferenced models. The software offers the possibility of merging different models, as well as the creation of ortophotographs and DEM's which provide additional options for visualizing and analyzing data. Active customer support, as well as the existence of an up-to-date user forum, proved to be quite invaluable for solving technical issues and understanding the intricacies of the software.

The basis of digital photogrammetry methods are Structure from Motion (SfM) algorithms.[8]

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7 For comparison of various photogrammetric and computer vision software *cf.* Verhoeven *et al.* 2015: 168-169, Table 2.

8 SfM algorithms allow simultaneous calculation of relative geometric projection and multiple 3D points from a series of overlapping images, taken with a camera orbited
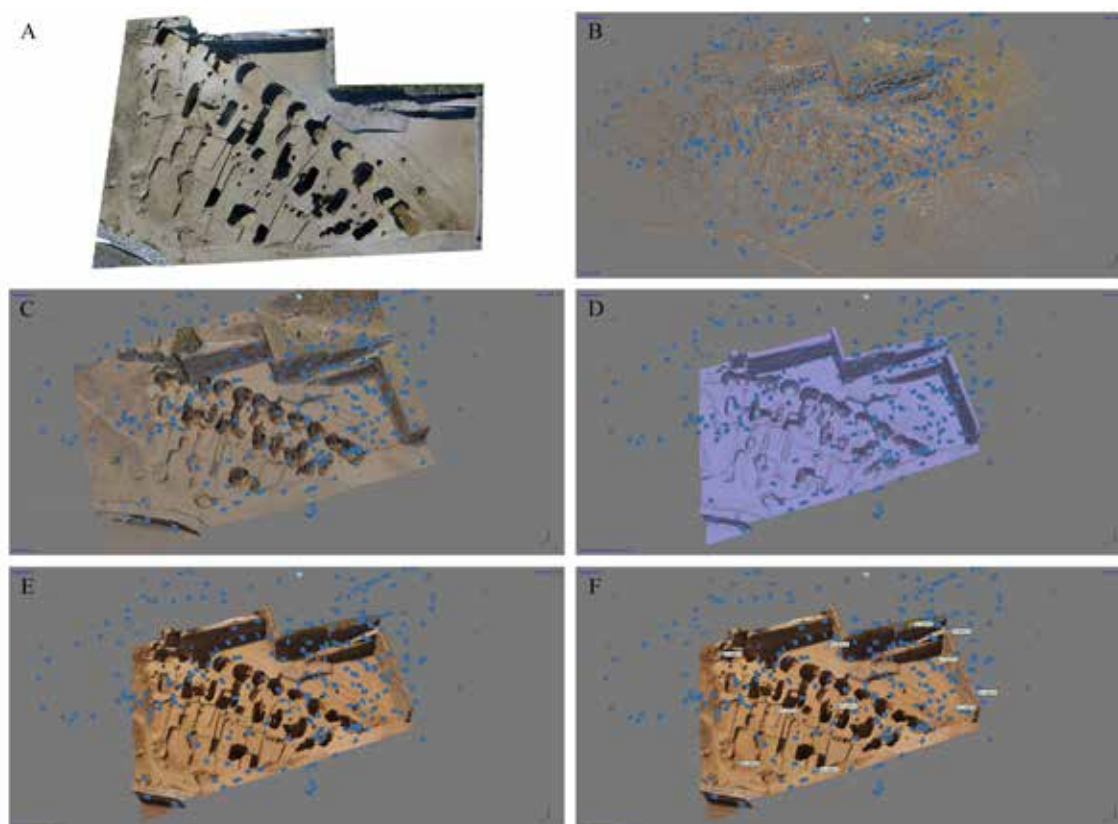
Fig. 4 Model creation: (A) Orthographic projection of the South-Western part of the grandstands (B) Sparse point cloud (C) Dense point cloud (D) Surface model (E) Textured surface model (F) Georeferencing of the model using control points (A-F: documentation of the Institute of Archaeology, Belgrade).

Based on a sequence of overlapping photographs, shot while moving the camera around the scene, these algorithms determine the geometric projection (scene geometry), i.e. reconstruct the position of the camera and the 3D geometry of the object. The software calculates the position of the photographs in space by aligning the randomly selected points from all the images. By detecting these characteristic points (such as object edges and specific details) on each photograph and tracking their position through multiple images, the software determines their location in a relative coordinate system (Douglass *et al.* 2015: 141; Verehofen *et al.* 2015: 167). Through this process, the position and orientation of the camera in a relative coordinate system is defined and a sparse point cloud is created (Douglass *et al.* 2015: 141) (Fig. 4).

The next step in the modelling process is the creation of a dense point cloud. This is done us-

around the scene (Doneus et al. 2011: 82).

ing the Multi-View Stereo (MVS) algorithms in relation to every point of the image,[9] on a pixel by pixel basis (Verhoeven *et al.* 2015: 169; Wallace 2016: 38–39). Following the creation of a dense point cloud, the software creates a 3D polygon mesh. The mesh is created by connecting sets of corresponding vertices (points) within the point cloud, which form numerous triangular surfaces (faces), the sum of which forms a mesh (Douglass *et al.* 2015: 142; Wallace 2016: 39). Following the creation of the 3D mesh model, a texture is generated by projecting pixels from either all or selected photographs. The texture is then applied to the model, which is finished at this stage. Alternatively, a DEM can be used to place different textures that visualize different data instead of a photographic texture.

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9 For each point it is possible to determine value, in radiometric data (intensity, grey value, color value), as well as geometrical data (position on the photograph).
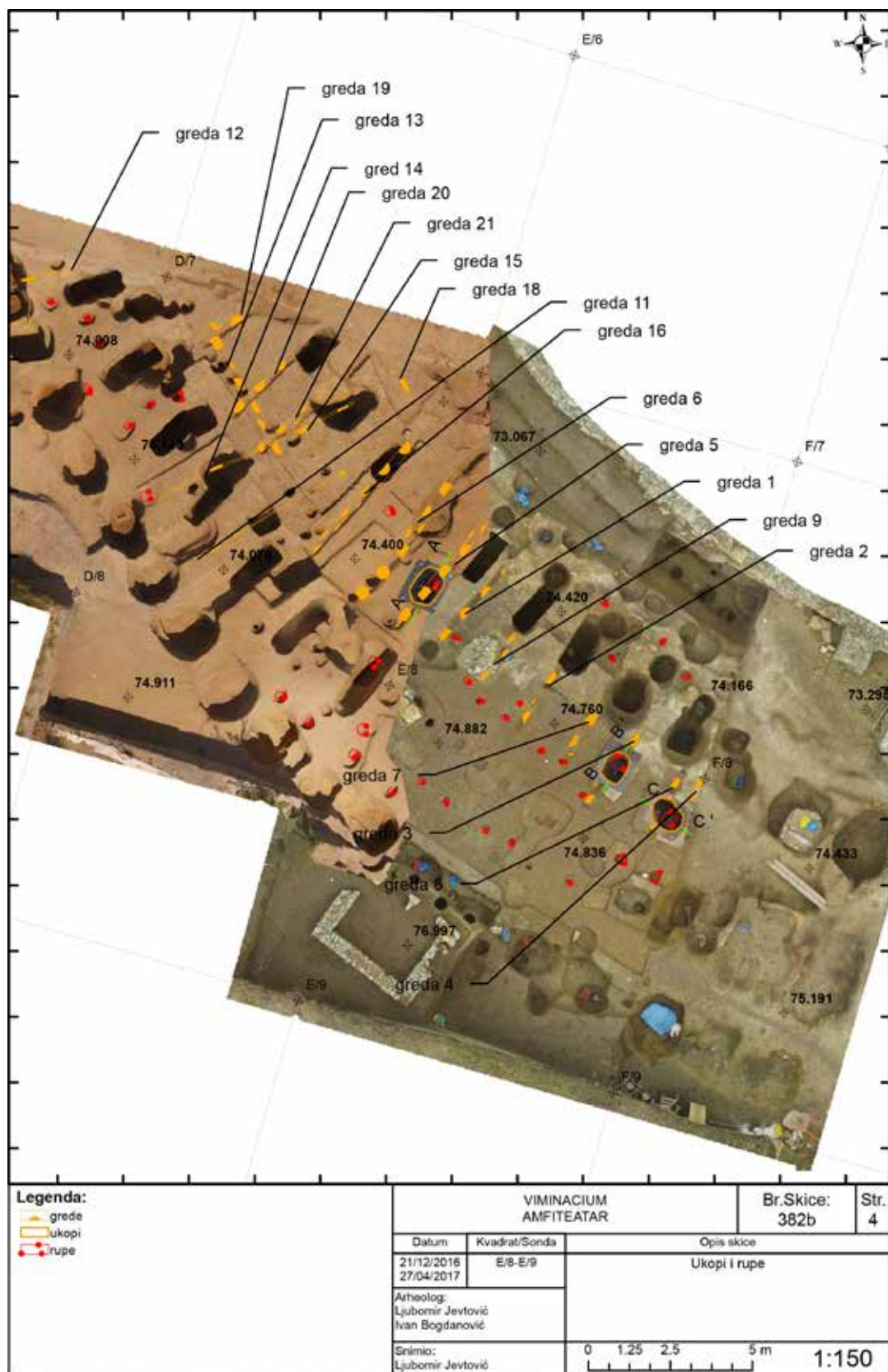
Fig. 5 Numerous pits with remains of wooden posts representing different construction phases of the amphitheatre (documentation of the Institute of Archaeology, Belgrade).
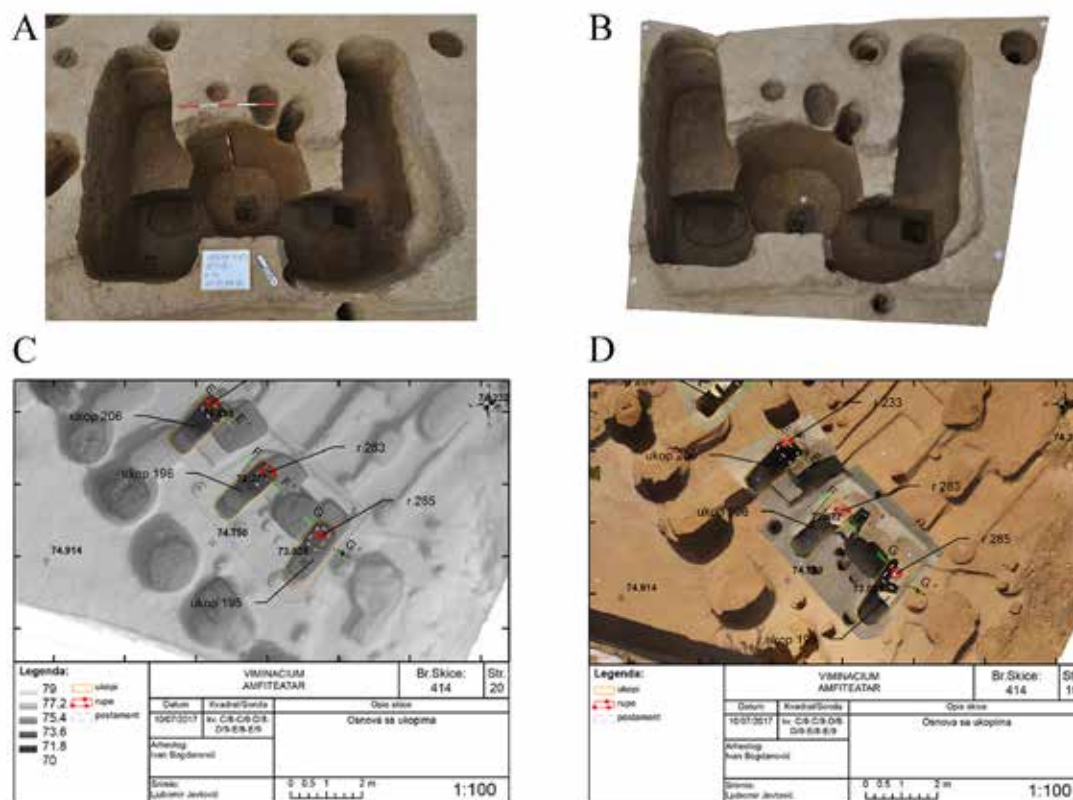
Fig. 6 A) Overlapping pits (B) Model of the pits (C) Technical drawing of the pits on the digital elevation model (D) Drawing and the model of the pits overlapped with the orthophoto of the South-Western grandstands of the amphitheatre (A-D: documentation of the Institute of Archaeology, Belgrade).

The final step of the process is the georeferencing of the model. This is done by adding markers in the position of the reference points and attributing coordinates to these points. Based on this, the model is rotated and scaled in order to fit into the absolute coordinate system. In case of major errors, optimization of the base point cloud is undertaken in regard to the coordinates of the reference points, and then the following steps are repeated (Doneus *et al.* 2011: 82–83).

UTILIZATION OF THE PHOTOGRAMMETRIC DATA

In archaeology, there are many options for 2D or 3D visualization of collected and processed photogrammetric data. Commonly, the creation of technical documentation is the most important step of the excavating process. During the early stages of the implementation in Viminacium, photogrammetry was used for the creation of traditional, in-situ documentation. It was perceived as a faster way of applying traditional techniques with the same end product. This opinion was shared by both archaeologists (since it allowed for a quicker continuation of fieldwork) and technicians (since it decreased their field time and exposure to the elements).

During the later phases of the excavation, including the investigation of the amphitheatre, it became obvious that visualization in 3D form is very advantageous and could be superior to standard 2D documentation. A greater quantity of information is obtained using 3D modeling then from drawings in 2D.
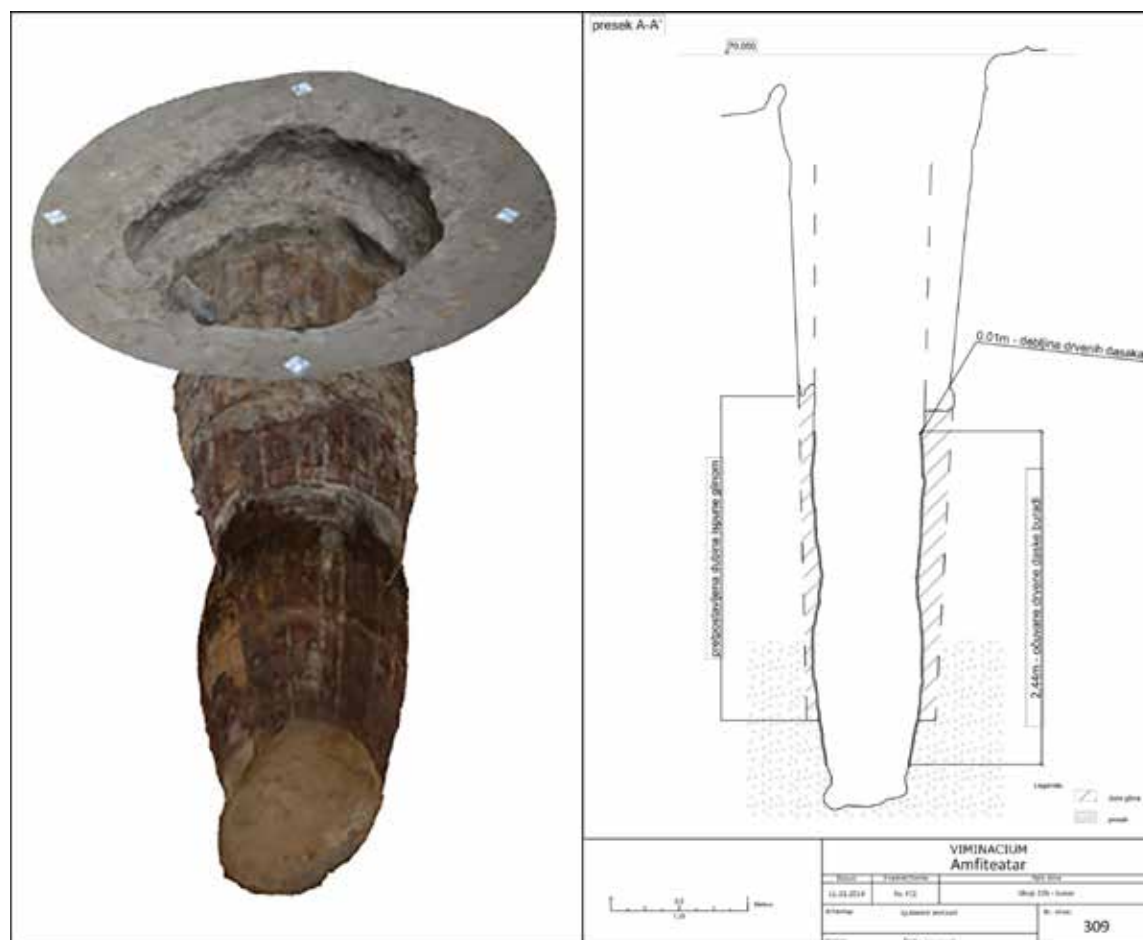
Fig. 7 (A) The model of the well (B) Technical drawing of the well derived from the model (A-B: documentation of the Institute of Archaeology, Belgrade).

Technical documentation

The photogrammetry was integrated smoothly into the standard documenting techniques of unearthed features on the Viminacium amphitheatre as well as on other locations. AGISOFT PHOTOSCAN has a built-in orthophoto option which allows easy extraction of the accurate 2D portrayal of the model. This portrayal would be imported into the AUTOCAD software[10] and used as a basis for technical drawings of standard, albeit digitalized maps, plans, and field sketches.

Immediately, a few benefits of the photogrammetric modeling were observed. The accuracy of documented features increased significantly,

as it became less dependent on the experience of the staff and thus less prone to human errors. Major factors such as insufficient field recording time, inconsistencies, and subjective perspectives during the recording process, become irrelevant, as the process is both time-efficient and objective. The technique of gathering data and the digitalized form of the process meant that the size of the feature was not crucial anymore, as the scale of the recorded scene can be easily modified for final documentation and publications.

Another important advantage of the method is that it allowed obtaining information about features that were difficult to document using traditional methods. Photogrammetry proved distinctly superior for documenting complicated

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10 Alternatively, any of numerous software options, used for precision drawing, could be used instead of the mentioned software.

Fig. 8 Model of a lower part of the well in a PDF format, cross section and the measurements (documentation of the Institute of Archaeology, Belgrade).

archaeological situations. The mentioned method was much easier and more accurate in documenting features, especially their cross-sections, which was significantly faster.

During the excavations of the amphitheatre, it was possible to conclude that surviving parts of the grandstands (*cavea*) were represented by pits with postholes or lower parts of the wooden posts that supported rows of seats (Bogdanović 2019: 180–186, 263–265; Nikolić, Bogdanović 2015: 553). The existence of several overlapping pits and posts in every single part of the space covered by the *cavea* indicates different phases of the construction of the building (Fig. 5). For these reasons, documenting just one of these features was demanding, while the presence of a vast number of pits and posts made the problem exponentially greater. The aerial photogrammetry provided an easy way of simultaneous documenting of a

large number of these features, while the terrestrial method allowed for fast creation of precise and detailed models when occasions demanded (Fig. 6). Combining both methods allowed us to gain all the needed information about the traces of wooden construction of the amphitheatre, which allowed easier recognition of the different phases of the construction of the *cavea*.

Nevertheless, the nature of some structures or some of their elements (underground structures), their accessibility (tight spaces or covered by some other feature), or some other factor (the lack of natural light) can affect photogrammetry. However, the method was far less affected by the mentioned limitations than traditional methods. The most prominent examples of the usefulness of the technique during the excavation of the amphitheatre were photogrammetric surveys of the well (Nikolić, Jevtović, Stojić 2017: 94–95; Bogdanović 2016: 13–14) and water collector (Bogdanović 2019: 196). The major of the above-mentioned problems was the fact that these features are narrow and have depths of c. 5 m and c. 2.5 m, which made even basic tape measurements difficult. Following the principles of methodology and the safety regulations, the excavation of the well was conducted in phases, while recording of the collector was done using a tripod. Thus, a model of the well was created for each subsequent phase of the excavation. Individual models were later merged into a single model, representing the entire feature. This allowed for obtaining of a profile map with planar and cross-section perspectives showing every detail of the feature (Fig. 7).

3D Visualization and presentation

The results of the photogrammetry could be visualized in many ways, depending on the expected results and their intended purpose. AGISOFT PHOTOSCAN allows the possibility to export a point cloud in any phase of the modeling, a completed model, an orthophoto, or a DEM. Any of these options has its benefits, yet for regular examination of the excavated features, the finished,

fully texturized model was the most obvious and usually the best choice. As the models are digitalized representations of the excavated (and thus often destroyed) feature, they are ideally suited for digital archiving and further analysis and examination following fieldwork. Additionally, they can be applied in a wide variety of studies, ranging from the research of a single artefact to an entire landscape.

Models can be exported in various digital formats (pdf, obj, dxf, 3ds, wrl, dae, ply, u3). We used a PDF format as it has already proved to be the most advantageous, due to its versatility and ease of sharing. This file format is common and thus easily accessible. Additionally, although decreased in size, PDF models retain much of their detail while the file size is low, which allows for easy sharing. Exporting in other formats, such as OBJ, can be advantageous since the model retains all its detail, but we realized that the downside is that it requires additional software packages to open. Luckily, most of these packages are open source, such as MESHLAB.

Another option that the AGISOFT PHOTOS-CAN allows is the online posting of 3D models. It is possible to do using a number of web services (online 3D file-sharing platforms such as SKETCHFAB) that can present a fast and easily accessible option for private and public display.

There are several advantages of the models over 2D documentation. During the excavation process, they were useful for examining the features and structures. In later phases, during analysis of the excavated features, they allowed reexamining of the results. Finally, the models can be both analytical and appealing for the publication and presentation of results. 3D models can be rotated, which allows for their viewing from any angle. They can be cross-sectioned across any plane, which allows much easier study of their internal structure. As the models are fully scaled, they can be used for the extraction of accurate metric information, such as dimensions or volume. If the model is georeferenced, x, y or z coordinates of

a single point within the model can be obtained. All of the mentioned operations can be achieved with unparalleled precision, depending solely on the skill of the user (Fig. 8). Additionally, as they are related to photography, fully texturized models offer a great visual representation of features.

A georeferenced orthophoto of a model can be inserted into any Geographic information system (GIS) software. This allowed us further analysis of obtained data but also overlapping with other data, obtained by prospection (aerial photography, satellite imagery, results of geophysical research, etc.), as well as from plans and other archaeological documentation. Such bases have become a cornerstone of spatial research in the past couple of decades and already exist for most archaeological sites in other countries. Photogrammetric models are compatible with such datasets and have proved to be a valuable addition for various spatial analysis.

The visual and metric quality of the models makes them a convenient and versatile option for presenting results to both professional and public audiences. Displaying the model as an image or in a video format is appropriate for basic analysis, dissemination and presentation of excavated data. The insights obtained in such a way have proved crucial during the conservation and reconstruction of certain parts of the amphitheatre. Additionally, we used the same formats for presenting the results of the excavation (Fig. 9). They are appropriate for a variety of purposes, ranging from reports demanded by public institutions, to the presentation of our achievements in scientific lectures. This modern approach significantly enhanced the visualization of archaeological discoveries, by making it more appealing, while simultaneously allowing the observers an easier understanding of a certain situation.

Displaying the results of photogrammetry is very advantageous for commercial purposes. It can be used for presenting Viminacium and the results of our excavations in the media. Also, it can be used to enrich the information on certain structures and features within the archaeological park. Inclusion of modern interactive approaches

could be crucial for future promotions of the site. In perspective, it can enhance the visitor's experience, which will hopefully increase the number of guests and thus further the development of the archaeological park.

CONCLUSION

The current benefits and enormous potential of photogrammetry make it a worthwhile addition to standard archaeological practices. It provides a new insight for studies of archaeological sites, landscapes and features, but also for small finds and other materials, as it has already proved quite invaluable for other disciplines that deal with cultural heritage.

During the investigation of the amphitheatre, we realized that photogrammetry represents a significant addition to the excavation process on Viminacium. Gained experience showed us that this method is extremely useful in the creation of archaeological documentation, as well as for the visualization and presentation of cultural heritage.

The primary characteristic of photogrammetry is the simplicity of data acquisition since the creation of the model requires only clear photographs and a few georeferenced points. The field preparation is standard, as for any documentation technique, and the perquisites are minimal. The process requires standard equipment, regularly used during fieldwork, such as utility-grade cameras and computers as well as a way of georeferencing the points. For terrestrial photogrammetry, in-field data gathering does not require any specialized training, except for a basic knowledge of photography and the following of some basic rules. Aerial photogrammetry does require specialized equipment and training in operating UAV's, but our experience has shown that regular and affordable UAV's offer more than decent results, while the training is relatively simple. The method is time efficient and compared to other traditional methods (drawing/sketching) signifi-

cantly faster. It is easily incorporated into existing field procedures and allows an additional benefit that the fieldwork can proceed while data processing and analysis is still under way.

The second stage of the process, i.e. model creation, is straightforward and automatized. It requires only basic technical skills and knowledge of the program. The obtained 3D model is geometrically precise, positioned in the georeferenced system, and provides photo-realistic visualization of the archaeological feature in 3D. Based on the model it is possible to create standard documentation of far greater precision than that of traditional sketch drawing. Other output formats provide additional benefits of easy manipulation and distribution. These can be used for professional as well as public visualization. Mentioned formats also offer a possibility of much realistic reexamining of the excavated features and can be easily complemented with other forms of documentation, which can often provide additional details.

The analytical quality and visual appeal of photogrammetry can be used with great effect for visual presentations, in both academic as well as in public displays. Its potential and value lie in interactive visualization and multimedia exhibitions that can be used to increase public awareness and provide additional understanding and appreciation of cultural heritage.

Our recent work undoubtedly suggests that photogrammetry should be a necessary addition for upcoming archaeological campaigns. Also, modern photogrammetry is finding new uses that will allow the exploration of new horizons, as it has become one of the driving forces for future advancements in the field of archaeology.

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REZIME
AMFITEATAR U SLIKAMA – PRIMENA FOTOGRAMETRIJE U ISTRAŽIVANJIMA VIMINACIJUMSKOG AMFITEATRA

KLJUČNE REČI: VIMINACIUM, AMFITEATAR, FOTOGRAMETRIJA, 3D MODELOVANJE, METODOLOGIJA ARHEOLOŠKIH ISTRAŽIVANJA.

Fotogrametrijski metod predstavlja novinu u izradi arheološke dokumentacije. Iako je nastao sredinom XIX veka, do njegove značajnije upotrebe u arheologiji dolazi tek sa razvojem digitalne fotogrametrije tokom poslednjih decenija.

U istraživanjima Viminacijuma, fotogrametrija je eksperimentalno primenjena 2012. godine prilikom iskopavanja amfiteatra. Uočene prednosti učinile su da navedeni metod postane standard u izradi dokumentacije na ovom lokalitetu.

U radu je prikazano naše iskustvo sa upotrebom fotogrametrije u istraživanjima amfiteatra, odnosno, prednosti i mane ovog metoda, kao i moguća upotreba u prezentaciji kulturnog nasleđa. Čitav proces dokumentovanja arheoloških celina činili su prikupljanje podataka i njihova dalja obrada.

Fotogrametrija se pokazala kao veoma pogodna za izradu tradicionalne 2D dokumentacije. Ovaj metod je znatno brži i objektivniji od tradicionalnih metoda, a omogućio je izradu detaljne i precizne dokumentacije čak i kod izrazito komplikovanih arheoloških celina, nezavisno od njihove veličine i veštine crtača. Rezultati snimanja predstavljeni su u okviru 3D modela. Oni nude niz prednosti u arhiviranju podataka i pri njihovoj analizi, a budući da su zasnovani na fotografijama, modeli sa teksturom su odlična opcija za vizualnu predstavu otkrivenih celina.

Predstavljanje modela u obliku slika ili u video formatu, može se koristiti u prezentovanju istraženih celina i rezultata arheoloških iskopavanja, u naučne ili komercijalne svrhe. Na ovaj način fotogrametrija se čini veoma korisnom, jer omogućava vizuelizaciju kulturnog nasleđa, čineći ga vizuelno dopadljivim, ali i lakšim za razumevanje.

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ARCHEOLOGICAL SITE GRADAC NEAR KREPOLJIN IN HOMOLJE

ABSTRACT

The results of recent investigations of the Gradac archaeological site near Krepoljin in Homolje are presented in this paper. Gradac is a fortified settlement built on the rocky cliff above the Mlava river, at the exit from the Ribarska gorge. Within the defended areal, there are the remains of at least three profane structures and a church settled at the projected north-east part of the mount. Based on accidental findings it could be said that the Gradac site was inhabited during prehistory, Late Antiquity, and the Middle Ages. A field visit for the purpose of revision was performed in 2019 by the authors of this paper, whose results are presented in the following text.

KEYWORDS: FORTIFICATION, CHURCH, GRADAC, ACCIDENTAL FINDINGS, RIBARSKA GORGE, DATING, KREPOLJIN.

FOREWORD

Knowledge about fortified settlements on the territory of Homolje is basically scarce. Archaeological examinations performed up to the present are generally trench excavations and shorter field surveys. Based on trench excavations whose results are not yet fully published, it might be said that the certain sites in which remains of the fortifications can be identified today were inhabited during the Late Antiquity or Early Byzantine period. Such sites are Zad in Ribar and Pčelinji krš in Laznica (Цуњак и Миљковић 1992: 103: Мишић и Селаковић 2017: 19; Миловановић 2017: 30-31, 35; Миловановић и Филиповић 2018: 2, n. 3; Миловановић 2018; Миловановић in print). During shorter field surveys of the other fortified

settlements in Homolje, archaeological findings on the surface of the terrain were gathered, indicating settlement during the 4th-6th centuries. In that context, the following registered sites might be distinguished: Grac – Gornjak spring and Velika pećina in the Gornjak gorge, Šetaće in Osanica, Pregrada – Podkrš in Žagubica, and Potaj Čuka near Žagubica on the way to Bor (Јацановић 2013: 13-14; Миловановић и Филиповић 2018; Цуњак и Миљковић 1992: 102; Milovanović 2019; Миловановић in print). However, the archaeological data, obtained by a field survey of the aforementioned sites are insufficient for final conclusions. For the time being, we do not have firm evidence about settlements on these archaeological sites during the Middle Ages epoch, even though such a possibility should not be ruled out. The only
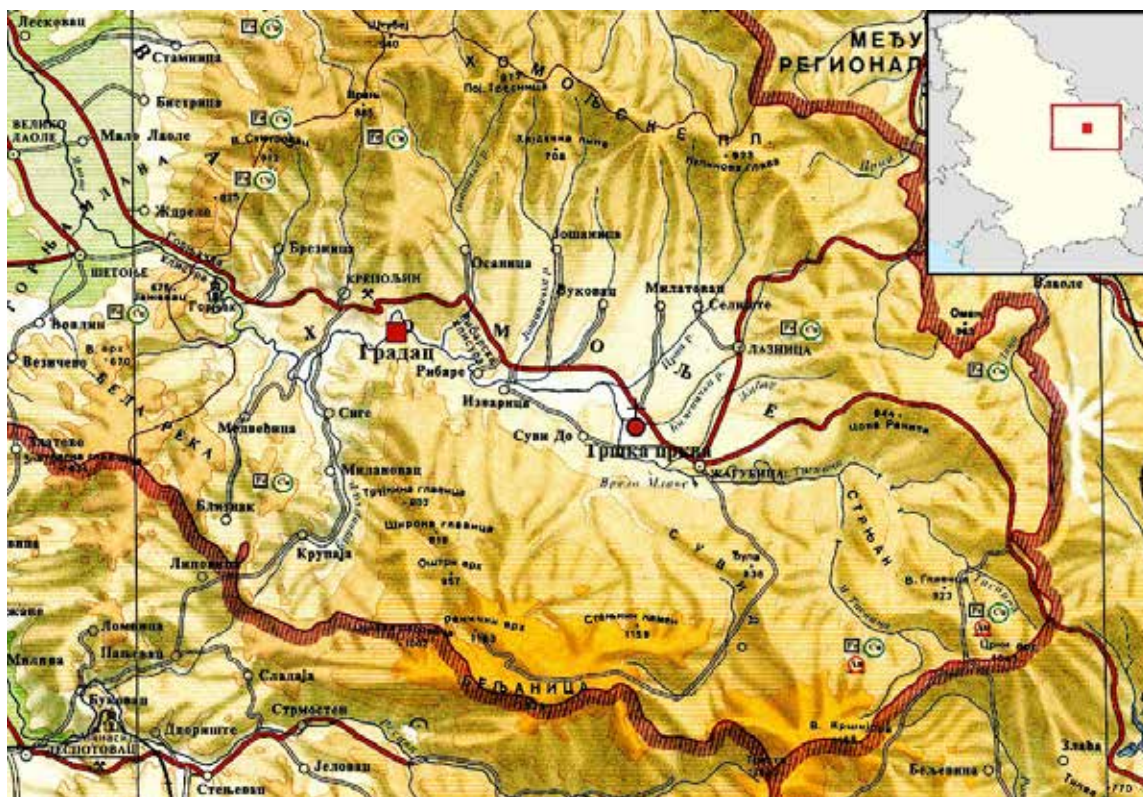
Fig. 1. Geographic location of the Gradac (Градац) archaeological site near Krepoljin in Homolje.

fortress mentioned in written sources of that period is Ždrelo in the Gornjak gorge (Даничић 1866: 115; Вушковић 2010: 107-108).[1]

When it comes to the study of sacral structures within the given territory, the situation is somewhat different. Until now, systemic archaeological excavations have been performed in the corpus of churches in the Gornjak gorge (Metropolinate, Church of Immaculate Mother of God and the Annunciation, as well as in the Trška church near Žagubica). These structures were built in the late Middle Ages (Мадас и Гајић 1983; Цуњак 2000; Чанак-Медић 2006). The test excavations in front of the Šupljaja church in Ribar, the results of which were also not published in full, should be also mentioned (Цуњак и Миљковић 1992: 103), as well as the rescue conservation works in the

Gornjak monastery (Цуњак 2000: 32-48; 67-68).

The Gradac site near Krepoljin belongs to the class of fortified settlements in Homolje (Fig.1). The visible remains of the well-preserved defence wall were constructed on the high rocky cliff, i.e., a strategically, skilfully selected position. Within the defended areal, the walls of the profane structures and the church can be recognized. We obtained the first data about the walls at the site near Krepoljin from Professor Jovan Dragašević in the mid-1870s (Драгашевић 1874: 60-61, 63; Драгашевић 1875: 80-81). Trench archaeological excavations were carried out in 1992 when the team of the Regional Institute for the Protection of Cultural Monuments from Smederevo and the Republic Institute for the Protection of Cultural Monuments from Belgrade explored the church on the north-eastern cliff of the site (Цуњак и Миљковић 1993; Радовановић 1997: 241). After this research, inhabitation of Gradac during the Middle Ages was assumed, with a note that the possibility of the use of this

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[1] The individual, accidental, chronologically sensitive finds, which are found in the wider areal of the fortified complex Ždrelo should be also mentioned. This is archaeological material roughly dated to the Late Antiquity period (Миловановић 2016: 213; Јацановић 2013: 13-14).

Fig. 2. Position of the Gradac archaeological site near Krepoljin at the exit from Ribarska gorge
(snapshot: Google Earth, September 2019).

area during earlier epochs should not be ruled out (Цуњак и Миљковић 1993; Јацановић 2013: 13-14; Мишић и Селаковић 2017: 18; Пуповац 2017: 48).

In September 2019, the terrain at the Gradac site was visited for the purpose of revision, with the primary goal of determining the degree of the fortification preservation, to which little attention had been paid until then.[2] During this visit, the profane structures and the church were investigated to the extent that was possible. According to former research, it might be said that Gradac near Krepoljin is, for the time being, the only altitudinal site in eastern Serbia on whose peak the remains of the sacral structure have been recorded. According to the masonry technique, the church most probably belongs to the corpus of the Late Middle Ages sacral structures. So far on the surface of the terrain, a certain repertoire of archaeological finds has been found, bearing testifying

that the mount in the Mlava gorge near Krepoljin had also been inhabited in earlier periods.

GEOGRAPHICAL FEATURES AND SITE POSITION

The Gradac site is located at just over an hour's walk to the east of Krepoljin, in the southern part of Braničevo district. The remains of the walls are visible today on the high cliff at the exit from the Ribarska gorge, above the left bank of the Mlava river. On the opposite side of the river there are rocky slopes with the name Čovečji pad (Figs. 2, 3). In this part of the Homolje microregion, the Ribarska gorge separates the Krepoljin and Žagubica basins, and their surroundings are abundant with sedimentary rocks, among which limestone, marl, and Permian red sandstone stand out, while of metamorphic rocks, slate is present (Петковић 1935: 81-83; Лазић 1948:32; Драгашевић 1876: 326).

North of the Ribarska gorge spread the southern slopes of Homolje mountains, where the Ve-

2 The Gradac site visit was conducted as a part of regular annual activities of the Heritage Museum of Homolje in Žagubica.

Fig. 3. Location of the Gradac archaeological site near Krepoljin on a topographic map (according to: the map of Yugoslav People's Army 1:50 000, Žagubica 1, sheet number 482/1, Edition of the Military Geographical Institute 1970).

Fig. 4. Professor Jovan Dragašević (1836-1915) (photo courtesy of Bora Dragašević, March 2018).

liki Sumorovac (912 m) and Vranj (885 m) peaks stand out. Apart from the wooded areas, this part of Homolje, especially in the area between the Osanica and Mlava rivers, is abundant with arable surfaces that encompass smaller hill glades and plains in the valleys of the aforementioned rivers. One tools hoard from Vranj roughly dated to the Late Iron Age period, testifies that this area has been suitable for agriculture and forestry since ancient times (Тапавички-Илић 2011: 7-8). South of the Gradac site a mountain forested area spreads, in which Kozarski vrh (654 m) and Trujkina glavica (802 m) heights dominate. Somewhat further from these peaks, the wreath of the Beljanica mountain (1.339 m) stretches out.

West of the Gradac site, at a distance of 9 km, the Gornjak mountains spread (825 m). Between these mountains and the site, there is the smaller Krepoljin basin, in which arable areas as well as a smaller number of village houses, are situated (Marković 1988: 76, 122). There is a path through the basin, which bifurcates at Krepoljin. One arm stretches towards the east, i.e., towards Žagubica basin, while the other leads to the Gradac site. During the field survey of the Gornjak and Ribarska gorges in 1992, the assumption was presented that during ancient times the road passed through this part of Homolje leading to Gamzi-grad (*Felix Romuliana*) (Цуњак и Миљковић 1992: 103). In that case, the Upper Moesian Roman route, which led from Viminacium (*Viminacium*) to Naissus (*Naissus*) (Vasić i Milošević 2000, 139; Јиречек 1959: 113), most probably divided at Iovis Pago (*Iovis Pago*) and through the Gornjačka gorge, and near Gradac it went toward the interior of the coastal Dacia province (*Dacia Ripensis*). It is possible that this Roman road had been also used during the Middle Ages, as is the case with the road which led through the valley of the Great Morava (Шкриванић 1974: 117-118; Ћирковић 1994: 466; Благојевић 1987: 108; Узелац 2015: 19).

HISTORY OF THE RESEARCH

The fortification near Krepoljin was mentioned for the first time in the literature by the Professor of military geography Jovan Dragašević in 1874 (Fig. 4). During his career, he performed geographical examinations of Homolje on several occasions and left data in his records about some of the fortified settlements. Describing the
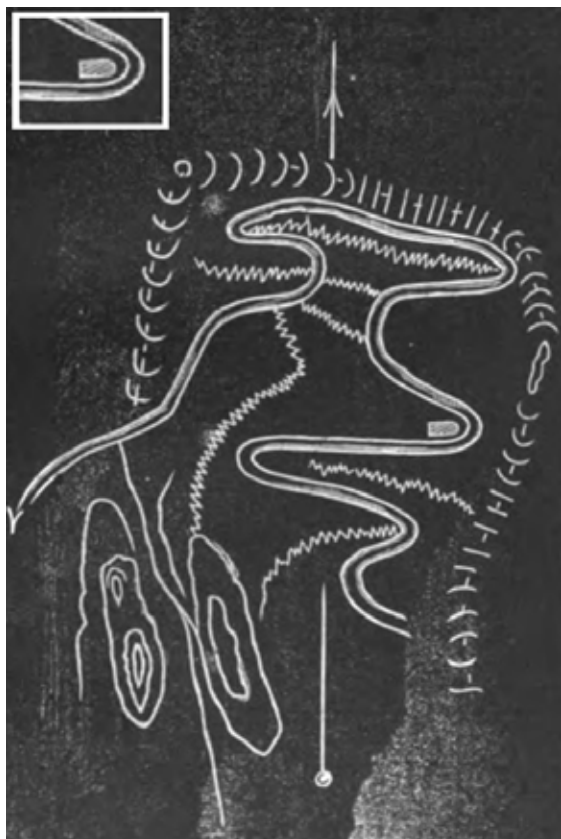
Fig. 5. Sketch of the cliff with the structure drawn in on the left bank of the Mlava river at the exit from Ribarska gorge (according to: Драгашевић 1876: 328).

river Mlava flow in Ribarska gorge, he notes that above the spring that meanders there are city ruins: "The ridge on which the city was built is hardly several meters (2-5-7) wide on the top and from there a high cliff breaks into the Mlava river" (Драгашевић 1874: 60-61, 63, 79; Драгашевић 1875: 80-81; Драгашевић 1876: 303). It is interesting that Dragašević called the site by the name Kudelin (Драгашевић 1874: 79; Драгашевић 1875: 80), even though the toponym Gradac was used by the locals during the second half of the 19th century (Валтровић 1890: 89-90). A similar situation occurs with the nearby Zad site in Ribar, called Drman by Dragašević (Драгашевић 1875: 80; Драгашевић 1876: 341; Ђорђевић 1910: 231-232). In the historical sources, the half-brothers Drman and Kudelin of Kumane and Bulgarian origin, are mentioned as independent masters,

who established themselves in Ždrelo during the second half of the 13th century (Даничић 1866: 115; Узелац 2015: 111, 118-120; Вушковић 2010: 107-108). It is very likely that during his research Dragašević, heard a legend from the locals about the presence of the aforementioned noblemen in this part of Homolje, and on that basis we may assume that one of the pioneers of Serbian archaeology wanted to identify the meritorious masters for construction of the ancient towns on the Gradac site near Krepoljin and Zad in Ribar.[3]

However, it is highly likely that Dragašević had not climb at the top of the site, since he did not provide a fortification ground plan. In order to compare, he made sketches and precisely located the defence walls constructed in the more accessible Zad hill in Ribar. Also, in his notes he did not mention the remains of the church at the top of the Gradac site, but paid more attention to the hydrological features of the Mlava river and surrounding relief, which were particularly interesting to him as a geographer (Fig. 5). At the very left bank of the river on the south-eastern slopes of the site, he drew the construction of the longitudinal base, which is semi-circular on the eastern side (Драгашевић 1876: 327-328). At first glance, it seems that these are today's remains of the church at the top of Gradac. However, there is also a possibility that during his visit to this part of the Ribarska gorge, Dragašević noticed a rural building that was used by the villagers.[4]

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3 If this assumption is correct, this would not be the only legend about Drman and Kudelin in Homolje. A saga telling of their presence in Ždrelo in the Gornjačka gorge was written in the middle of the 19th century, Влаиђ 1850: 32-34; Медовић 1852: 193-194. Legends about them may be also heard today from the locals of some villages in Homolje, see https://www.ebranicevo.com/homoljska-legenda-o-drmanu-i-kudelinu-foto-, (Accessed on: 25/9/2019). However. the toponyms "Drman" and "Kudelin" are not known to today's villagers of Krepoljin and Ribar, Миловановић 2016: 121. Also, other travel writers and researchers have not recorded these names (except for Kanitz who rewrote notes from Dragašević).

4 During his visit of Homolje, Dragašević discovered the remains of churches on several sites, but he didn't draw a plan for any of them. In his drawings we can see that on several occasions (e.g., in the yard of the Gornjak

Fig. 6. Professor Mihailo Valtrović (1839-1915)
(according to: Милинковић 1984: 15).

Felix Kanitz took over the data from Dragašević, using the same name for the site near Krepoljin. It is necessary to note that the Austro-Hungarian travel writer and researcher was the first to assume settlement of this fortification during the Roman period (Каниц 1985: 248, 266-267, 272; Јововић и Шуљагић 2016: 270-271). After Kanitz, the remains of the old towns in the gorge of the Mlava river were mentioned by Vladimir Karić in the book *Србија. Опис земље, народа и државе (Serbia. Description of the Country, People and State),* but to a smaller extent (Карић 1997: 847-849). The site was first mentioned under the name Gradac by Professor Mihailo Valtrović in 1890 (Fig. 6). This was a paper in the journal *Starinar* about prehistoric bronze objects, in which Valtrović, among other things, published the axes accidentally found in Mlava below the site (Валтровић 1890: 89-90). These are, at the same time, also the

first published finds from the territory of Homolje (Миловановић, in print).

At the beginning of the 20th century, Gradac was mentioned by Professor Tihomir Ђorђević, specifying the Roman coins originating from this site (Ђорђевић 1910: 232-233). Further interest in the site near Krepoljin occurred at the beginning of April, 1947. At that time the representative of the Ministry of Education of Serbia headed by Vladimir Rabotin conducted visits to the archaeological sites and ethnological research done in Homolje. The team also consisted of Ђorђe Orlov and Brana Stojanović (Миловановић, in print).

In the 1950s, the archaeological site near Krepoljin, in the vicinity of the exit from the Ribarska gorge, was visited by Nikola Krstić, at that time an associate of the Požarevac Museum and a teacher in Petrovac na Mlavi. N. Krstić characterized the site as a powerful fortification, and on the edge of the rock he noticed the remains of the church with a preserved altar (Јацановић и Живковић 2000: 129; Dragojević 1983: 55). In the subsequent period, the fortification was mentioned by Dimitrije Madas and Aleksandar Gajić, in 1983. In their article, in which medieval tombstones were elaborated on, as well as the graves in the complex of Ždrelo, the "Krepoljin town" protecting the entrance from the east side of Gornjak gorge was mentioned (Мадас и Гајић 1983: 222).

The first test excavations at the Gradac site were performed in 1992 by Mlađan Cunjak and Milorad Miljković.[5] At that time the church was investigated, in which two graves were found. In the report there is a brief description of the defence walls, and unauthorized excavations were also evidenced in the field (Цуњак и Миљковић 1992: 103; Цуњак и Миљковић 1993: 67-68; Радовановић 1997: 241). By the end of the 20th century, the site had also been visited by experts from the Požarevac museum as part of the

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monastery and its surroundings) he located the buildings that functioned at that time. That was most certainly the case with the structure (whose purpose is still unknown) along the very left bank of the Mlava river below the south-eastern slopes of the Gradac site near Krepoljin.

5 This refers to the research conducted by the Regional Institute for the Protection of Cultural Monuments from Smederevo and the Republic Institute for the Protection of Cultural Monuments from Belgrade, Цуњак, Миљковић 1993; Радовановић 1997: 241, n. 90.

Fig. 7. Ribarska gorge, view from the Gradac site (photo: M. Milovanović).

Fig. 8. Krepoljin basin, view from the Gradac site (photo: M. Milovanović).

Fig. 9. View towards north-eastern, protruding side of the Gradac site near Krepoljin and remains of the church (photo: M. Milovanović).

Fig. 10. The Gradac archaeological site near Krepoljin, northeast side (photo: M. Milovanović).

Old Cultures of Homolje project, and finds from prehistory were collected. The complete report of these explorations has not been published yet (Манојловић 2001a: 329-330; Манојловић 2001b: 332; Миловановић 2016: 40, n. 157; Milovanović 2019: 59, ref. 6).

A field visit of Gradac was conducted by the authors of this paper in September 2019 for the purpose of revision, primarily in order to obtain data on the micro-location and level of preservation of the architecture. Initially, the locals were surveyed, and then the terrain was examined. From archaeological finds on the surface of the site, pottery sherds and part of a millstone were found. It is interesting to note that at that time anthropological and archaeo-zoological material was collected. In addition, the locals provided objects for inspection, found (according to their words) at the beginning of the 1960s at the top of Gradac.[6]

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6 Archaeological, anthropological, and archaeozoological

THE PRESENT CONDITION OF THE SITE

The Gradac fortification was built in the middle of a limestone cliff, which is situated at the very exit from the Ribarska gorge (Fig. 7), immediately along the eastern rim of the Krepoljin basin (Fig. 8). The base of the cliff is shaped like an irregular four-shaped star, whose surface is mostly covered with woods. The edge of the protruding arms consists of inaccessible cliffs and steep slopes, under which the Mlava flows, creating large bends. The altitude of the site is approximately 330 m.

In the middle of the cliff, there is a longitudinal rocky plateau, on which walls were constructed adapted to the terrain configuration. The base of the plateau, with an irregular oval shape, stretches from the southwest towards the northeast. On the northeast side, the plateau is projected and in

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finds collected in the field were submitted to the Heritage Museum of Homolje in Žagubica.

Fig. 11. Wall – walking path (?) on the southern side of the site (photo: M. Milovanović).
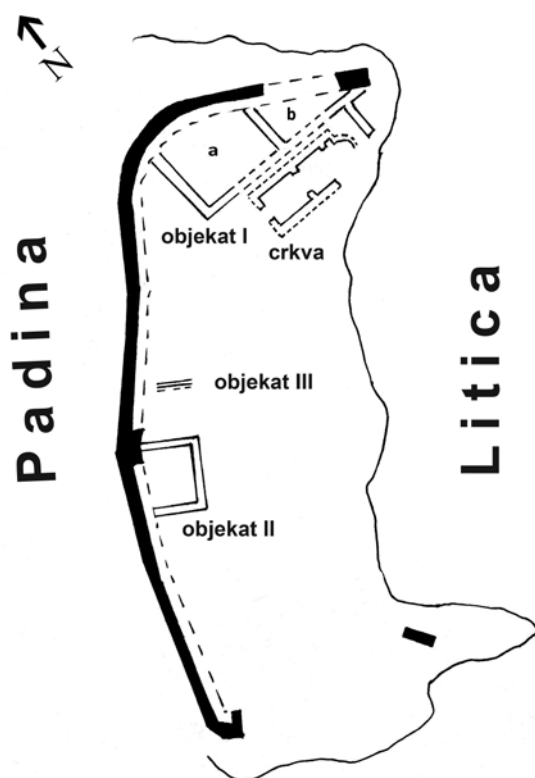
that part are remains of the church (Fig. 9). Below there are vertical cliffs that descend to the left bank of the river (Fig. 10). The view from this point is towards the very heart of the Ribarska gorge and the Beljanica mountain peaks.

Access to the site is possible from the southern side, by a narrow path, next to a rocky cliff, which in this part of the terrain is located at a slightly higher altitude than the fortification. The cliff is here elongated and cut. A wall was built at the place where the cut is recognizable (Fig. 11); its purpose at this moment can be only assumed. In fact, from the top of the smaller plateau of the southern cliff there is a view toward the Krepoljin basin, from which the former inhabitants of the fortification were able to detect an enemy break-

Fig. 12. Sketch of the Gradac fortification near Krepoljin (drawing: M. Milovanović).

Fig. 13. Preserved remains of the rampart on northwest side of the fortification (photo: M. Milovanović).

Fig. 14. Devastated rampart on the northern side of the fortification (photo: M. Milovanović).

Fig. 15. Interior of room a of Structure I (photo: M. Milovanović).

through from this direction. The wall is oriented approximately along the north – south axis. It is made of crushed limestone, of small and medium size, bonded by whitish lime mortar. Its dimensions are approximately 2.70 x 1.40 x 1.30 m.[7] It can be anticipated with necessary caution that the wall was built in the function of a "walking path", so as to more easily reach the protruding position in order to observe the surroundings. In this part of the site, there is also a cut in the rock, which can be assumed, with reservation, to be a trench. Further below the cliff there is a small passable slope covered with forest, and towards the southwest, as the terrain gradually descends, there is a meadow through which the agricultural road passes. From this place there is a view of Vukan and Ježevac, which means that the areal of the settlement had visual contact with the fortifications of

the Gornjak gorge. From the meadow, the road heads towards Mlava, from where it leads over today's bridge to Krepoljin.

Within the defended areal, at least two structures were registered, with the working titles Structure I and Structure II (Fig. 12). The route of the rampart spreads from the southwest towards the northeast, following the rim of the western slope. Its length can be followed to a distance of over 40 m (Figs. 13, 14). The highest preserved height of the rampart is 4.20 m, while the width is 2.70 m at the place where Structure II is situated. The defence wall has been devastated in several places by illegal searchers. Damage to the outer face on the north and western part of the route is particularly noticeable. The building technique of the defence wall involved use of crushed and cut limestone of small and medium size with whitish mortar used as a binder. On the west terrace, where the rampart suffered the damage, negatives

7 Because of vegetation which surrounded the wall, it was not possible to take absolute dimensions during the visit.

Fig. 16. Outer front of the northern wall of Structure II (photo: M. Milovanović).

of the former well fence can be observed.

Structure I and Structure II are made using the same building technique as the fortification's rampart. The remains of Structure I are located on the northeast part of the site, near the church. The construction includes at least two rooms, marked as "a" and "b". Room "a" has a rectangular shape and a length of 6.40 m (Fig. 15). Its width together with the rampart is 7.20 m. The walls are preserved at a height of up to 0.85 m, while their thickness is 1.05 m. Room "b", judging by the current state on the field, was triangular. It was not possible to measure its dimensions because of the dense vegetation and steep terrain. The southern wall of Structure I, as well as the eastern and western wall of room "a", are connected to the inner face of the rampart. The aforementioned southern wall is parallel to the northern wall of the church and at that part their total width is 2.90 m. If we take into consideration, as will be seen later in this text, the current thickness of the southern church

wall of 1.20 m, then between the southern wall of Structure I and the sacral building, free space might be expected at a width of 0.65 m, but some future archaeological excavation will provide a final conclusion. At the eastern end of the structure, a smaller wall was constructed towards the south, parallel to the church apse.

Structure II is situated in the western part of the site. Its inner dimensions are 4.30 x 5.10 m. The maximum preserved height, measured at the northern wall, is approximately 1 m (Fig. 16). The walls' width is 0,90 m. The northern and southern wall of Structure 2 are connected to the inner face of the rampart. Approximately in the middle part of the defended areal there is one more wall that might represent a third profane structure. Judging by the terrain configuration, it is most likely to be the outer face. Its length is 4.60 m, and preserved height is 0.35 m. It can be assumed that the wall was connected to the inner rampart face as in the above-mentioned structures.
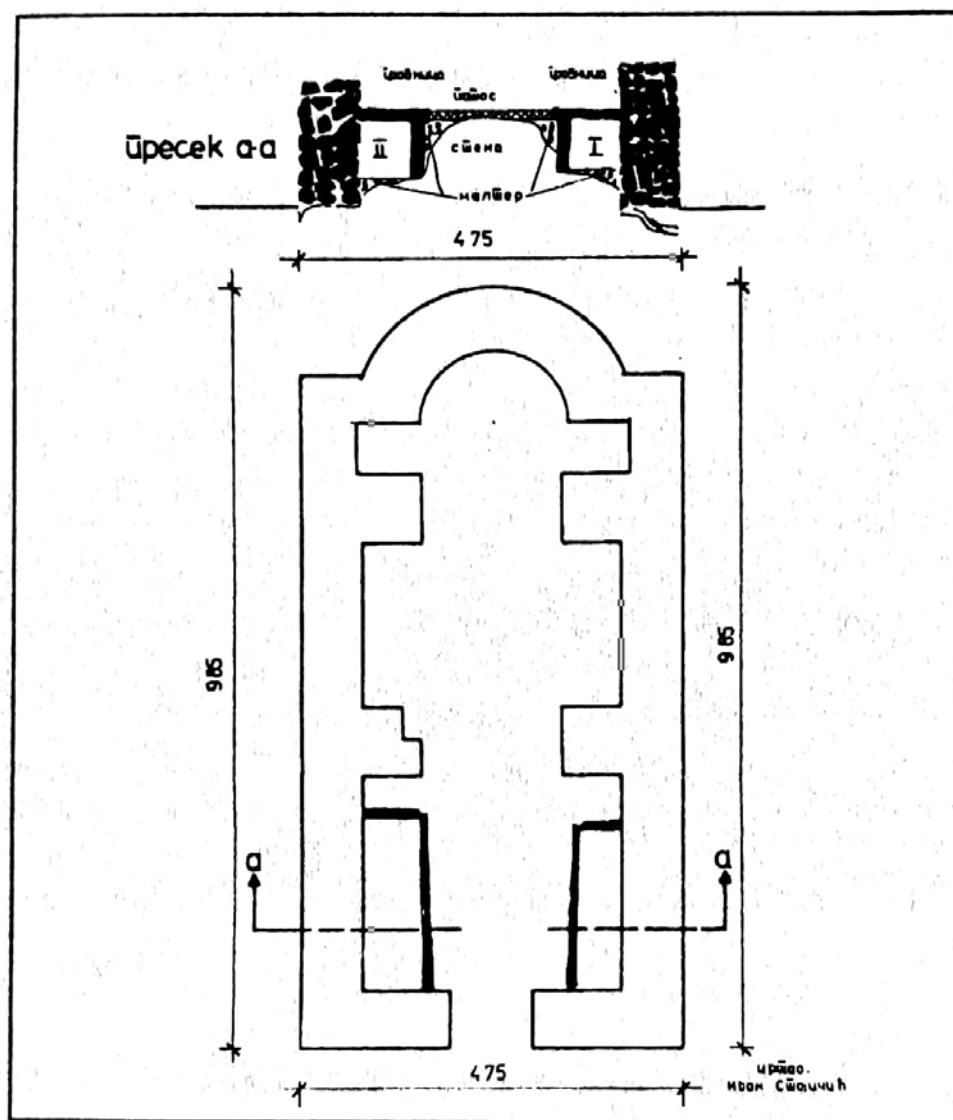
Fig. 17. Church ground plan on the Gradac site near Krepoljin according to M. Cunjak and M. Miljković
(according to: Цуњак и Миљковић 1993: 68, Fig. 1).
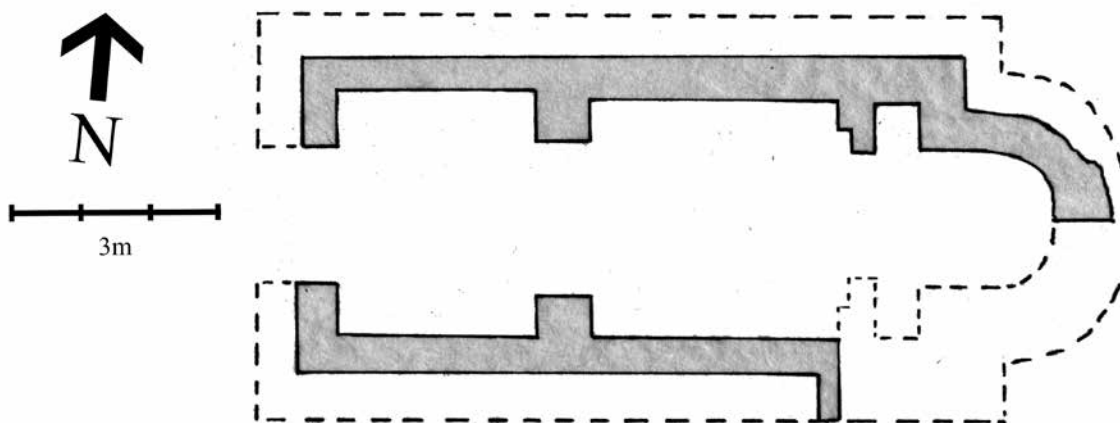
Fig. 18. Church ground plan on the Gradac site near Krepoljin (current condition) (drawing: M. Milovanović).

Fig. 19. Inner face of the apse (photo: M. Milovanović).

Fig. 20. Damage of the apse outer face (photo: M. Milovanović).

Fig. 21. Church northern wall – view of masonry technique (photo: M. Milovanović).

THE CHURCH

A distinctive feature at the Gradac site is represented by the remains of the church, which are situated at the projected northeast part of the rocky plateau, i.e., along the southern wall of Structure I. It is a structure whose walls are for the most part above ground level. Thus, it was possible to establish its main characteristics in the field and therefore, more attention will be paid to it in this paper. The results obtained during the 1992 exploration should first be briefly reviewed. The church base is single-naved, oriented along the east-west axis with a deviation of 6°, towards north. On the east side there is an apse, semi-circular from the inner and outer sides. The interior of the church is divided by pilasters into three bays (Fig. 17). In the western bay, there is one tomb each along the north and south walls. M. Cunjak and M. Miljković, the heads of research, point out that the foundations of the temple were made of crushed stone

in lime mortar, and the walls were made of hewn stone blocks of tufa. Fragments of frescoes were evidenced in a niche (Proscomidion?) which was part of the north wall in front of the apse. The external dimensions of the building are 9.85 x 4.75 m. In the report the preserved height of the walls is emphasized (about 0.50 m) as well as the width (0.80 m) (Цуњак и Миљковић 1993; Цуњак и Миљковић 1992: 102).

During the terrain visit in 2019, new and somewhat different data regarding the Gradac church were obtained, after an examination of the current situation. First of all, it should be noted that no protective measures were noticed on the walls, which could protect the building from further deterioration and destruction. According to new measurement, the inner length of the church is 10.52 m. The width of the middle bay is 3.40 m, while the width of the western is 3.61 m. The southern part of the apse as well as the eastern part of the southern wall are completely devastat-

Fig. 22. Church southern wall (photo: M. Milovanović).

Fig. 23. Church southern wall – devastation (photo: M. Milovanović).

Fig. 24. Entrance on the church western wall by the north and southern tomb within western bay (photo: M. Milovanović).

Fig. 25. Preserved floor in the north part of the altar apse (photo: M. Milovanović).

Fig. 26. Southern tomb, current condition (photo: M. Milovanović).

Fig. 27. Church interior at the Gradac site near Krepoljin, view from the western bay (photo: M. Milovanović).

ed, most probably by the work of illegal searchers (Fig. 18). It was not possible to establish the outer dimensions of the building since the walls were covered with earth, debris, and overgrown vegetation, with the exception of the apse.

The preserved apse wall width is 0.73 m. It should be noted that its outer face was not preserved (Fig. 19, 20). The apse foundation was built on uneven rock, using a small piece of limestone with whitish mortar as a binding agent. It is difficult to say how many stone rows were in the foundation zone prior to revisional archaeological excavation. The preserved inner apse height is 0.73 m while the outer height is 0.82 m. The inner face is made of square tufa blocks of whitish-grey colour, and different dimensions. Geological surveys indicate that tufa storage deposits exist in nearby Beljanica, but also in other parts of eastern Serbia (Гавриловић 1993: 6-7). The square stone blocks are noticeable in all inner faces of the walls (the largest piece has dimensions of 38 x 32 x 20 cm) which are also bonded with whitish lime mortar (Fig. 21). Two rows of square stone blocks have been preserved on the north wall and apse, and three rows of square stone blocks on the south wall. For the time being, the question regarding the construction method of the outer face of the church walls remains open.

The southern wall is preserved in a height up to 0.75 m (Fig. 22). On its outer side, a smaller cut limestone can be perceived lying on the rock; thus it was possible to measure the current width of the foundation zone, which is 1.20 m (Fig. 23). The maximum preserved inner height of the north wall is 0.53 m. Within the western wall of the western bay with a height of 0.55 m was an entrance to the church, with a width of 2.14 m (Fig. 24). At its corners, larger square blocks of limestone and tufa were observed.

The church had flooring which is preserved along the northern inner side of the apse (Fig. 25). The preserved length of the flooring is 0.90 m, while its width is 0.33 m. It is made of whitish lime mortar with rows of smaller size crushed limestone below. On the surface of the east bay, a lump of lime mortar is observed which was certainly part of the church flooring.

During the archaeological excavations, M. Cunjak and M. Miljković recorded two tombs inside the western bay, which were cut in the rock. The northern tomb was built next to the northern and western church wall. The lateral sides are made from vertically placed stone plates. The northern tomb is not observable on the terrain since on this part were thrown earth and debris. The heads of research state its length as 2.26 m, while its measured depth is almost 0.60 m. The width of the tomb is 0.69 m on the eastern side, while on the west it is 0.75 m. A similar situation is also apparent with the southern tomb, which is built along the southern and western church wall (Fig. 26, 27). Its length is 2 m, while its measured depth is about 0.57 m. The widths in this case are also not unified. The western side is 0.68 m wide, while the eastern is 0.50 m wide. (Цуњак и Миљковић 1993: 68-69, Сл. 1). Today, the filling of the southern tomb consists of debris and earth. The measured height from the filling to the top of the southern wall is 1.23 m. During clearing for photography, the following osteological material was found: two mandibles (*mandibula*), part of a breastbone (*sternum*), and most probably the shorter bone of the forearm (*radius*).

During investigations at the beginning of the 1990s, scattered human bones were also found. According to the words of the investigators, two adult individuals could be singled out, one of them male and the other female.[8] Traces of green patina were noticed on certain parts of the bones, on the basis of which it was established that there were archaeological findings in the southern tomb, where a female individual was laid. Both tombs had a mortar floor to level the surface of the uneven rock. It was concluded that the tombs were covered with slabs of fine-grained sandstone (Цуњак и Миљковић 1993: 68). Inside the

8 Anthropological analysis on the bones has not been performed to date.

church, scattered massive whole and broken slabs of a dark grey colour can be seen today (Fig. 27). A total of two whole and 13 broken slabs were noticed. The dimensions of the largest plate with vertically carved edges are 1.39 x 0.64 x 0.16 m. Some specimens are ornamented with the technique of carving in the form of oblique borders. The possibility of burial in another part of the nave should not be ruled out, given the large number of gravestones. Inside the nave, a semi-circular processed block was recorded, which was most probably part of the window frame or doorframe of the church.[9]

M. Cunjak and M. Miljković determined the church in the Gradac site to be from the 10th century. Dating was performed according to the findings of a deltoid arrow and "similar single-naved structures which can be found in the wider area of our coast" (Yugoslavia at that time) (Цуњак и Миљковић 1993: 69). Lack of stratigraphic context and chronologically sensitive findings complicate dating of the Gradac sacral building. It is also necessary to emphasize that we do not have all the architectural data. The fact that today's dimensions do not match the measurements from 1992 indicates the need for revisional archaeological excavations. However, if all the data that we have at our disposal are considered, new interpretations can be offered, with additional caution, about the time of construction of the church, despite insufficient research.

The construction of sacral structures in dominant places, such as the case on the Gradac site, was common in the Early Byzantine period (Милинковић 2010: 92). Science has suggested that the cliff near Krepoljin may have been inhabited during this period (cf. Цуњак и Миљковић 1993; Јацановић 2013: 13-14; Мишић и Селаковић 2017: 18; Пуповац 2017: 48). In the area of northern Illyricum, during the aforementioned period, it is noticeable that the

number of sacral structures was growing, especially on mountain-fortified settlements and in secluded areas (Милинковић 2015: 33). However, smaller churches whose interior was divided into three bays by pilasters were a rarity during the 6th century. Such a type of sacral building of somewhat larger dimensions, as far as known, has been only explored at the Castellion site in Palestine (Hirschfeld 1992: 114-116, Fig. 52).

Building of sacral structures in hard-to-reach positions is confirmed also during the Middle Ages (Милинковић 2010: 92). Judging by the archaeological excavations so far, smaller single-nave churches with pilasters appeared more intensively during this period of history. The heads of research, as has been already pointed out, dated the church in Gradac in the 10th century, on the basis of an arrow and similar ground plans of contemporary temples occurring in the area of the Adriatic coast. Buildings of that time are classified within Pre-Romanesque church architecture. Research has shown that Pre-Romanesque sacral monuments are characterized by modest dimensions, conditioned by the needs and possibilities of the Slavic environment and Roman centres of that time (Суботић 1963: 12-13). It is difficult to assume that the church in Gradac was built on the model of pre-Romanesque temples. First of all, it should be noted that the masonry technique, which in this case implies square tufa blocks, does not coincide with that of the coastal region during the Pre-Romanesque period. It should also be noted that churches, such as the one in Gradac, appear also outside the pre-Romanesque cultural circle, as is the case with the temple of Agia Kiriaki (*Αγίας Κυριακή*) in the island of Naxos in the Aegean Sea, which was most probably built in the 9th century (Ćurčić 2010: 322/343).

In the following periods we find numerous analogies for smaller number of single-nave types of sacral building whose interior is divided into bays with pilasters. Further in text we will present several examples. According to its basic corpus, the Gradac church has similarities with the church

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9 Stone slabs and pieces of architecture evidenced inside the church will be the subject of study of D. Radisavljević in a future paper.

of St. Nicholas (*Άγιος Νικόλαος*) in Kyriakosellia on Crete, determined in the 11ᵗʰ century. The upper structure of the temple is supported by leaning arches in the eastern and western bay, and a transverse vault in the middle, and is entirely supported by pilasters (Кораћ и Шупут 2010: 208, 206/255-256). The earliest dated sacral building in Serbia with such a base is the Latin Church near Gornji Matejevac in the vicinity of Niš. According to the masonry technique and other architectural elements, it is considered that the church represents a version of Byzantine provincial construction and that it was built in the first half of the 11ᵗʰ century (Ракоција 1990-1991: 22-21). Analogies can be further found in Bulgaria, as is the case for example with the St. Archangels' church of the Bachkovo Monastery (*Бачковский монастырь*), roughly dated to the 12ᵗʰ – 13ᵗʰ century (Миятев 1969: 121, Рис. 114).

This type of sacral building occurs more often on the territory of Serbia during subsequent centuries. The internal organization of the space of the Gradac church near Krepoljin congruencies congruent with the temples of St. Nicholas in Baljevac and St. Nicholas in Brvenik in the area of Raška. The temple in Baljevac was built of large, rectangular pieces of ashlar stone, arranged in regular rows. The suggested dating for the church is the fourth or fifth decade of the 13ᵗʰ century (Чанак-Медић и Кандић 1995: 213). From their outer side, the walls of the church in Brvenik are built from ashlar blocks of trachyte of unequal dimensions. Within the western and central bays, gravestones were arranged in two rows, under which archaeological excavations revealed graves. The construction of the church is presumed to date to the end of the 13ᵗʰ or the beginning of the 14ᵗʰ century (Чанак-Медић 2006: 235-236).

The other sacral buildings on the territory of medieval Serbia are close to the Gradac temple from the 14ᵗʰ century, such as the older phase of the cathedral church in Novo Brdo and the church of St. John in the complex of Studenica. During recent research of the St. Nicholas cathedral in Novo Brdo, it has been established that there is a smaller single-nave cemetery church below it, which is similar in size and shape to the Gradac church. The preserved church walls were made of crushed and cut stone. It is considered to have been constructed in the second quarter of the 14ᵗʰ century (Поповић и Бјелић 2018: 51-52, Fig. 14/a-b). The church of St. John the Forerunner in Studenica is situated within the monastery walls (Радан-Јовин, Јанковић и Темерински 1988: 56-57, 55/22). Its walls were built from tufa ashlar in combination with crushed and cut stone. According to recent studies, the St. John the Forerunner church was built during the third or fourth decade of the 14ᵗʰ century (Поповић 2015: 82, 84, Fig. 34). We also find numerous parallels in later periods. In the valley of the Lim river, as well as in the wider area of Stari Vlah, single-nave church structures have been recorded, whose inner space is divided with pilasters on three bays, and which can be roughly dated to the 16ᵗʰ – 17ᵗʰ century (Пашић 2002: 87-88, Сл. 2).

According to the above-presented examples, it can be concluded that smaller single-nave churches with three bays appear in a wider period of time. Considered as a whole, the church in Gradac is most similar to the Trška church near Žagubica, which is about 9 km away, toward the east. Archaeological and architectural research conducted during the 1980s showed that the original base of the Trška church had a single-nave shape with an apse on the east side. From the inner and outer sides, the apse was constructed in a semi-circular form. The nave was divided into three bays by pilasters, while a narthex was on the west side. The temple foundation was made of smaller crushed stones soaked in lime mortar. Walls made of yellowish brown square tufa blocks also bounded with lime mortar were constructed above (Чанак-Медић 2006: 182-183). The western facade of the older church included highly elaborated sculptures of gryphons and lions, which may have their origin in the Hungarian and Raška construction style. In later periods, the Trška church would
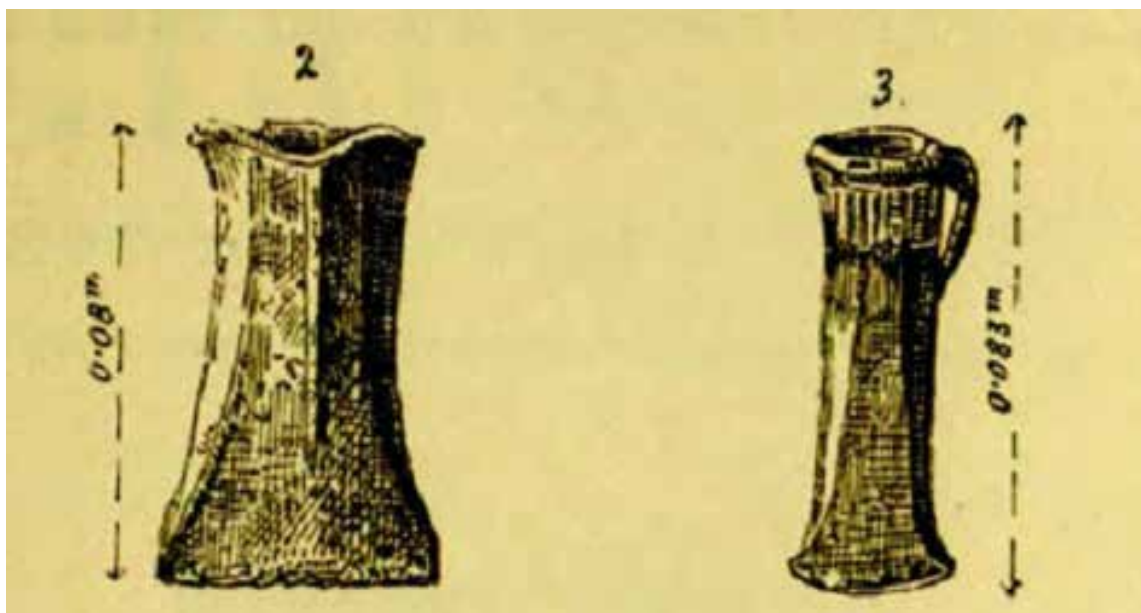
Fig. 28. Bronze axes from Mlava (according to: Валтровић 1890, TAB. IX/2-3).

have a large number of upgrades, which will be not be the subject of research at this moment, because it is beyond the scope of this paper.[10]

During archaeological excavations, graves around and inside the church were found. It was concluded that burials were performed over a long time span. The oldest graves belong to the 14th century, while the youngest are determined to be from the 19th century. In the nave of the Trška church, gravestones were found and the graves below them were investigated. A slab found at the place where ktetors were usually buried, which is the southern wall of the western bay, attracted attention, and below it the skeletons of a woman and a newborn baby were found (Чанак-Медић 2006: 198). A similar situation was also recorded at the previously mentioned temple of St. John the Forerunner in Studenica. There, along the southern wall of the western bay, a ktetor's grave was found, made at the same time as the church was built (Поповић 2018: 82-83).

Based on explorations conducted by Milka Čanak-Medić, it was determined that commence-

ment of construction of the St. Nicholas church near Žagubica can be dated to the end of the 13th or beginning of the 14th century. It is assumed that the ktetor of the Trška church was King Dragutin or one of his district masters (Чанак-Медић 2006: 178, 189, 198-199, 203, 208). Kings Milutin and Dragutin conquered these areas after defeating their half-brothers Drman and Kudelin in the nearby fortification of Ždrelo in 1284 (Станковић 2012: 85-86) or 1292 (Узелац 2015: 210).

A similar mode of construction to the Gradac church has also been recorded in the single-nave church of Immaculate Mother of God in the Gornjačka gorge. On the western side a narthex was subsequently constructed. According to morphological characteristics of some letters on the gravestone inscriptions, it has been concluded that the ktetor was buried around the middle of the 14th century, and that the church was most probably built during his lifetime. The frescoes discovered on the walls during archaeological excavations are determined to be from the first half of the 14th century (Мадас и Гајић 1983: 226, 228-230). We remind you that fragments of iconography were also discovered on the Gradac church during archaeological research in 1992, but so far, they have not

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10 About later phases of construction of the Trška church, see also М. Чанак-Медић, 1997. Ексонартекс цркве Св. Николе у Тргу код Жагубице.
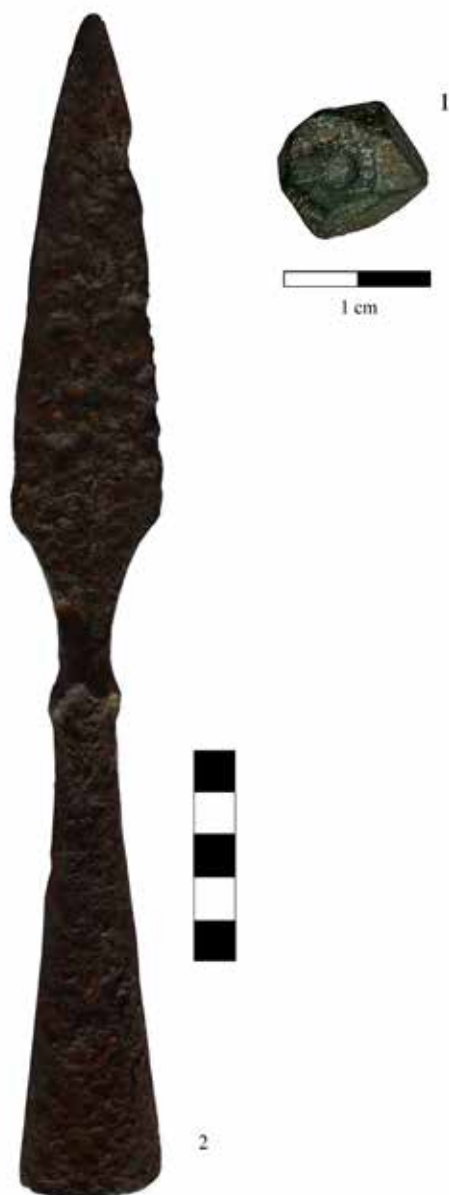
Fig. 29. Polyhedron ornament and spear from the Gradac
site near Krepoljin, accidental finds
(photo: M. Milovanović).

been the subject of study. According to the afore-
mentioned observations, the sacral structure on
Gradac could be preliminarily dated to the period
between the construction of the Trška church near
Žagubica and the church of the Immaculate Moth-
er of God in Gornjak gorge, i.e., at the end of the
13th or the first half of the 14th century.

Fig. 30. Stone millstone from the Gradac site near
Krepoljin, accidental find (photo: M. Milovanović).

FINDS

A smaller number of archaeological finds indi-
cate that the cliff on the left bank of the Mlava river
in the Ribarska gorge was inhabited during prehis-
tory. In 1890, two bronze axes that were found, as
recorded, in Mlava, below the very churchyard, in
the place called Gradac, were presented to the pub-
lic (Валтровић 1890: 89). According to the submit-
ted drawing (Fig. 28), it can be concluded that the
axes belong to a Celta type axes and can be dated
to the Late Bronze age (Гарашанин и Гарашанин
1951: 62). These tools have numerous analogies
in the archaeological sites of that time all over Eu-
rope. The territorially closest parallels are found in
the accidentally discovered hoards from the Bronze
Age in Suvi Do near Žagubica and in Šetonje near
Petrovac na Mlavi (Шљивар 1991: 33-34, Т. I/1;
Јацановић и Радојчић 2003: 7, 16, 25/1-2).

One of more interesting finds from the Gradac
site is a small bronze weight of polyhedron shape,
with dimensions of 0.9 x 0.8 x 0.8 cm, which is
stored in the Heritage Museum of Homolje in
Žagubica (Fig. 29/1; T. I/1).[11] On one of the flat
surfaces a circular indent can be observed, i.e., an
embossed dot, which most probably represents a
weight mark. Above, a smaller slanted notch can
be identified. It is also noticeable that the polyhe-

11 The object was provided to the museum by the courtesy
of Bora Nikolić from Suvi Do, in March, 2018.

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dron "corners" are not equally processed, so their dimensions are different. The weight of this item is 3 g. Several weights of polyhedron shape have been evidenced so far in Serbia. Those are accidental finds, with various weights from several ounces (*unca*), originating from Novi Banovci, Salakovac or unknown sites which are, according to S. Krunić determined to be from the period of the 2nd -3rd century (Крунић 1995: 9-10). However, according to its weight, the example from Gradac is closer to the specimens with the value of one nomisma (4.54 g). It can be assumed that false weights appeared in order to decrease the value of one nomisma. It is believed that false weights were used during the Early Byzantine period in the fortified settlements in Ðerdap (Špehar 2010: 80).

During the terrain visit in 2019, a smaller number of archaeological finds were discovered. Those are objects from the excavated earth that occurred during illegal activities at the top of the site. Pottery sherds were the most numerous. Those are the sherds whose chronological span is difficult to determine, due to atypical shapes, except in the case of one fragment. It is a sherd of a pot rim made of clay with grey-brown baking colour and quartz admixture, made on a potter's wheel (T. II/1). The rim is bent, and the mouth is rounded. A pot with such a rim has the closest similarities territorially with the acoustic pottery pots discovered during the exploration of the Trška church near Žagubica. Chronologically these vessels were, according to analogies, determined to date from the end of the 13th to the end of the first quarter of the 14th century (Чанак-Медић 2006: 191, 203).

On the surface of the terrain in the vicinity of Structure II, part of a millstone made of grained stone of whitish colour, most probably of some kind of sandstone, was found (Fig. 30; T. II/2). It is the lower half of the millstone, the static part. The upper surface is flat, slightly prominent, while the lower is raised at the ends. In the middle of the millstone, a smaller damaged semicircle is perceived, which was the opening for the axle inserted in the lower static stone and around which

the upper one revolved. The opening of the upper part (R=2.5 cm) gradually widens toward the lower one (R=4 cm). Without stratigraphic context, it is difficult to date this millstone from Gradac. Such a shape represents a universal shape of the lower half. Research shows that it was in use from the La Tène period and was one of the most commonly found types in the territory of Serbia, prevalent during the whole Antiquity period (Jovičić 2019: 205-206). This shape also appeared in later times, during the Middle Ages, as evidenced by the specimens discovered during research of the Ras fortification (Popović 1999: 150, 328–329, Sl. 100, kat. br. 251/1).

Archaeological finds made of iron which are not chronologically sensitive are kept by the locals, and accordingly, they will not be the subject of more detailed analysis in this paper. A small chisel, two arrows, and a buckle belong to that group (T. I/2-5). The exceptions are probably represented by a well-preserved javelin butt and a spear. The javelin butt was used as an offensive weapon from the time of the Roman Republic until Late Antiquity. With regard to typology, findings of this type generally do not differ, so their dating is made according to the context of their finding (Бугарски 2009: 230-231). The specimen from Gradac has in its lower part the opening for insertion, whose arms are connected, while the upper part of the object gradually comes to a spike of a square cross-section (T. I/6). The javelin dimensions are 11 x 2.1 x 0.9 cm (socket diameter R=2 cm).

The spear from the Gradac site is characterized by a deltoid shaped tip with a socket for insertion, and dimensions of 27.1 x 3.3 x 0.6 cm (socket diameter R=3.2 cm). The find is characterised by the reinforcement located between the tip and the socket (Fig. 18/2; T. I/7). Spears with reinforcement were known during the Early Byzantine period, which is evidenced by specimens from *Iustiniana Prima* (Caričin Grad) and some sites from the Migration period in Panonia (Кондић и Поповић 1977, 210-211, TABLE XXVII/95; Dimitrijević, Kovačević i Vinski 1962, Tb. XI/3). However, it
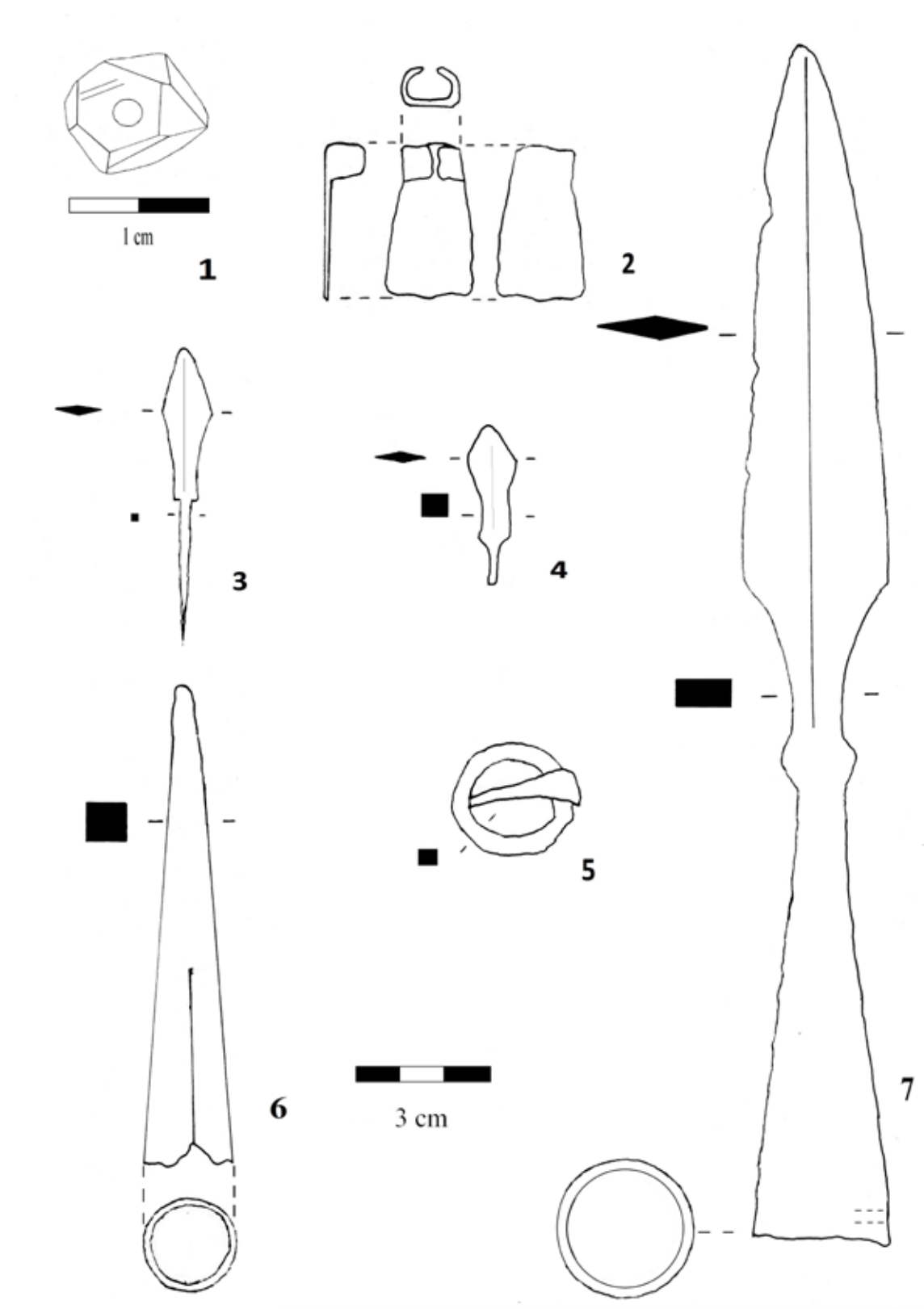
T. I. Accidental finds from the Gradac site near Krepoljin (drawing: M. Milovanović).

3 cm

1

10 cm

2
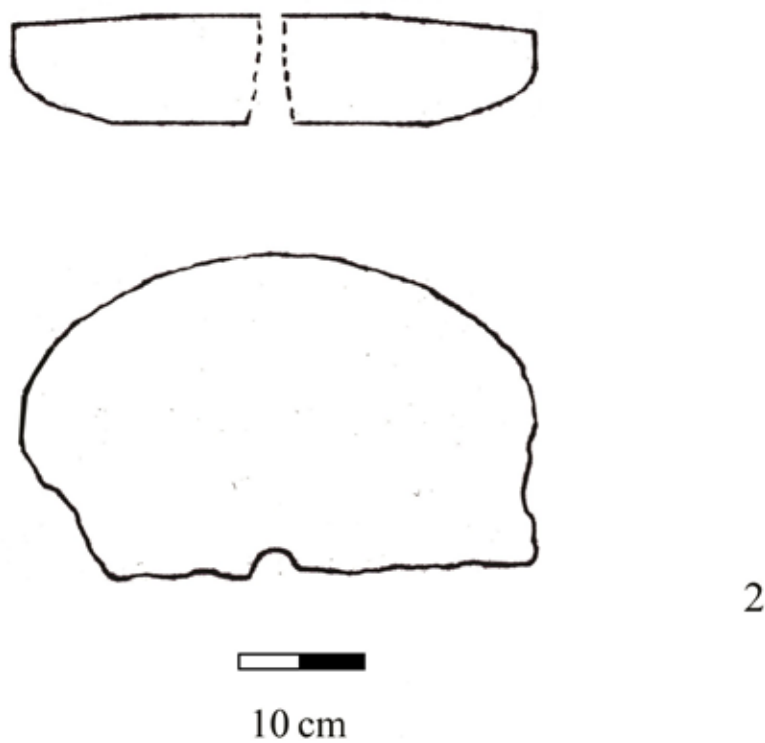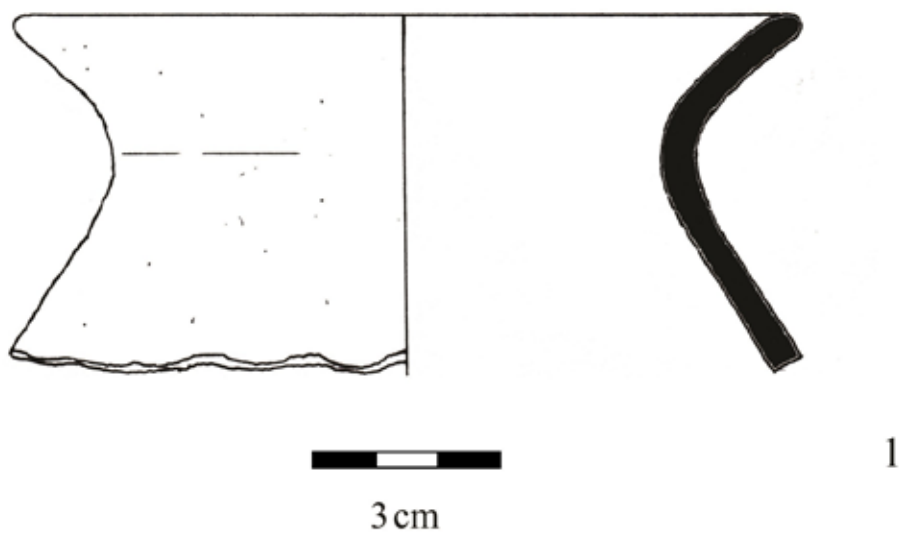
T. II. Accidental finds from the Gradac site near Krepoljin (drawing: M. Milovanović).

seems that analogies for this type of spear should be sought in later periods. Judging by its shape, the specimen from Gradac has similarities to the medieval spears from the typology sorted out by Petar Pop-Lazić (Поп-Лазић 1983: 163, 170-171). A similar spear, which has reinforcement on the upper part of the socket, has been discovered on the Šumljak site near the Kalna village in the Knjaževac region and is considered to belong to the period of the 13th-14th century (Lalović 1982: 70, T. I, Fig. 9; Јовановић 1990: 196, T. I/3).

CONCLUSION

It is still early to draw final conclusions about the Gradac archaeological site near Krepoljin, since the defended areal, except for the church, has not been archaeologically excavated to date. The aim of this paper is primarily to provide more detailed information about the present condition of the site to an academic audience in order to provide the basis for future research. The bronze axes found below Gradac testify that the limestone cliff on the exit of Ribarska gorge was originally inhabited during the Bronze Age, most probably at its very end. We emphasize once more that those are the finds published by M. Valtrović in the *Starinar* journal for 1890, and that it was the first time that the site was mentioned under the name Gradac.

The weight in the shape of polyhedron and the javelin butt, discovered by locals, may suggest the inhabitation of Gradac during Antiquity. It is also necessary to emphasise the Roman coins mentioned by T. Đorđević. Finds of this type definitely indicate the presence of a population on the site before the epoch of the Middle Ages. The iron objects also collected by the locals on the surface of the terrain are not chronologically sensitive to such an extent and occur during various periods. The exception is perhaps the spear, which most probably originated in the Middle Ages.

Up to 1992, there were no attempts to explore the site archeologically. The small church situat-

ed on the protruding north-east part of the rocky plateau drew the most attention of researchers at that time. The base of the church is single-nave, and the interior is divided by pilasters into three unequal bays. However, other data about the sacral structure, provided by M. Cunjak and M. Miljković, do not match the present state in the field. After a site visit in 2019, it was established that appropriate protection measures had not been performed on the church, and that the apse and the southern wall were devastated to a great extent. The question of relations between Structure I and the church remains open for the time being, until archaeological excavations are carried out.

Single-nave temples whose interiors are divided by pilasters into three bays, occur in different periods of the Middle Ages. The base of the Gradac church has closest similarities territorially with the Trška church near Žagubica, which is considered to have been built at the end of 13th or at the beginning of the 14th century. When it comes to the masonry technique that involves combination of crushed stone and square tufa blocks, parallels may be found with the church of the Immaculate Holy Mother of God in the Gornjačka gorge and St. John the Forerunner in Studenica, built during the first half of the 14th century. Based on the aforementioned observations, it seems that the sacral structure on Gradac should be dated to the period between construction of the Trška church and the temple of Immaculate Holy Mother of God, but final judgement should be provided by revisional archaeological excavations.

In debris of the southern tomb within the western bay, osteological material was found that will definitely be the subject of study by physical anthropologists. During excavation of the northern and southern tomb, scattered skeletal remains were also found, assumed to belong to the ktetors of the church. In the forthcoming period, comparative anthropological analysis on the bones found in 1992 and 2019 should be performed.

During the visit in the field, a rampart with a length of over 40 m and at least three profane

structures were explored to the extent possible. The site is devastated for the most part by the activity of illegal searchers. In the following period, primarily the test excavation of the defended areal should be expected in order to obtain a stratigraphic picture of the site. Before that, it is necessary to perform recording of the present state and additionally to carry out a field survey of the wider Gradac area.

On the surface of the terrain, a smaller number of archaeological finds was discovered. Those are pottery sherds and part of a millstone, which are not chronologically sensitive to a large extent. With necessary caution, a preserved sherd of a pot rim which might be dated according to the analogies to the end of 13th or the first half of the 14th century, may be singled out.

There are few written sources describing events in the Homolje area during the medieval epoch. Areas in the Mlava and Pek valleys belonged to the Nemanjić state during the last quarter of the 13th century (Станковић 2012: 85-86; Узелац 2015: 210; Благојевић 1987: 84). They were within the Braničevo land area which Archbishop Danilo II said was fortified (Даничић 1866: 115). In Serbian historiography, it is believed that the Homolje parish (župa) was there (Мишић 2006: 11), therefore the existence of the fortified seat of the local authority within the aforementioned geographical-administrative area should be expected. In Homolje, at least for the time being, the Gradac site, near Krepoljin, stands out as a possible administrative and military centre. According both to the finds and immovable archaeological material, there are indications that demonstrate that this site was inhabited at the end of the 13th or at the first half of the 14th century. However, whether the fortification was built at that time still remains an open question.

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REZIME
ARHEOLOŠKI LOKALITET GRADAC KOD KREPOLJINA

KLJUČNE REČI: UTVRĐENJE, CRKVA, GRADAC, SLUČAJNI NALAZI, RIBARSKA KLISURA, DATOVANJE, KREPOLJIN.

U radu su predstavljeni rezultati dosadašnjih proučavanja arheološkog lokaliteta Gradac kod Krepoljina u Homolju. Reč je o utvrđenom naselju koje je izgrađeno na stenovitom grebenu, visoko iznad leve obale reke Mlave pri njenom izlasku iz Ribarske klisure. Unutar branjenog areala, nalaze se ostaci najmanje tri profana objekta i crkve koja je smeštena na isturenom severoistočnom delu uzvišenja. Prvo interesovanje za lokalitet javilo se početkom sedamdesetih godina 19. veka, kada je profesor Jovan Dragašević ostavio podatke o razvalinama grada na grebenu iznad Mlave. Pod imenom Gradac nalazište je prvi put spomenuto od strane profesora Mihaila Valtrovića 1890. godine. Tokom narednog stoleća u nekoliko navrata sprovedena su rekognosciranja terena. Godine 1992. vrše se prva arheološka iskopavanja i tom prilikom je istražena crkva. Terenski obilazak u svojstvu revizije obavljen je 2019. godine, čiji su rezultati predstavljeni u ovom radu.

Pokretni nalazi koji su sakupljeni na površini terena od strane meštana i autora ovih redova, ukazuju da je greben kod Krepoljina prvo bio naseljen u bronzanom dobu i najverovatnije tokom kasnoantičkog ili ranovizantijskog perioda. Ostali pronađeni nalazi, poput žrvnja, koplja i

ulomka keramike, mogu pripadati razdoblju srednjeg veka. U radu je poseban akcenat usmeren na ostatke crkve. Prilikom ispitivanja, dobijeni su podaci koji nude novo datovanje sakralnog zdanja na lokalitetu Gradac. Sudeći prema osnovi i tehnici zidanja, crkva je najverovatnije izgrađena krajem 13. ili tokom prve polovine 14. veka, ali konačan sud o datovanju doneće reviziona arheološka iskopavanja. Cilj ovog rada je, pre svega, da se naučna javnost detaljnije upozna sa trenutnim stanjem lokaliteta kako bi se dao osnov za buduća istraživanja.

* * *

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ANTIQUE ARCHAEOLOGICAL SITES REGISTERED IN THE VINICITY OF HEALING SPRINGS IN THE AREA OF BELGRADE

ABSTRACT

There are several healing springs in the area encompassed by the territory of the City of Belgrade today. Alongside some of these springs, archaeological sites have been registered. The topic of this paper is the question of whether some of these springs had been known and used by the people of the Antiquity period, including the question of continuity of their exploitation in Prehistory and/or the Middle Ages. The sites presented are: Višnjička Banja, Leštane, Vrčin and Jakovo.

KEYWORDS: HEALING SPRINGS, ANTIQUITY, BELGRADE, VIŠNJIČKA BANJA, LEŠTANE, VRČIN, JAKOVO.

Bearing in mind basic theoretical demands, on one hand, as well as the complexity and diversity of the geological structure of the territory of Serbia and the existing structure-geological, geomorphological, hydrogeological, physical-geographical and other circumstances on the other, B. Filipović divided the territory of Serbia into the following six hydrogeological regions:

- Dacian Basin region
- *Carpatho-Balkan region*
- Serbian crystalline core region
- Šumadija-Kopaonik-Kosovo region
- Dinaric region in Western Serbia
- Pannonian basin region (Филиповић, Б. 2003: 15).

The topic of this paper is archaeological finds (movable or otherwise) discovered in the vicinity of healing springs in the area of Belgrade. We should stress here that only those sites are listed for which we believe that their inhabitants, during the period that interests us, knew about the nearby healing springs and used them. The accent in this paper is placed on the Antiquity period, but the existence of prehistoric and medieval layers will also be mentioned, in order to provide insight into a possible continuity of use of thermal springs.

Within the mentioned division by B. Filipović, the springs from Višnjička Banja, Leštane and Vrčin belong to the Šumadija-Kopaonik-Kosovo region, while the healing springs in Jakovo belong to the Dinaric region in Western Serbia (Васиљевић 2014).

VIŠNJICA AND VIŠNJIČKA BANJA

Višnjička Banja is a settlement within the area of Višnjica. It was named after a hot spring, originating from the bank of the Dunavac. The tem-

VIŠNJICA AND VIŠNJIČKA BANJA			
Bronze Age	The culture Žuto Brdo	SETTLEMENT	
Late Iron Age		Pottery	
Antiquity		-Building -Votive inscription (?) -Ring with a carnelian gem -Coins -The site of Bela Stena -four tombs made of bricks	
Early Middle Ages		The site of Bela Stena Byzantine, Sarmatian-Iazygian and Slav pottery	
Middle Ages		There were remains of a round tower on the bank of the Danube and a medieval monastery	

perature of the water is 14.4°C, and its pH level is 7.5. The water is characterised by the presence of hydrogen sulphide (Филиповић, Б. 2003: 76).

The necropolis from the Bronze Age represents the oldest known trace of settlements on the territory of Višnjica, a discovery provided by M. Vasić. There are finds of the fragments of La Tène pottery (ceramics) from this area in Belgrade City Museum. The travel writer Kanitz mentions the existence of the Roman fortress wall. The Roman presence is also confirmed by the votive scripture findings dedicated to an unknown deity (possibly a forgery), antefix, jewelry, and ceramics. The Roman necropilis where four brick built tombs were

discovered especially stands out. The Gradina site clearly reveals the existence of the Byzantine fortification, placed on the dominant plateau above the river Danube.

This locality may be identified with the fortification called Octavus, and it was registered by Procopius in his work. The continuity of the process of people forming settlements is confirmed by findings dating from the Great migration period and the Slav period. The remains of the monasteries and most likely a circular tower, which are connected with despot Stefan, also belong to the late medieval period. The writer of these lines described in more detail the mentioned localities
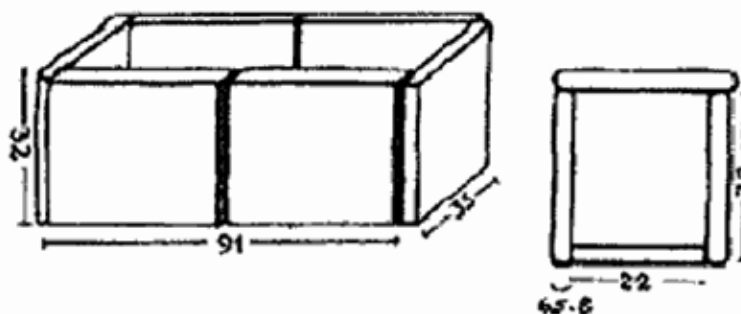
Fig. 1 Construction of a child's tomb from the site of Gradina near Višnjica
(according to: Тодоровић, Кондић и Бирташевић 1956, 77, сл. 5).

LEŠTANE			
Bronze Age and Older Iron Age		The site near Bubanj Potok NECROPOLIS with skeletal burials and urns	
Antiquity		The site of Zabran Accidental finding of an iron PICKAXE	
Antiquity		The site near Bubanj Potok POTTERY	

in his article dedicated to the exploitation of the healing water springs alongside the Danube limes (Vasiljević 2018: 51─53).

There is no direct evidence on the exploitation of healing springs in the area of Višnjička Banja during Antiquity. On the other hand, there is ample evidence of the tumultuous life and the existence of a Roman settlement, fort, and necropolis in this place, whose development was probably largely influenced by those healing springs.

LEŠTANE

Leštane is a settlement in the Municipality of Grocka, in the City of Belgrade. There are two healing springs in the area of Leštane. They belong to the nitrogenous water group. The temperature of the water at the source of L-1 is 21°C, and the pH value 8, while the temperature at the spring L-2 reaches 25°C, and the pH value is also 8 (Филиповић, Б. 2003: 76).

The findings from Višnjička Banja are represented in this article, as well as the localities in Leštane. In the vicinity of this settlement, at Bubanj Potok, there is evidence of the existence

of Bronze and older [earlier] Iron Age necropoli with urns. The fragments of La Tène and Roman ceramics were also found in that locality. The finding of the Antique pickaxe comes from Zabran locality (Vasiljević 2018: 53─54).

Findings from Antiquity are too few for us to be able to talk about a horizon at Leštane. The existence of a prehistoric necropolis would suggest a cult place, which could be linked to healing springs. An answer to questions on the further continuity of this cult place and possible exploitation of healing springs can be provided only by future research.

VRČIN – ZAVOJNIČKA REKA

Vrčin is a settlement in the Municipality of Grocka, in the City of Belgrade. The temperature of the water is 21–24°C, and the pH value 8.5. It belongs to the nitrogenous water group (Филиповић, Б. 2003: 76).

The site of Šuplja Stena in Vrčin is located on the right side of the road Belgrade–Kragujevac, and it is known for being a prehistoric mine (Гарашанин, М. и Гарашанин, Д. 1951: 27).

VRČIN – ZAVOJNIČKA REKA			
Bronze Age		The site near Bubanj Potok MINE	
Bronze Age		The site near Bubanj Potok SETTLEMENT	

JAKOVO			
Neolithic	The Vinča culture	The site of Bršljenak SETTLEMENT	
Neolithic/Eneolithic	The Vinča culture Horizon I – end of Vinča B – beginning of Vinča C Horizon II – Vinča C/D Horizon III – Vinča D	The site of Kormadin SETTLEMENT	Horizon I (5050–4700 BC) Horizon II (4700–4600 BC) Horizon III (4600–4400 (?) BC)
Bronze Age		The site of Kaluđerske Livade NECROPOLIS 88 graves with urns	
Late Bronze Age	The culture of Belegiš	SETTLEMENT	
Older Iron Age	Iron Age IV	The site of Ekonomija "Sava", a multi-layer prehistoric SETTLE-MENT with a SET-TLING HORIZON from the Iron Age IV	
Late Iron Age		The site of Ekonomija "Sava" THE LA TÈNE HORI-ZON	
Antiquity		The site of Kaluđerske Livade SETTLEMENT	From the 1st to the 4th century
Early Middle Ages		The site of Kormadin A Gepid NECROPOLIS	5th – 6th centuries
Middle Ages		NECROPOLIS 108 graves	From the 12th to the 14th centuries The largest number is from the second half of the 13th and the begin-ning of the 14th century
Late Middle Ages		THE MONASTERY OF FENEK	15th – 16th centuries

Traces of a smaller settlement from the Bronze Age period were registered in the immediate vicinity (Бошковић 1956: 13). Possible connections of these sites and the near-by healing springs are yet to be examined.

JAKOVO

Jakovo is a settlement in the Municipality of Surčin, in the City of Belgrade. Until 2004, when a new municipality was formed, it belonged to the Municipality of Zemun. Jakovo is located in

south-eastern Srem, 24 kilometres the south-west of the centre of Belgrade, and 4 kilometres from the bank of the river Sava. The Monastery of Fenek is located in its immediate vicinity.

The temperature of the mineral water in Jako-vo is 18.5 ˚C, and the pH value is 6.4. It belongs to the hydrocarbonate waters group, more specifical-ly, to the subclass of sodium waters (Филиповић, Б. 2003: 112–113).

A large number of archaeological sites have been registered in the area of Jakovo. The first archaeological research activities were conducted in this region even before the beginning of World War I.

The oldest layers, determined in the Vinča culture period, belong to prehistoric settlements registered at the sites of Kormadin (a multi-lay-er site, which encompasses three horizons de-termined as belonging to the Vinča culture) and Bršljenak. When it comes to the multi-layer site of Kaluđerske Livade, the oldest layer belongs to a necropolis from the Bronze Age Belegiš culture. The settlement located at the site of Ekonomija "Sava" belongs to the Late Bronze Age period. At the same site, the presence of a settlement from the Late Iron Age IV was also registered, as well as a La Tène layer.

The most interesting layer for out topic is the Antiquity horizon at the above-mentioned site of Kaluđerske Livade, where the existence of a long-term Antique settlement was confirmed, inhabited from the first to the fourth centuries. It is assumed that, at the beginning of the new era, there was an autochthonous settlement in this place. The inhab-itants of this settlement had been exposed to the Romanisation process, which resulted in a quick-er development of the settlement and very intense life in it during the third to the fourth centuries. The chronological sequence of the site in Kupino-vo is continued with a Germanic necropolis from the fifth to sixth centuries, discovered at the site of Kormadin. The archaeological picture of the site of Kaluđerske Livade is complemented with a medieval necropolis from the 12th–14th centuries.

The story about the past of Jakovo is completed by the Monastery of Fenek, the founding of which is dated into the second half of the 15th century, according to folklore, although the oldest written mention of the Monastery dates from 1563.

The site of Kormadin (older names: Jakovač-ki Vinogradi and Kurmadin) in Jakovo has been known to the scientific public for a very long time. The first research activities, of smaller range, were performed before the World War I, and the finds were placed in the Archaeological Museum in Zagreb afterwards (Šeper 1952: 25).

Due to vast damage at the site, which occurred between the two world wars as well as during the construction of the modern settlement, the Muse-um of Zemun performed archaeological rescue excavations in the period from 1956 to 1958.

Kormadin is located on the northern periphery of Jakovo, i.e. on the south-western border of the suburb of Surčin. It consists of a low, spacious hill, bordered by the canal of the river Galovica in the north, and a Roman canal in the south-east. The height of the hill in respect of the surround-ing terrain is approximately three metres. Once surrounded with a swamp, but out of the reach of high water, the hill served as a suitable place for settling. Similar favourable conditions had been taken advantage of on the nearby hill of Bršljenak as well, where a Vinča settlement was registered (Јовановић и Глишић 1960: 113).

Research activities have shown that the oldest layer at the site of Kormadin is a Vinča culture settlement. Aside from the prehistoric cultural layer, a Germanic necropolis from the fifth to 6th centuries was also registered. During research conducted in the 1950s, 26 graves were examined (Јовановић и Глишић 1960: 113−142).

Among the finds from Kormadin, especially interesting ones are miniature vessels with tubu-lar spouts. L. Balj defines this type of vessel as "miniature vessels which don't belong to children toys" (Balj 2009: 26). Three small vessels of this type were found at Kormadin (Šeper 1952: T. 2/1, T. 5/6, T. 9/4).
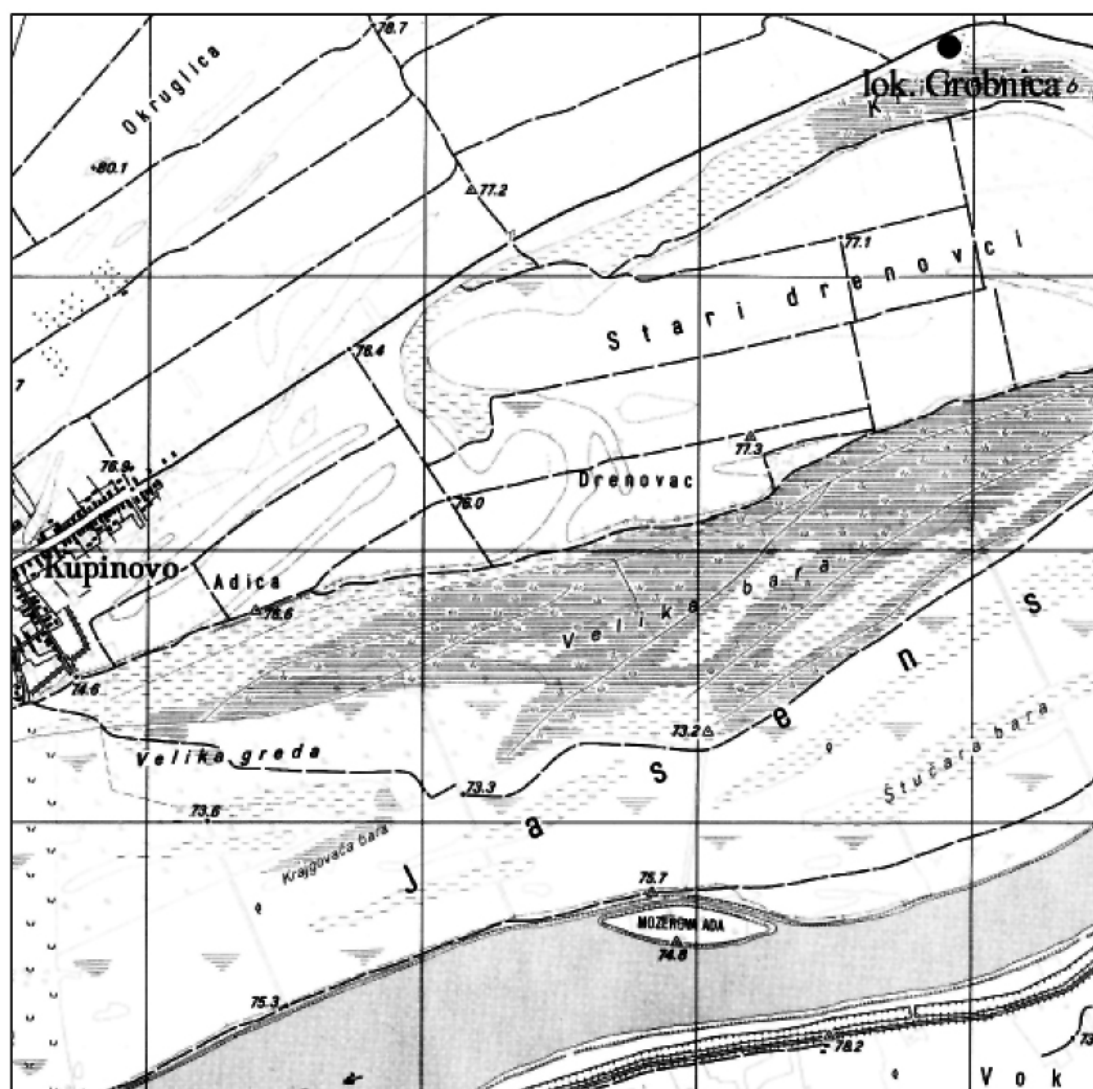
Fig. 2 Detail from a situation plan of the site of Kormadin – excavation campaign in 2008
(according to: Булатовић, Капуран и Стругар 2010: 40).

D. Balen Letunić believes that they had been suitable for feeding children. It is very interesting to note that Schliemann also interpreted similar vessels discovered in Troy in the same manner (Balen Letunić 1982: 72). A different opinion is offered by J. Živković, who believes that the mentioned small vessels had been used for measuring liquid (Živković 2001: 21).

A completely new view on this type of vesselwas given by V. Filipović. According to him, the spout on those miniature vessels was never placed close to the rim, which would mean that the amount of liquid they could receive would be very small and, thus, this type of vesselhad never been used for pouring. The diameters of spout openings, ranging up to 5 millimetres, would also suggest such a conclusion (Filipović, V. 2007: 99).

On the basis of their shape, V. Filipović believes that pipes are in fact the most similar to this type of vessel. The mentioned vessels also have suitable functional traits, such as thick walls, a very narrow opening, and a small spout onto which a longer, wooden pipe could have been attached for smoking. The thickness of walls, com-

pared to the dimensions of the items, suggests a heat isolation function, as is also the case in modern pipes. On the basis of ethnological and ethno-medial material from these areas, the author concludes that the Vinča culture miniature vessels with a spout had been used for smoking medicinal herbs (Filipović, V. 2007: 99–102).

In order to confirm this assumption, it is necessary to perform a chemical analysis of the traces of substances preserved in those vessels. We should also mention that L. Balj states that no traces of burning had been noted inside vessels of this type from Gomolava, which would have, probably, existed had they been used as pipes, that is to say, if herbs had been burnt in them (Balj 2009: 29).

Especially interesting for our topic is the opinion of M. Živković that the mentioned miniature vessels represent liquid measuring cups. It is, perhaps, too much to assume that the said measuring cups could have been used for measuring the necessary amount of healing water from a nearby spring, but we believe that this possibility also deserves to be noted.

The first finds from the Germanic necropolis at the site of Kormadin were discovered in 1902, when a trustee of the Archaeological Museum in Zagreb, a teacher from Surčin, A. Poturičić, performed minor archaeological excavations of the prehistoric necropolis. Poturičić informed the Museum in Zagreb of the results of his research. It can be seen from his letters that, aside from a significant Eneolithic layer, there were traces of a considerably later necropolis as well, dug into the ruins of the settlement, profiting from its suitable, elevated position. A. Poturičić bears witness to the findings of three skeletons with grave offerings and one without them, oriented along the west–east axis. When it comes to grave offerings, belt buckles were mentioned, as well as iron knives and scissors, and glass and amber pearls. In the three years that followed, excavations continued, headed by Poturičić, and later J. Brunšmid. During the research, more grave offerings were discovered, but they have not been published in detail.

Right until the middle of the 20th century, no attention was given to the medieval findings from Kormadin, even though the site had been damaged on several occasions (Димитријевић 1960: 5).

The exception is a finding discovered while preparing earth for making bricks at the brickyard. On that occasion, six skeletal graves were discovered, oriented along the west–east axis; five of them had grave offerings and one did not. The finds discovered are kept at the Museum of Vojvodina (Димитријевић 1960: 5).

After the founding of the Museum in Zemun in 1955, significantly more attention was given to the site. Since it was determined during a field survey that the site was endangered by earthworks, archaeological rescue excavations began, conducted in three campaigns. The research showed that, in this case, it was probably not a necropolis with continuous rows, but rather an example of the custom of burying the deceased in large groups. D. Dimitrijević mentions that this type of burial can be noted among Germanic tribes from the fifth century, being especially widespread during the sixth and seventh centuries, and gradually ceasing to be practiced in the eighth century. This type of burial reflected the differentiation degree of Germanic society of that period (Димитријевић 1960: 8).

Twenty-six skeletal graves were discovered on the systematically researched part of the terrain, dug directly into the Eneolithic layer. The burials were performed in simple pits, relatively narrow, with rounded ends. Out of the total number of 26 skeletons, eight male individuals were registered, nine female, six children, and three individuals whose sex could not be determined. The position of the skeletons was almost uniform. All the skeletons were laid on their back, stretched out, with legs placed in parallel. The heads of most skeletons were facing forward, but heads were also often turned towards the right shoulder, i.e. towards the north, which led D. Dimitrijević to consider the possibility of this being a remnant of older burial rituals (Димитријевић 1960: 9).

Only two of the researched graves had no

grave offerings. Those were children graves, marked with numbers 22 and 24. In terms of grave offerings, a sword, spear, arrows, quiver, *fibulae*, belt buckles, rings, coins, tinder, whorls, combs, glass et al. were registered. On the basis of analysis of research results, D. Dimitrijević concluded that this was a necropolis of the Gepids, settled in the area of Srem during the fifth and the sixth centuries (Димитријевић 1960: 11─44).

We will mention that, on the basis of results obtained through anthropological analyses performed by Ž. Mikić, three out of the total of nineteen analysed skulls from the Germanic necropolis had artificial deformations (Микић 1994: 133).

The research of the necropolis continued in 2008, when, aside from the researched medieval grave, the stratigraphy of the Vinča settlement was additionally and more precisely determined (Булатовић, Капуран и Стругар 2010: 11─42).

During the construction of the by-pass on the highway around Belgrade, in June 1991, an archaeological site located in the place called Kaluđerske Livade was accidentally demolished. The position of the site had not been noted on the map of archaeological sites which the constructor obtained before beginning the works. The site is located in the south-eastern part of Srem that belongs to the city area of Belgrade. It is on the section Dobanovci–Ostružnica, on the left bank of the Sava, between Surčin and Jakovo.

The site is located on the southernmost elevation of the western part of a long loess ridge, oriented along the north-east/south-west axis, running in parallel with the flow of the Sava and surrounded by a swamp. The name of the site probably originates from the fact that, in the period from the 16th to the 19th centuries, this area belonged to the near-by Monastery of Fenek.

Archaeological research, performed on the surface of ca 1 ha, determined the existence of a layer from the Bronze Age period, with 88 graves of incinerated individuals, buried in urns (Петровићb1998: 13─15). I. Bogdanović draws attention to the finding of a dagger, a rare occur-

rence in this region (Богдановић 1995/1996: 27).

When it comes to the Antiquity period, part of an Antique settlement was researched, with an uninterrupted continuity in the period from the first up to the fourth century. This continuous existence is explained by its location directly next to the Antique road Singidunum–Sirmium, i.e. Taurunum–Bassianae–Sirmium. Movable and immovable findings bear witness to the existence of a settlement of an autochthonous population from the first century, which went through a Romanisation process after the Roman conquest, after which the life at the settlement continued, with special intensity during the third to fourth centuries (Петровић 1996: 13–31; Црнобрња 1996: 33–36).

The largest number of Antique metal finds were made of bronze and iron. Out of the total of 64 processed finds, thirty were made of bronze, thirty (very corroded and damaged) from iron, one from silver, one was coated with silver, and two were made of lead. Most findings were discovered in the surface layer, created after the removal of humus, and a smaller number were discovered in settlement layers, pits and trenches. Among the metal objects, there are *fibulae*, bracelets, buckles, rings, keys, medical instruments (tweezers, hooks, probes etc), tools (axes, adzes), as well as fragments of larger objects whose purpose could not be defined with certainty. A total of fifteen *fibulae* of different types was discovered, dated to the fouth century. B. Petrović mentions that some of the *fibulae* that were found represent the first examples of those types discovered in the surroundings of Belgrade. The *fibulae* had been made in the wider area of the province Pannonia, except for iron ones, which were products of local workshops (Петровић 1996: 13–31).

During the research, sixteen bronze Roman coins were found, dated mostly to the first or second century , up to the fourth century (Црнобрња 1996: 33–36).

The existence of a medieval necropolis was also established, with 108 graves examined. The necropolis is dated to the period from the 12th to

the 14th centuries, with traces of the most intense burying activities coming from the second half of the the 13th, and the beginning of the 14th centuries (Јанковић 2003: 73–120).

The site of Ekonomija "Sava" is located not far from the current flow of the Sava, on an elevated ridge, with a dominant position over the swamp terrain in its surroundings. Trench archaeological excavations, conducted by the Homeland Museum in Zemun in 1959, provided enough data to register the existence of a multi-layer prehistoric settlement. The oldest layer belongs to the Belegiš culture of the Late Bronze Age, followed by a clearly located habitation horizon from the Older [Early] Iron Age, dated to Iron Age IV; the existence of a layer from the La Tène period was also established. The site was registered in 1958, when a hoard of fifty bronze objects – tools, arms [weapons], and various decoration items, was discovered during agricultural works. The field surveys of the terrain showed that the hoard came from the prehistoric settlement, with a surface of ca one square kilometre (Dimitrijević 1959: 60─65; Тасић 1962: 127–130; Тасић 1966: 16).

The Monastery of Fenek is located in the south-eastern part of Donji Srem, on the territory of Jakovo, twenty kilometres from Belgrade. The monastery complex encompasses the church dedicated to Saint Paraskeva, sleeping quarters of the monks, which surround the church on three sides, and a separate chapel, also dedicated to Saint Paraskeva. Even though it does not belong to the group of monasteries of Fruška Gora by its geographic location, Fenek has always been considered as belonging to this group, due to the manner in which it was founded, conditions of historical development, and architectonic shape,. From the very foundation of the monastery, it was an important centre of the cult of Saint Mother Paraskeva, which was especially developed from the beginning of the 15th century in the area of Belgrade and Donji Srem. There are no reliable data on the basis of which an exact date could be determined for when the monastery was built, nor the name

of its founder. According to folklore written down by Metropolitan Vikentije Jovanović in his report from December 2nd 1775, the Monastery of Fenek, like the monasteries of Krušedol and Hopovo, had been built in the second half of the 15th century by a Serbian Bishop Maksim Branković, with his brother Despot Jovan and their mother Angelina. The oldest historical mention of Fenek, however, comes from 1563 (Божовић 2010: 1).

We believe that it is not a coincidence that the Monastery of Fenek is dedicated to Saint Paraskeva; in fact, we believe that in this case we have an example of a site where the cult of a saint is the continuation of an Antique sacred place of iatric character, linked to the properties of healing waters.

From this overview of the sites, we may assume that thermal springs of the said locations had been known throughout prehistory, Antiquity, and/or Middle Ages. More specific evidence to confirm this assumption can only be provided by future research, on terrain or theoretical.

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REZIME
ANTIČKI ARHEOLOŠKI LOKALITETI REGISTROVANI U OKRUŽENJU LEKOVITIH IZVORA NA PROSTORU BEOGRADA

KLJUČNE REČI: ARHEOLOŠKI LOKALITETI, LEKOVITI IZVORI, ANTIKA, BEOGRAD, VIŠNJIČKA BANJA, LEŠTANE, ZAVOJNIČKA REKA−VRČIN, JAKOVO.

Temu rada predstavljaju arheološki nalazi (pokretni i nepokretni) otkriveni u blizini lekovitih izvora na prostoru Beograda. Isključivo su nabrojani lokaliteti za koje smatramo verovatnim da su njihovi žitelji, tokom perioda koji predstavlja temu proučavanja, poznavali i koristili obližnje lekovite izvore. Naglasak je dat na period antike, ali je navedeno i postojanje praistorijskih i srednjovekovnih slojeva. Na taj način omogućen je uvid u mogućnost postojanja kontinuiteta korišćenja lekovitih izvora.

Predstavljeni su višeslojni arheološki lokaliteti registrovani u Višnjičkoj Banji, Leštanima, Vrčinu (Zavojnička reka) i Jakovu.

Najstariji poznati nalazi iz Višnjičke Banje potiču iz bronzanog i gvozdenog doba. F. Kanic navodi postojanje zidina koje pripisuje rimskom utvrđenju. Zabeleženi su i nalazi rimskih votivnih natpisa (mogući falsifikat) i antefiksa, kao i prstena, novca i keramike iz istog perioda. Na lokalitetu Gradina nalaze se ostaci vizantijskog utvrđenja, moguće kastela Octavum zabeleženog kod Prokopija. U blizini utvrđenja otkrivene su četiri rimske grobnice, zidane od opeka. Prilikom istraživanja lokaliteta Bela Stena utvrđeno je postojanje peći iz ranog srednjeg veka. U blizini je otkriven i grob sa prilozima u vidu zlatnog nakita iz VI−VII veka. Postoje i nagoveštaji o postojanja srednjovekovnog manastira i kule kružnog oblika.

Moguće je da se na prostoru Leštana nalazilo stanište iz paleolitskog perioda. Kod Bubanj Potoka postojala je nekropola, uništena radovima na izgradnji puta. Pored ostataka ljudskih skeleta i urni, otkriveni su i nalazi iz bronzanog doba, halštata, latena i rimskog perioda. Na lakalitetu Zabran, izvan arheološkog konteksta, otkriven je jedan rimski budak. Dugotrajno korišćenje nekropole n Bubanj Potoku ukazuje na mogućnost postojanja kultnog mesta, čiji bi kontinuitet imao vezu sa postojanjem lekovitih izvora.

Na lokalitetu Šuplja stena u Vrčinu utvrđeno je postojanje praistorijskog rudnika. U neposrednoj blizini rudnika nalazilo se manje naselje iz perioda bronzanog doba. Tek treba utvrditi eventualnu povezanost ovih lokaliteta sa obližnjim lekovitim izvorima.

U ataru Jakova registrovano je više arheoloških lokaliteta. Vinčanskoj kulturi pripadaju naselja na nalazištima Kormadin i Bršljenak. U okviru višeslojnog lokaliteta Kaluđerske livade, najstariji horizont nastao je u okviru belegiške kulture bronzanog doba. Periodu poznog bronzanog doba pripada naselje otkriveno na lokalitetu Ekonomija Sava. Na istom lokalitetu egzistirala su i naselja u periodima starijeg gvozdenog doba IV i latena.

Za našu temu najznačajnije je antičko naselje na Kaluđerskim livadama, gde je kontinuiran život trajao od I–IV века. Pretpostavlja se da je na ovom mestu, početkom nove ere, postojalo i domorodačko, predrimsko naselje.

Hronološki sled lokaliteta u Jakovu produžava se germanskom nekropolom iz V–VI veka, delimično istraženoj na lokalitetu Kormadin. Arheološku sliku na lokalitetu Kaluđerske livade dopunjuje srednjovekovna nekropola iz XII–XIV veka. Priču o prošlosti Jakova zaokružuje manastir Fenek, čije podizanje predanje vezuje za drugu polovinu XV veka, mada najstariji pisani pomen manastira datira iz 1563. godine. Manastir Fenek posvežen je Svetoj Petki–Paraskevi, svetiteljki čiji je kult povezan sa izvorima, što može poslužiti kao osnova za mogućnost da su lekovita vrela u Jakovu bila poznata i, u kontinuitetu, poštovana tokom više vremenskih epoha.

Pregled lokaliteta ukazuje na mogućnost da su lekoviti izvori na prostoru današnjeg Beograda bili poznati i korišćeni tokom praistorijskog, antičkog i srednjovekovnog perioda. Konkretnije dokaze za potvrdu ove pretpostavke mogu pružiti jedino buduća istraživanja, terenska i/ili teorijska.

<p style="text-align:center">* * *</p>

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INCIDENCE OF DENOMINATIONS IN GRAVES AT THE SOUTHERN NECROPOLISES OF VIMINACIUM

ABSTRACT

At the southern necropolises of Viminacium, coins as grave goods were recorded in 24.60% of the total number of discovered graves (10769). These data show a discrepancy between the ancient source reports about the use of so-called "Charon's obol" and archaeological evidence. Even though only about a fourth of the graves contain coins as grave goods, this percentage is above the average reported on analogous necropolises in the surrounding area. From this number, the incidence of asses and dupondii is by far the most frequent, thus confirming the use of low-value denominations in funeral practice. It may be also concluded that in the largest percentage, the custom of placing the coin in the mouth of the deceased was observed, especially in the example of graves with one coin.

KEYWORDS: ROMAN EMPIRE, NECROPOLISES, COINS, DENOMINATIONS, VIMINACIUM.

Roman beliefs about the afterlife were diverse, and investigations of necropolises across the former Empire provide some guidelines on which to base conclusions. However, it is still very difficult to assess what and (to what extent) people believed in, as well as how their beliefs were developing and changing through time, bearing in mind some perceived distinctions that varied in different parts of the Empire[1]. In an attempt to illuminate to a degree the nature of funerary customs practised at the Viminacium southern necropolises, primarily from the aspect of the use of coins, we have analysed the types of denominations which were deposited in the graves.

At the Viminacium southern necropolises (Više Grobalja and Pećine), from the 1st to the mid-3rd centuries, both cremation and inhumation rites were practised. In the mid-3rd century, the ritual of cremation of the deceased was abandoned and the only burial type from that moment on was inhumation. During rescue archaeological investigations in this area from 1978 to 1990, a total of 10769 graves were discovered, of which 2930 were cremation burials and 7839 inhumation burials (Table 1). From the total number of recorded graves, only 2649 contained coins as grave goods, which is 24.60%.[2] Coins are were

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1 More recent research highlights regional differences in funerary rituals, but also confirms some similarities: forms of burial (cremation and inhumation), parallel existence of both rituals, gradual transition to inhumation, burials outside the city walls, etc.; cf. Hope 2007: 129.

2 Viminacium: Vojvoda i Mrđić 2015: 12, Table 3; Vojvoda i Mrđić 2017: 12, Table 3; Brigetio: 20.16% (average of three necropolises where the percentages from 19.54 to 29.46% were recorded), cf. Găzdac-Alföldy and Găzdac 2009: 162, Fig. I; Matrica: 21.50%, cf. Topal 1981: 95; Emona: 14.40%, cf. Petru 1972; Plesničar-Gec 1972; Miškec 2012: 135; Novaesium approximately 14% and Gerulata only 6%, cf. Topal 1981: 95, ref 276; Ptuj (western necropolises): 18.17%, cf. Istenič 2000: 14-259; Singidunum: 12.59%, cf. Simić 1997: 46; Pop-Lazić 2002: 19-39. The data from the last two necropolises should be taken with some reservations due, to the deficient and am-

	Number of graves	Number of graves with the coins	%
Inhumations	7839	1461	18.65
Cremations	2930	1188	40.55
Total	10769	2649	24.60

Table 1 – Incidence of graves with coins as grave goods

much more present in cremated burials (40.55%) then in inhumation burials (18.65%).

Already, these data clearly show a certain discrepancy between the ancient source reports and the real role that coins had in funerary rituals at the Viminacium necropolises. Greek and Latin sources from the 5th century BC to the 2nd century AD, regardless of certain differences in their accounts, make reference to the custom of placing a single low-value coin into the mouth of the deceased immediately after death, as a tax for their transportation across the Acheron or Styx to the underworld (Stivens 1991: 215). The custom originates from the belief that it was necessary to pay Charon for the transition to the world of the dead. Initially from the Mediterranean cultural circle, at the time of the Roman Empire this custom had spread to

biguous documentation from earlier excavations, which subsequent researchers encountered in the process of publishing the necropolises.

the north-western provinces (Toynbee 1971: 49). The necessity of placing the so called "Charon's obol" into the mouth of the deceased, with the intention for it to touch the soul, closely relates to the time of placing the coin. It was inserted at the time of death when, as it was believed, the soul began its journey to the other world. This fact is crucial for understanding the custom, as the placement of the coin signifies the ritual of transition, closing the passage between the living and the dead, rather than the practice during burial (Stivens 1991: 221). Coin finds from numerous investigated necropolises across the Empire, including those of Viminacium, confirm the occasional use of low-value denominations in funerary practice. What surprises us is the discrepancy between the reports from ancient sources and the archaeological evidence – the facts that only a small number of graves contained coins, that sometimes a num-
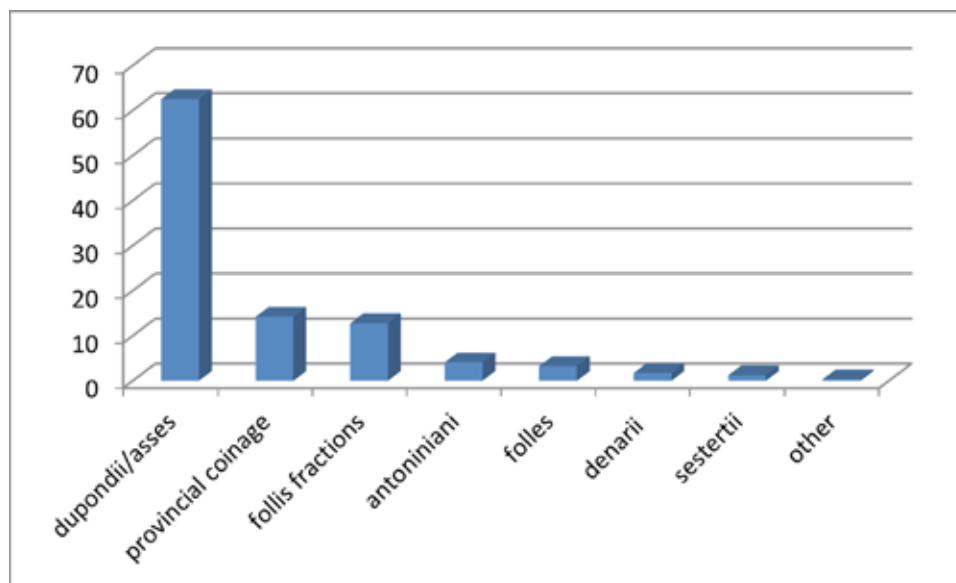
Graph 1 – Incidence of denominations at the Viminacium southern necropolises graves

ber of coins occured, and that they were placed on different parts of the body or around it.

As already noted, in only about one fourth of the graves at Viminacium southern necropolises, coins as grave goods were recorded (24.60%). The fact is that among this fourth, a single low-value coin was recorded in the largest percentage (86.20%).[3] A large discrepancy in relation to the ancient sources is also reflected in the location of the coin finds within inhumation burials. Only 28.40% of coins were placed in the mouth of the deceased, while an additional 20.70% were found around the head of the deceased. In a notable percentage, other coins were recorded on the torso (10.70%), followed by the pelvic region (6.70%), while other positions (next to legs or feet, or next to arms) were recorded in a small percentage. In graves with two coins in their inventory (9.80%), different combinations of placement were noted, with the largest percentage recorded in the mouth and around the head (together 32.20%). In a few graves with a larger number of coins (from 4 to 88) in which it was possible to determine their position, they were mostly found next to the feet, legs, or the pelvis.

Depositing low-value coins in the graves is in accordance with the claims of the ancient sources. The most prevalent coins are dupondii and asses (62.50%), followed by the provincial editions (14.20%), follis fractions (12.74%), antoniniani (4.07%), and denarii (1.72%), while the incidence of sestertii is only 1.20% (Graph 1). Observed by century, the presence of silver coins in graves increases with the decrease of their real value from the 1st century (13 pcs.) through the 2nd (40 pcs.), to the 3rd century (96 pcs.). The exceptions are the finding of three solidi and one semis of Valentinian I in a grave of an individual interred without a coffin,[4] as well as a newly found hoard of 7 solidi (Honorius – Theodosius II) in one of the monumental tombs.[5]

Concerning the most numerous denominations from graves, dupondii and asses, these are mostly examples with traces of long-term usage before depositing. This particularly refers to the samples emitted during the 1st century, which make up 15.56% of the coins in the graves.[6] From the analysis of graves with several coins, of which at least one is from the 1st century, it has been noticed that the largest number of these graves are dated to the 2nd or even 3rd century. This suggests the need for ultimate caution when dating the graves with one coin from the 1st century as grave goods, and that in these cases, an additional 60-120 years should be taken in account, at least when it comes to the Viminacium southern necropolises. A greater presence of provincial emissions in the graves refers mostly to the 3rd century issues, primarily from the Nicaean mint, whose presence testifies to the deficiency of small bronze coins in circulation, which was pronounced in Upper Moesia starting from the reign of Caracalla to the reign of Gordian III.

Based on the above, it can be concluded that the custom of placing coins in the grave was respected by only a part of the population at Viminacium and was more firmly rooted in the section of the population that practised cremation. Within one quarter of the graves containing coins, it can be said that the custom of placing coins in the mouth of the deceased was honoured in the largest percentage of cases, particularly in graves with a single coin. In general, low-value coins with traces of longer use were deposited.

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3 Graves with two coins are represented with 9.80%, followed by the graves with three coins (1.91%), while other occurrences (from 4 to the hoards with 88 coins) are present in small percentage.

4 Pećine necropolis, G-5571, an individual interred without a coffin, laid on the back, with the arms crossed on the pelvis.. After lifting the skeleton, under the left half of the pelvis, four gold coins of Valentinian I were discovered. (field inv. C – 13391-13394). These were the only grave goods in the grave (cf. fieldwork diary, 3761, 3763). These gold coins unfortunately disappeared during the robbery of the National Museum in Požarevac.

5 Pećine necropolis, G-5868, discovered in 2016. g.; cf. Vojvoda and Redžić 2020: 217-231.

6 The 2nd century issues are present in the largest percentage (43.54%), followed by the 3rd century emissions (26.27%), 1st century, then 4th (14.45%) and finally 5th century (0.18%).

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REZIME
ZASTUPLJENOST NOMINALA U GROBOVIMA NA VIMINACIJUMSKIM JUŽNIM NEKROPOLAMA

KLJUČNE REČI: RIMSKO CARSTVO, NEKROPOLE, NOVAC, NOMINALI, VIMINACIJUM.

Na viminacijumskim južnim nekropolama (Više Grobalja i Pećine) istovremeno su upražnjavani rituali kremacije i inhumacije od 1. do sredine 3. veka. U to vreme obred kremacije pokojnika bio je napušten i jedini vid sahranjivanja nadalje predstavlja inhumacija. Tokom zaštitnih arheoloških istraživanja od 1978. do 1990. go-

dine u ovom arealu otkriveno je ukupno 10769 grobova kremiranih (2930) i inhumiranih (7839) pokojnika (Tabela 1). Od ukupnog broja registrovanih grobova samo 2649 njih sadržavalo je novac kao prilog, što iznosi 24,60%. Pri tome novac je znatno više prisutan u grobovima kremiranih (40,55%) nego u grobovima inhumiranih pokojnika (18,65%).

Kod ove četvrtine grobova, u najvećem procentu registrovano prisustvo jednog novčića (86,20%) male vrednosti. U najvećoj meri prisutni su dupondijusi i asi (62,50%), slede provincijska izdanja (14,20%), frakcije folisa (12,74%), antoninijani (4,07%), denari (1,72%), dok su sestercijusi prisutni samo sa 1,20% (Grafikon 1).

Običaj prilaganja novca u grob bio poštovan samo od dela populacije na Viminacijumu i čvršće je bio ukorenjen u delu populacije koji je praktikovao kremaciju. U okviru četvrtine grobova koja je sadržavala novac, može se reći da je u na-jvećem procentu poštovan običaj stavljanja novca u usta pokojnika naročito u primeru grobova sa jednim novcem. Prilagani su uglavnom novčići male vrednosti sa tragovima dužeg korišćenja.

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DISTRIBUTION RATIO OF ISSUES FROM THE MINTS OF VIMINACIUM AND DACIA: THE EXAMPLE OF THE SOUTHERN NECROPOLES OF VIMINACIUM

ABSTRACT

Data on coin finds from the southern necropoles of Viminacium represent precious material for analysing the monetary circulation of provincial mints of Viminacium and Dacia, in the territory of Moesia Superior. A large sample of processed coins (6233), originating from archaeological research activities on these necropoles, provides the possibility for various kinds of comparisons. As shown by comparative analyses of monetary finds from these two mints on the territory of Moesia Superior and Dacia, issues from Viminacium had the goal of a wider circulation range, while issues from the province of Dacia, it would seem, were minted only for the needs of that particular province. In any case, production of both mints from the Balkans, in Dacia and Viminacium, represented a manner of handling the monetary crisis in the middle of the 3rd century and providing the money necessary for the army.

A lack of imperial bronze coinage in circulation in the Danube Valley and the Balkans provinces was especially prominent at the beginning of the 3rd century and probably represented the main reason for opening a provincial coins mint in Viminacium in 239, and then another one in Dacia, in 246. This lack of small bronze coins was especially notable in Moesia Superior (Upper Moesia) and both Pannonias (Борић-Брешковић 1976: 8, ref. 2; Црнобрња 1993: 17-19; Găzdac and Alföldy-Găzdac 2008: 136, ref. 14; Војвода и Петровић 2011: 288-289; Војвода и Јесретић 2012: 121-122; Војвода 2013: 159-160; Vojvoda i Mrđić 2015: 14-17, ref. 10-13; Vojvoda i Mrđić 2017: 15-16; Borić-Brešković and Vojvoda 2018: 74, ref. 3; Vojvoda and Crnobrnja 2018: 133, ref. 10). The provincial coins mint in Viminacium was opened in October 239, which was also the

starting year of the provincial era (AN I – AN XVI).[1] It was active for 16 years, from 239/240 up to 254/255, with two intermission periods, in 248/249 (AN X) and in 253/254 (AN XV).[2] Viminacium obtained the right to mint provincial coins at the same time as it got the status of a colony, at the beginning of the reign of Gordian III.[3] On

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[1] The period between October 19th and October 21st 239 is taken as the beginning of the monetary era of Viminacium; cf. Dušanić 1976: 58.

[2] It is most likely that the interruption in the work during AN X was caused by Pacatianus' usurpation, who was minting antoniniani in Viminacium at that time, in order to pay the army. Similarly, the interruption during AN XV in the time of Valerian I is interpreted by the minting of antoniniani for military needs in the war with the Sassanians; cf. Pegan 1984: 213; Vasić 2012: 14-15; Găzdac and Alföldy-Găzdac 2008: 141, ref. 43-46.

[3] A secondary imperial mint was also operating in Viminacium, opened at a later time, during the reign of Philip I; cf. Kondić 1969: 47-65; Vasić 2005: 19; Vasić 2012: 39-41

the other hand, it would seem that the beginning of minting in Dacia was linked to the sojourn of Philip I in this province, and operations against the Carpi.[4] The mint in Dacia produced coin issues during a period of ten years, with the mark of the local era from AN I – X (246/247–254/256).[5]

Data on coinage findings from the southern necropoles of Viminacium represent precious material for an analysis of monetary circulation in the territory of Moesia Superior in the period 192–238 AD, i.e. the period before the opening of the provincial coins mint in Viminacium, and then the subsequent mint in Dacia. A large sample of processed coins (6233) originating from archaeological research activities on these necropoles provides the possibility for various kinds of comparisons. Out of the total number of registered examples of imperial and provincial coins (6228), [6]5128 pieces belong to the imperial type (82.33%), while 1100 pieces belong to the provincial type (17.67%).[7] If we exclude the coins from the 4th and the 5th century (Pećine – 544 pieces and Više Grobalja – 42 pieces), we get the following ratio for the imperial and provincial coins during the first three centuries: 80.50% (4542 pieces) versus 19.50% (1100 pieces).

The analysis of monetary circulation in this period (192–238), on the basis of the sample from Viminacium, has shown a domination of issues of provincial coins compared to the imperial ones (65% to 35%) (Borić-Brešković and Vojvoda 2018: 76-77, Table 1, Graph 1). By observing just the provincial mints, it has been noted that issues from the Stobi mint prevailed from the reign of Septimius Severus up to the reign of Elagabalus, while issues from the Bithynian mint in Nicaea can almost exclusively be registered during the time of Alexander Severus. Other mints from Asia Minor and Thrace are present in smaller percentages (Borić-Brešković and Vojvoda 2018: 76). From the opening of the provincial mint in Viminacium, and its issues entering circulation, right until it was closed (between 238 and 255), a lack of imperial issues became even more prominent (they are present in only 11%) (Borić-Brešković and Vojvoda 2018: 78, Graph 2). When it comes to provincial issues, the mint from Viminacium dominates with ca 50%, followed by the mint from Nicaea with 42%, while issues from the mints in Dacia and Thrace are present with only 2.27% each.

Finds of coinage from the province of Dacia, produced in considerably smaller numbers than coinage from the mint of Viminacium, had a certain role in the monetary circulation in the area of Moesia Superior. Thus, 155 examples of coins from the southern necropoles of Viminacium originated from the mint of Viminacium (93.40%) and 11 from the mint in Dacia (6.60%). Coin hoards also provide possibilities of gaining insight into the monetary flows of a given period. In 10 hoards on the territory of today's Serbia, coinage from both of these provincial mints are present, with a similar ratio (on average 8.70%): Bošnjane 61:2; Brežane 25:2; Bujkovac 120:2; Vlajića Brdo I 101:14; vicinity of Vranje 19:3; Popovac 15:2; vicinity of Ćuprija 73:7; Izvore 26:2; Vrkašice 106:10; and Sremska Mitrovica 128:8.[8]

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with references therein.

4 Găzdac, Alföldy-Găzdac 2008: 140. According to Fitz, these events were also the cause for a secondary imperial mint to be opened in Viminacium; cf. Fitz 1978: 642.

5 The period of July–August 246 is taken as the beginning of the Dacian monetary era. Thus, the monetary eras of Viminacium and Dacia mostly overlap, with the difference of roughly three months; cf. Vasić 2012: 15.

6 The total number of processed examples of coins originating from the necropoles of Više Grobalja and Pećine is 6233. The total of 6228 comprehends examples of imperial (1st–5th century) and provincial mints (1st–3rd century). The five examples which haven't been included in our analysis belong to Republican mints (2), Greek mints from the 2nd century BC (1) and imitations (2); cf. Vojvoda i Mrđić 2015: 10, Table 1, ref. 6; Vojvoda i Mrđić 2017: 10, Table 1, ref. 5.

7 This calculation also includes the coins from the 4th and the 5th century, originating from the most recent of the three necropoles from the site of Pećine (Vojvoda i Mrđić 2017: 14-16, ref. 16, Table 4).

8 Bošnjane: Борић-Брешковић 1988: 89-96; Brežane: Вулић 1905: 92-93; Bujkovac: Борић-Брешковић и Митровић 2014: 87-134; Vlajića Brdo I: Арсенијевић 1997: 43-108; Vranje vicinity: Борић-Брешковић 1988: 89-96; Popovac: Борић-Брешковић 1979: 39-54; Ćuprija vicinity: Борић-Брешковић 1983: 69-84; Izvore: Стаменковић и Самарџић 2013: 163-181; Vrkašice: Орлов 1970: 153-161; Sremska Mitrovica: Орлов 1972: 153-161.
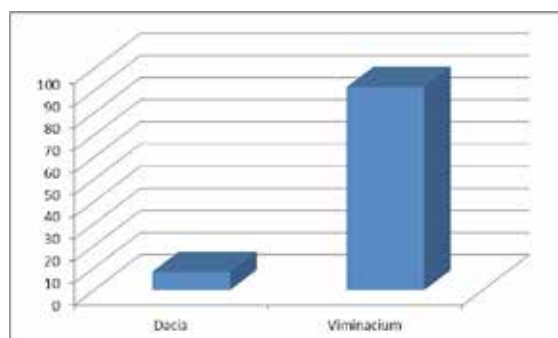
Graph 1 – Distribution of coins from the mints in Dacia and Viminacium in the area of today's Serbia

Unlike the finds of coins discovered during archaeological research and those from coin hoards, the presence of a certain type of coins in systematic museum collections does not provide equally reliable data on monetary circulation. In such cases, those are usually coins which came to museums from older private collections, and, therefore, their finding location is questionable. Nevertheless, in publishing certain museum collections, researchers have often stressed that those previous owners used to collect coins in given areas.[9] Taken with a certain amount of caution, data from museum collections regarding the presence of provincial coins from Viminacium and Dacia certainly contribute to creating an image on the monetary circulation in Moesia Superior. Thus the numismatic cabinet of the National Museum in Belgrade contains 4770 examples of issues from Viminacium and only 105 from the mint in Dacia (Borić-Brešković, Vojvoda 2018: 79; Vojvoda, Crnobrnja in print). At the Belgrade City Museum, this ratio is 1700 examples from Viminacium to 183 examples from Dacian issues (Борић-Брешковић 1976; Borić-Brešković, Vojvoda 2018: 79; Црнобрња 1993); at the National Museum in Požarevac, it is 1335 to 34 (Borić-Brešković, Vojvoda 2018: 80; Бенџаревић, Бранковић 2016: 143-167); at the National Museum in Šabac, it is 59 to 4 (Борић-Брешковић,

Петровић 2012: 135, ref. 1; Vojvoda, Crnobrnja in print).[10] In total, finds from archaeological excavations, from hoards, and parts of previous private collections which are in several museums in Serbia today, provide us with 8072 examples of issues from the mint in Viminacium and 416 coins from the mint in Dacia (Graph 1).

Aside from production itself, other differences have also been noted in the work of the two provincial mints. The mint of Viminacium stands out in regard to the one from Dacia due to its considerably wider circulation area. After Moesia Superior, coinage from the mint of Viminacium is most numerous in Pannonia Inferior, followed by Dalmatia, Pannonia Superior and Dacia, with a smaller number of its issues even registered in Italy itself (Regio X, Venetia et Histria), in Noricum, then in Thrace and Moesia Inferior, as well as in barbaricum (part of the barbaricum in Banat), Ukraine, Belorussia, Poland, Germany, Slovakia (Borić-Brešković, Vojvoda 2018: 81-89, Graph 3, Map 1-2). Issues from the mint of Dacia had a different role in the circulation within the province of origin and in the area of Moesia Superior and both Pannonias, where they also occur, but on a considerably lower scale than in Dacia itself. Also, the influx of coins from the mint of Dacia was almost identical in Moesia Superior and both Pannonias (Găzdac and Alföldy-Găzdac 2008: 146, Fig. 4; Vojvoda and Crnobrnja in print, Graph 6).

A comparative analysis of monetary finds from these two mints on the territory of Moesia Superior and Dacia yielded the results shown in the following charts (Graph 2 and 3):

If we observe the ratios in Moesia Superior (Graph 2), we can note that the mint from Viminacium had an increase from the second to the fourth year of minting (AN II – IV VIM or 240/241–242/243), a decrease in the fifth year (AN V or 243–244), and a relatively uniform influx until the end of the ninth year. The opening of the mint in Dacia and the first two years of its minting

9 For example, coins from the numismatic collection of the National Museum in Požarevac are mostly linked to Viminacium and its surroundings; cf. Бенџаревић и Бранковић 2016: 144, ref. 8, 150, ref. 46; Војвода и Бранковић 2016: 104; Borić-Brešković and Vojvoda 2018: 78, ref. 12.

10 The mentioned examples from both mints come from the site of Banovo Polje.
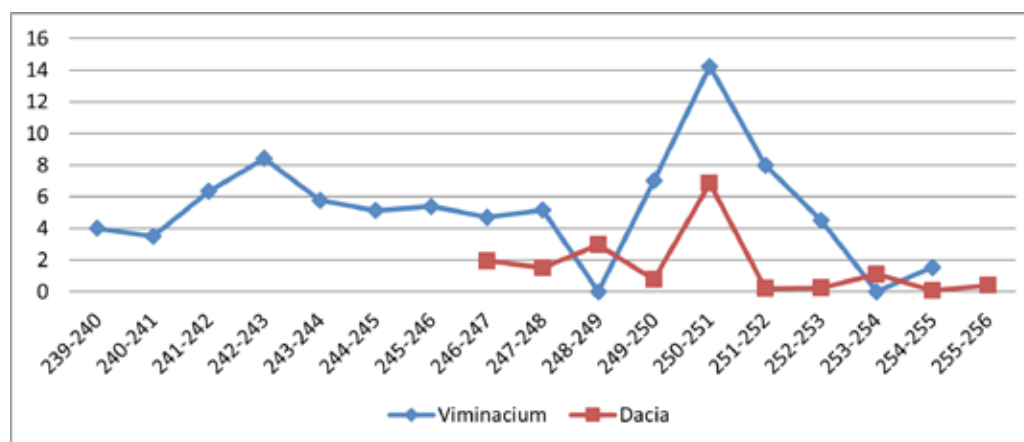
Graph 2 – Presence of provincial coinage from mints in Viminacium and Dacia in Moesia Superior, according to the minting year (AN I-XVI VIM and AN I-X DAC).
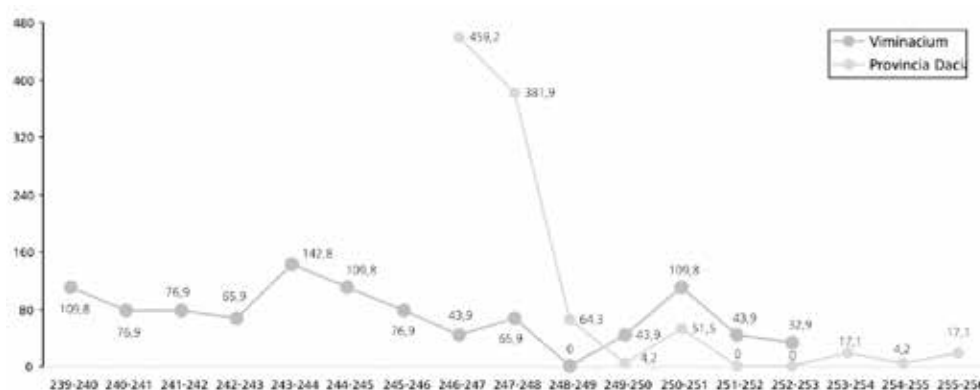
Graph 3 – Coin index of the Viminacium and Dacia provincial mints in Dacia
(according to Găzdac, Alföldy-Găzdac 2008: 152, Fig. 10).

(AN I – II DAC or 246/247–247/248) left traces in the circulation in Moesia Superior, though certainly on a smaller scale than issues from the mint of Viminacium. The coinage from the first two years of the mint in Dacia was present in an almost identical percentage in Moesia Superior (AN I–II or 246/247–247/248). The first interruption of the operation of the mint from Viminacium (AN X VIM or 248/249) was followed by a certain increase in parallel Dacian issues from the third year (AN III DAC). As we have already mentioned, this was linked to the usurpation by Pacatianus, who used the mint of Viminacium for minting *antoniniani* at that time.[11] According to M. Vasić, the mint of Dacia was also not active for several months, from the beginning of its fourth year (July/August 249) up to the moment that the Senate acknowledged

Trajan Decius (October 249) (Vasić 2012: 15). In any case, the mint of Viminacium noted a considerable increase with Trajan Decius coming to power, from 249/250 (AN XI VIM), and achieved its peak of production in 250/251 (AN XII VIM). In parallel to the twelfth year of the Viminacium mint, ran the fifth year of the Dacian mint (AN V DAC), which also reached its highest influx in Moesia Superior. Events which caused the exceptional production of both mints were linked to the intrusion of Goths in Moesia Inferior and Thrace, the sojourn of Decius in the Balkans and his passing through Viminacium (Vasić 2012: 17).

The mint of Viminacium then noted a decrease in the following two years (AN XIII–XIV VIM), while the Dacian issues almost died away during its sixth and seventh year of minting (AN VI–VII DAC or 251/252–252/253). After a second inter-

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11 Cf. supra ref. 1.

ruption in operation during the fifteenth year (AN XV VIM or 253/254), the mint of Viminacium operated for just one more year (AN XVI VIM or 254/255), and on a very small scale, after which it was closed. Graph 2 clearly shows that both mints reached their production peak in 250/251, while minting issues of Trajan Decius, Trebonianus Gallus and members of their families.

The picture is somewhat different when it comes to issues from the mint of Dacia in its province of origin (Graph 3). This relates, most prominently, to the first two years of minting (AN I–II DAC or 246/247–247/248), with its production continuing merely to decrease and be almost identical to the one noted in Moesia Superior. This massive production in the mint of Dacia is probably linked to the increased concentration of troops in this province because of the invasion of Carpi (Găzdac and Alföldy-Găzdac 2008: 141, ref. 42). Furthermore, issues from the mint of Dacia represent 40% of all the coins of Philip I found in Dacia (Găzdac and Alföldy-Găzdac 2008: 141, ref. 41). Also, these monetary finds are concentrated almost solely in the southern parts of the province, which is another fact that supports the newly defined location of this provincial mint in Apulum, and not in Ulpia Traiana Sarmizegetusa, as was traditionally believed. Apulum was the seat of *Legio XIII Gemina*, and there were also western Carpathian areas rich in ores in its vicinity (Găzdac-Alfoldy and Găzdac 2005: 651; Găzdac and Găzdac-Alfoldy 2008: 145). As for the issues of the mint of Viminacium, the dynamics of their influx into Dacia, by year, is similar to the that in Moesia Superior, although its issues are more numerous than those from the Dacian mint, with the exception of the first two years of minting in Dacia.

The founding of the mint in Viminacium and another one later in Dacia represented an official manner of temporarily solving a problem in the functioning of the monetary system of the Empire. However, it would seem that the roles of those two newly founded mints in the Balkans were different. As shown by the comparative analyses of finds from these two mints from the area of the province of Dacia, the issues from Viminacium had the goal of a wider circulation range, while issues from the province of Dacia, it would seem, were minted solely for the needs of that particular province. Namely, the mint of Dacia had a high production, and exceeded the number of issues from Viminacium in Dacia itself only in 246–249, and afterwards, from the rule of Philip I up to the rule of Valerian I, the issues of Viminacium were more numerous (Găzdac 2008: 275, 277, Fig. 9; Găzdac and Alföldy-Găzdac 2008: 152, Fig. 10; Borić-Brešković, Vojvoda 2018: 84). The production of both mints from the Balkans, that from Dacia and that from Viminacium, represented a manner of dealing with the monetary crisis in the middle of the 3rd century and providing the necessary money for the army.

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REZIME
ODNOS ZASTUPLJENOSTI EMISIJA KOVNICE VIMINACIJUM I DAKIJA: PRIMER VIMINACIJUMSKIH JUŽNIH NEKROPOLA

KLJUČNE REČI: RIMSKO CARSTVO, PROVINCIJALNE KOVNICE, VIMINACIUM, DACIA.

Nedostatak imperijalnog bronzanog novca u opticaju podunavskih i balkanskih provincija početkom 3. v. bio je posebno izražen i verovatno je predstavljao glavni razlog za otvaranje kovnice provincijalnog novca u Viminacijumu 239. g., a potom i u Dakiji 246.g. Kovnica provincijalnog novca u Viminacijumu otvorena je oktobra 239. godine što je bio i početak računanja provincijalne ere (AN I – AN XVI). Radila je 16 godina, od 239/240. godine do 254/255. godine sa dva prekida tokom 248/249 (AN X) i 253/254 (AN XV). Kovnica provincijalnog novca u Dakiji emitovala je novac deset godina uz oznaku lokalne ere od AN I – X (246/247-254/256).

Za analizu monetarne cirkulacije na teritoriji Gornje Mezije u periodu 192-238 AD, odnosno periodu koje prethodi otvaranju kovnice provincijalnog novca u Viminacijumu, a potom i kovnice u Dakiji, dragoceni su podaci o nalazima novca sa viminacijumskih južnih nekropola. Nalazi novca provincije Dakije, srazmerno daleko manjoj produkciji u odnosu na kovnicu Viminacijum, imali su izvesnu ulogu u monetarnoj cirkulaciji na prostoru Gornje Mezije. Tako sa viminacijumskih južnih nekropola potiče 155 primeraka novca kovnice Viminacijum (93,40%) i 11 iz kovnice Dakija (6,60%). Izvestan broj dačkih izdanja potiče i iz 10 ostava novca, u kojima je zabeležen sličan odnos zastupljenosti viminacijumske u odnosu na dačku kovnicu. Ukupno uzevši, nalazi sa arheoloških istraživanja, iz ostava, kao i delovi ranijih privatnih kolekcija koje se danas nalaze u više muzeja u Srbiji, iznose 8072 primeraka emisija viminacijumske kovnice i 416 moneta kovnice Dakija (Grafikon 1).

Osim same produkcije, do sada su uočene i druge razlike u radu dve provincijalne kovnice. Viminacijumska se ističe u odnosu na kovnicu Dakija, izuzetno širim arealom cirkulacije. Kako su pokazale komparativne analize monetarnih nalaza ove dve kovnice na području provincije Dakije, emisije Viminacijuma imale su za cilj širu cirkulaciju, dok su emisije provincije Dakije izgleda kovane samo za potrebe matične provincije. Produkcija obe balkanske kovnice, u Dakiji i Viminacijumu, predstavljala je način upravljanja monetarnom krizom iz sredine 3. veka i snabdevanja vojske neophodnim novcem.

* * *

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PRINCIPIA OF ROMAN CASTRUM PONTES –SPATIAL AND SOCIAL RELATIONS IN THE BUILDING

ABSTRACT

The decision of Roman Emperor Trajan to build this famous bridge also influenced the stone constructions of the associated castra on both sides of the Danube, in the areas of today's village of Kostol in Serbia and the town of Drobeta-Turnu Severin in Romania. For this reason, we analyse in this paper the castrum Pontes in Serbia, which we suppose was characterized by dimensional relations between the constituent elements. Certain relations noticed in the plan of castrum fortifications can also be observed in the plan of an individual building – within the main principia.

The classical plan of a Roman principia and the specific geometric relations in the case of Pontes Principia influence certain social relations of users and this building. An analysis of analogous solutions in the auxiliary castra of Limes also contributes to a better definition of the functions of certain rooms of the principia. However, by applying modern software designed for architectural analyses, we can study the above relationships more thoroughly and offer suggestions for functions that have not been determined yet.

INTRODUCTION

The plan of the Pontes castrum in the area of today's village of Kostol in Serbia is a part of the whole construction that consists of Trajan's Bridge and the very similar castrum of Drobeta on the opposite bank of the Danube in today's town of Drobeta-Turnu Severin, Romania. Within the camp of Pontes, the building of the principia was partially explored during research in the period 1980-1990 (Petrović, Vasić 1996: 25; Гарашанин, Васић 1980: 7-24. Vasić, Kondić 1986:542 – 560; Гарашанин, Васић 1987: 71-

116). Today's remnants of the bridge and castrum Pontes date from the time of the reign of emperor Trajan (98-117 A.D.). During Trajan's offensive against Dacia, several castra along the banks of the Danube between Moesia and Dacia were renovated or built from the foundations. The famous bridge between Pontes and Drobeta was built in the period 103-105. A.D. According to Procopius, two castra were built simultaneously with the construction of the bridge (Гарашанин, Васић 1980: 8). The purpose of these castra was obviously to control communication between the new Roman provinces of Dacia and Moesia.

Several archaeological phases are registered on the castrum Pontes and its principia. There is a possibility that the first phase of construction represented one small fortlet from the Flavian period (Vasić, Kondić 1986: 543). Below the traces of stone ramparts and stone principia, remnants of wooden constructions were discovered, which testifies to the character of the first phase construction. The next phase of fortification walls and principia, with stone walls, from the period of Trajan (103-105. A.D.) was the most significant in the sense of architectural quality. Archaeological finds from the principia show that this building had been built at the same time as Trajan's bridge, which is the same case regarding the principia building in Drobeta (Milošević 2004: 55, 58). After a period of maintenance neglect during the period of the Severan dynasty (first half of the III century), a reconstruction of castrum Pontes occurred. In this reconstruction, some of the towers lost their function and were not restored. The restoration of this phase also occurred on the building of the principia, where some of the facilites within it were not reconstructed (Petrović, Vasić 1996: 25). The last reinforcements of defenses (building of new towers, closing some of the gates) were recorded during the second half of the IV century. This building activity included the construction of a new horreum (granary) (Vasić, Kondić 1986: 554). According to documentation of the Archaeological Institute in Belgrade, the building of principia was not restored in this period, but small houses were built above its remnants. After the last restoration in the IV century, there was no new ones in the following centuries.

The research concluded that this is a building that is characterized by a symmetrical plan and is very similar to the concept of the principia in the Drobeta camp, on the opposite bank of the Danube (Marcu 2009: 279, Pl. 19). The shape of its plan is very close to a square, while the shape of the inner courtyard is a quite regular square. The appearance of squares as representatives of regular geometric shapes indicated the possibility of a certain geometric relationship between them and that this determined the plan of the entire principia.

The existence of certain geometric relations in the architecture of the principia can also impose an examination of their influence on user behavior. The spatial qualitative impacts of architecture on their users (visibility and movement within that space) can be considered through certain modern software (Varoudis 2014: 298), providing an integral observation of several dimensions of the architectural space. By applying specific software, researchers gain direct insight into the location of each point when perceiving one type of impact at a certain moment. Through a group of operations in this software, the relationship between individual spaces, angles, obstacles, individual distances, maximum and minimum values of action (e.g., in the form of movement) is analyzed. One of the examples of the direct effect of the space of an architectural building on people is the movement that space imposes on them. Depending on this movement and the degree of visibility of certain spaces, the spaces of basic communication and those that were characterized by greater secrecy stand out.

In the architecture of the period of late antiquity, , the separation of the functions of certain spaces according to the place concerning the communication of users appeared for the first time. In military architecture, we can notice this shift within the fort layout with its main roads, and special spaces for the principia and the shrine within it, the commander's building (praetorium), economic buildings (granaries), hospitals, barrack blocks for living etc. For this reason, analyses of qualitative influences on user behavior using certain graph methods of modern software can indicate the functions of parts of the building. Archaeological research in the case of the Pontes Principia has so far yielded no results, since the destruction of the level from Trajan's period on the whole surface of principia was significant.
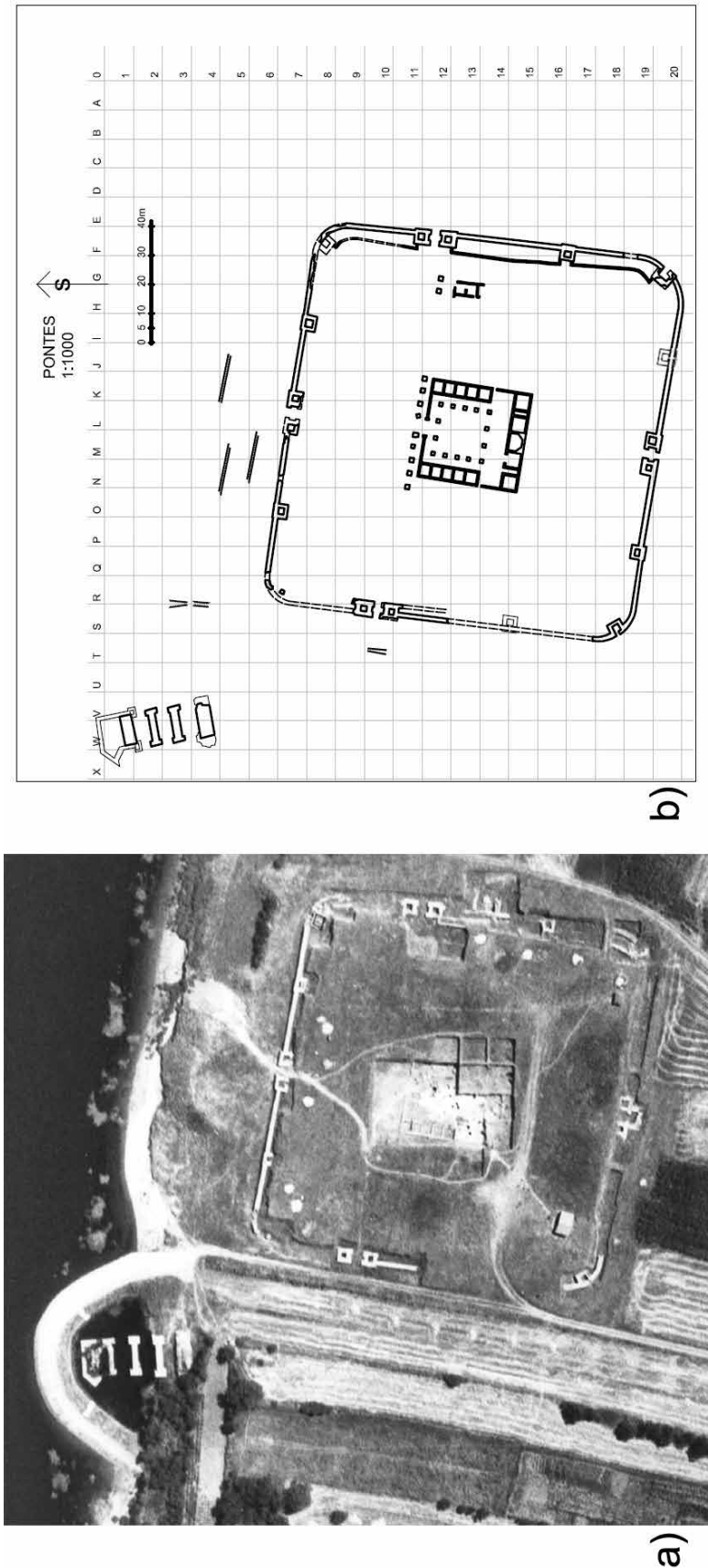
Fig. 1 a) The aerial footage of the archaeological site of Pontes; b) Plan of castrum (Trajan's phase) after archaeological investigation (Doc. of the Institute of Archaeology, Belgrade).
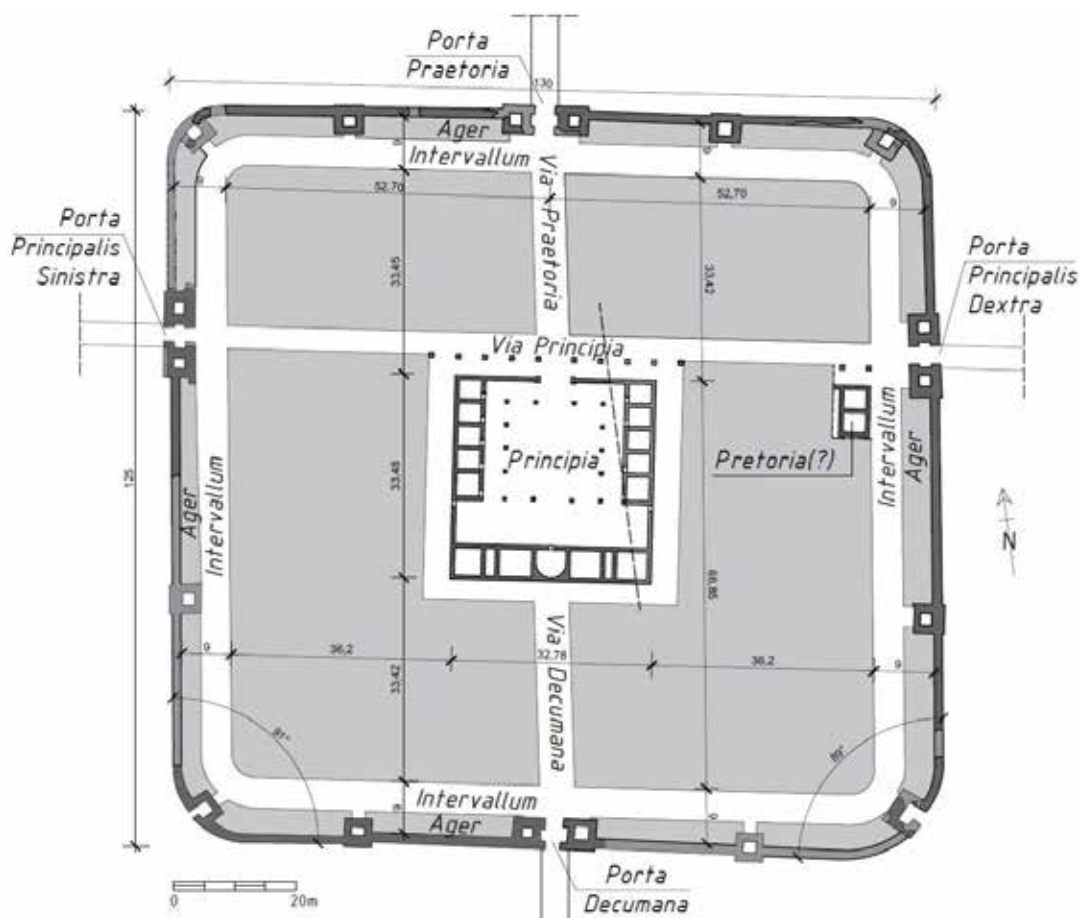
Fig. 2 The plan of the Pontes castrum with the positions of gates, towers, ramparts, associated ager and intervallum, main roads through castrum, the building of principia and discovered part of the officer's building (pretoria ?).

GEOMETRY OF CASTRUM PONTES

In the analysis of the shape of the Pontes castrum and the principia building, technical documentation from the archaeological research was used, as well as aerial footages of visible remains in the field (Fig. 1). Castrum Pontes has the layout of an almost regular rectangle, which was the basic form of Roman castra from the Middle Imperial period (Cambell 2009: 32-33). During the I and II centuries A.D. the planning concept followed the earlier recommendation of ancient writers Hygianus and Polybius, with frequent deviations determined by local conditions and the requirements of specific cohorts (Petrović, Vasić 1996: 18). The basic layout of the Roman castrum refers to the rectangular plan, where distinct blocks of buildings were created. A T-shaped arrangement of roads was established where the crossroads met near to the headquarters (principia), which often occurred at the central block in a fort (Cambell 2009: 33).

If we consider the ideal north-south orientation, the direction of the eastern rampart of the castrum has a deviation at its north end of 9° to the east. We were able to define that the angle between the southern and western ramparts was determined to be 91°, which was also the case with the angle between the northern and eastern ramparts. The remaining two opposite angles were determined to be 89°. The pronounced closeness of these values to the values of a right angle and the constitution of terrain where the castrum is built indicate that there was an obvious error in the process of mea-
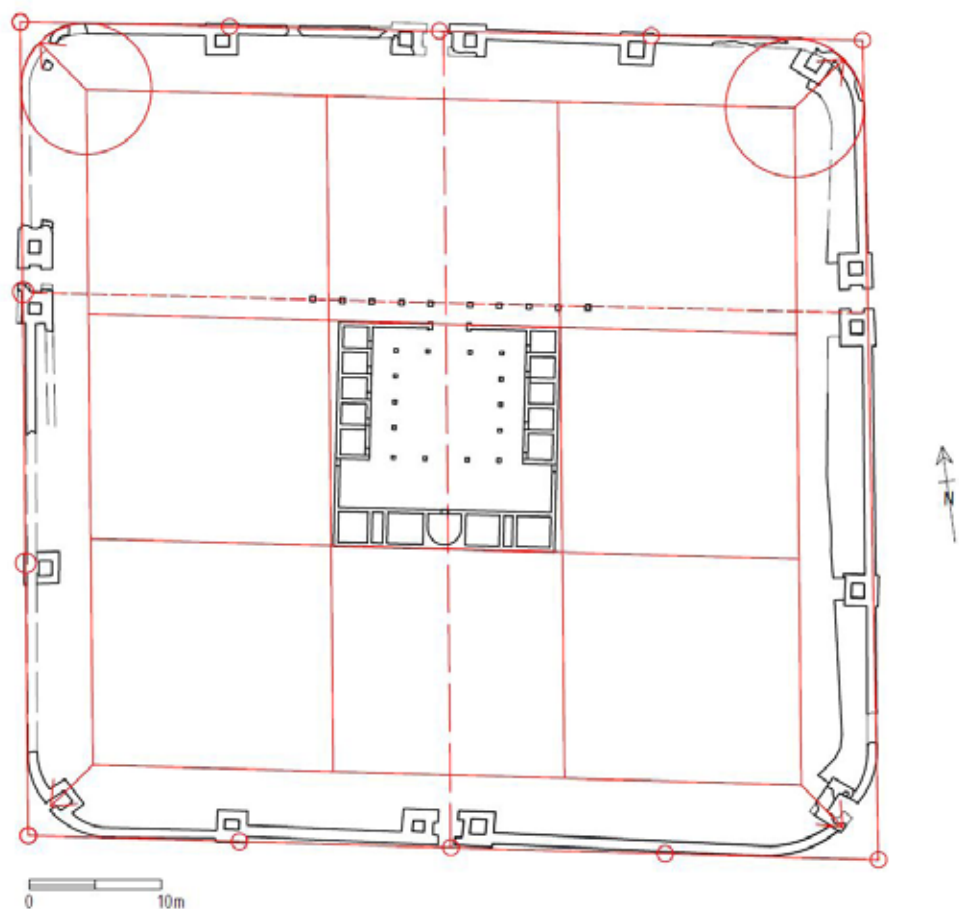
Fig. 3 The plan of castrum Pontes with the positions of fortifications and the building of principia
with the geometrical relations of the castrum plan.

surement, which was a common case in the period of antiquity when using hand instruments at a great distance (Taylor 2003: 66). Therefore, it seems that castrum fortification walls were not built on an accurately rectangular plan. Also, the positions of the western gate Porta Principalis Sinistra and eastern gate Porta Principalis Dextra were determined at the same angles (Fig. 2).

Behind the fortifications of Trajan's castrum Pontes and their associated ager, there was an intervallum, unburdened by built structures. With it, the fortifications and the ager were separated from the building structures inside the camp. During research, the northeast corner of the officer's building (Pretoria?) was registered, which established that the inner border of the intervallum from Trajan's time was 9 m distant from the inner face of the ramparts (Petrović, Vasić 1996: 25; Vasić, Kondić 1986: Fig.4). Within the space enclosed by the intervallum, the buildings of the auxiliary garrison of Pontes were planned to be placed. Observing the internal arrangement of the castrum, it can be noticed that its internal space under the built structures was in the shape of a rectangle, very close to the shape of a square. Its plan can be divided along the length (in the north-south direction) into three equal parts - northern, central, and southern space. In the western-eastern direction, the camp was divided into equal halves (Fig. 3). At the current level of research of the route of the castrum ramparts, it seems that concerning the extreme corners of the rectangular interior space, the most protruding corner points of the Pontes fortifications have been determined. The distance
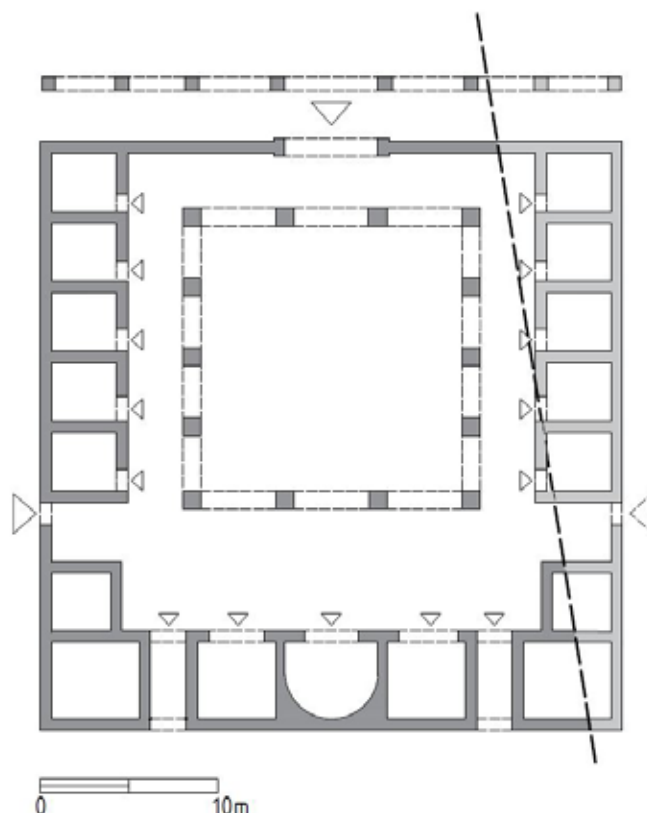
Fig. 4 The reconstruction of the plan of Principia in the castrum of Pontes (the author's drawing according to the Doc. of the Institute of Archaeology, Belgrade and Petrović, Vasić 1996. Fig 2.)

between the internal built space and the route of the outer face of the ramparts has the value of the radius of circles (Fig. 3), along which the route of the ramparts at the corners was defined, at least on the north side of the castrum.

The division of the interior into three parts was common for Roman camps but did not always imply an equal width of the mentioned areas (Campbell 2009: 32-34). The central space is divided by width into three equal squares, and the surface of the central square is occupied by the principia building (Fig. 3). The fact that the principia building occupies the area of the central square with its outer enclosing walls indicates that its position and size were determined simultaneously when planning the routes of the Pontes fortifications. The size of Roman principia at Pontes (1093, 92m2) is one fourteenth of the size of the castrum (1,51ha), i.e. it occupies 7% of the fort surface[1].

Roman castra from the period of the I-II century at the Iron Gate show a similar relationship of size towards the buildings of principia (Milošević 2004: 50, 57, 62). The same circumstance applies to forts on the territory of Roman Dacia and Britannia (Marcu 2009: 213, 227 with the ref. 1662).

DIMENSIONAL AND FUNCTIONAL ANALYSES OF PONTES RINCIPIA

The building of principia was discovered in the center of the Pontes castrum, as part of the oldest stone phase, (Petrović, Vasić 1996:24). The principia building inside the Pontes castrum has been explored for the most part (Fig. 4). Only part

1 In earliar papers, the size of castrum was calculated ac-

cording to the overalll width and length of the castrum to 1,6ha. However, the size of Pontes castrum plan is a bit smaller - it is 1.5ha due to the rounded corners of its fortifications. (Гарашанин, Васић 1987: 80; Milošević 2004: 53).

of the eastern rooms remains unexplored. If we consider the ideal north-south direction, the direction of the eastern side of the principia has a deviation at its north end of 9° to the east, as is the case with the entire castrum. [2] However, the deviation of castrum ramparts is connected to the irregular shape of the castrum plan, while the deviation of the principia is connected to deviation i.e. rotation of the whole building in space, with very regular angles in the plan of the building.

The building of the principia is of a regular rectangular plan in shape. A review of the available archaeological documentation established that the size of the building was 32.86 × 33.48 m. As already mentioned, there are no deviations from the right angles in the plan of the facility, which shows that its construction was much more regular concerning the whole castrum.

The investigated (larger) part of the principia indicates that a square courtyard surrounded by a colonnade was developed in the center of its northern part. Along the lateral sides of the courtyard, a series of rooms of equal dimensions extended into the northern part of principia. At its southern part, along the south side of the courtyard, a large hall was built. Behind the hall, a series of rooms flanked the central one, which had an apse. To the east, rooms are registered at the same distance from the courtyard colonnade as those in the west. The same is the case with the layout of the southern rooms. The eastern explored part of the rooms in the south had a symmetrical arrangement like the western part of these rooms concerning the central room and the building axis of symmetry.

The entrance in the principia is also placed centrally concerning the visible width of the courtyard with the associated porticoes. The width of the entrance to the principia building is 5.25 m. All the above data indicate that during the reconstruction of the principia plan, symmetry had to be taken into account in the plan of the building towards the north-south direction with the already mentioned deviation of 9° to the east.

On the west and east sides of the northern part of the building, there are five rooms planned in a row. The width of these rooms is the same - 3.65 m (Fig. 5). The other interior dimension of the room is 3.3 m. The concept according to which they are designed is uniform - the entrances to each of the rooms are designed so that one doorframe rests on the transverse wall between the observed room and the next.

Towards the interior of the rest of the northern space, a portico was planned, about 3.1 m wide, from the outer face of the room wall to the inner face of the columns. It was supported by carved columns: a base with associated toruses, trochilus, and a plinth was found of one of them. The columns of the eastern and western parts of the portico are projected in the axes of the transverse walls of the rooms along the western and eastern enclosing walls of the principia so that there are five of these on each side. However, on the north side of the portico, as well as on the south, there were four columns each.[3] The two central columns on the north and south sides are connected to the directions of the door jambs at the entrance to the building, the pillars on the outside of the porch, and the directions of the walls of the central room at the southern end of the principia. The reason for the wider distance between the columns and entrance jambs on the north and south sides was the dominant communication in the north-south direction, where the basilica and the sanctuary

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2 The thickness of the above-ground parts of all walls is about 0.6 m, while the width of the foundation parts of the colonnade of the inner courtyard is about 1 m. During the research, no particularly pronounced fundamental expansion concerning the above-ground parts of the walls was noticed. On most of the walls, it was either uniform with the facades of the walls or protruded only a few centimeters. (Petrović, Vasić 1996, 25). Data on the dimensions of the walls and certain details of the Principia were obtained according to the technical and photo-documentation of the Archaeological Institute in Belgrade and the kind statements of MilojeVasić, to whom I would especially like to take this opportunity.

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3 According to the technical documentation of the Archaeological Institute in Belgrade, on the north side of the porch, the eastern column of the two central columns of the porch on this side was found, which is in the axis of the eastern door jamb of the north wall of the principia.
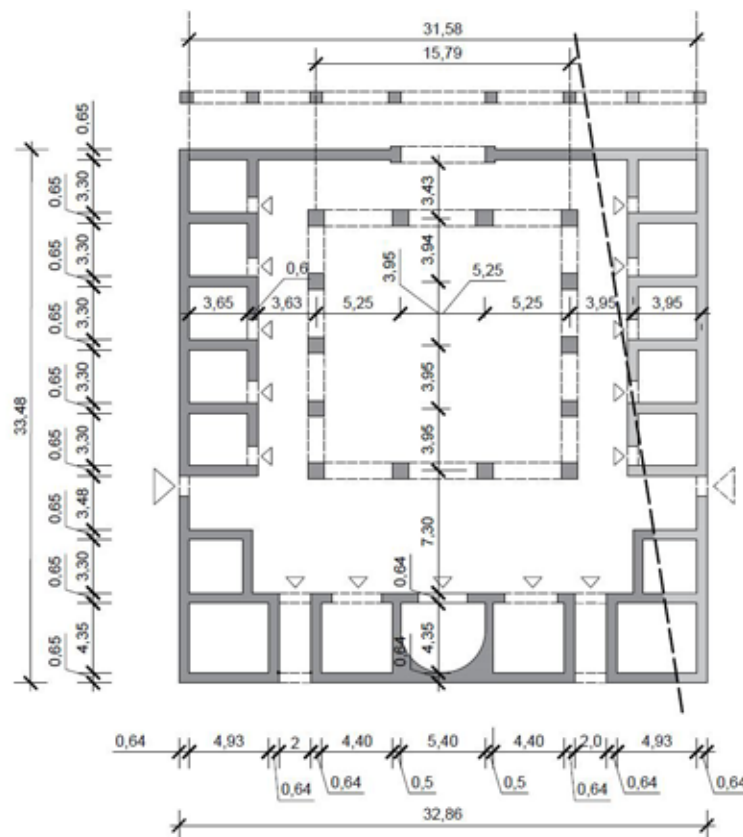
Fig. 5 The reconstruction of the plan of Principia in the castrum of Pontes with metric measurement of the plan elements (the author's drawing).

are the main focal centers on the way from the entrance to the principia. The width of this north-south communication was adapted to the width of one of the main communications within castrum – the Via Praetoria.

Within the rooms in the south, the central room stands out with its shape and position. The apse is defined on the south side of this room, while the northern half of its plan is characterized by right angles. This room is also placed on the axis of the north-south direction, as well as the entrance to the principia, which again shows its symmetry. The room is preserved at the level of its foundations, and it can be concluded with sufficient certainty that the entrance to it was placed in the axis of the north-south direction. To the left and right of this room, other rooms in a row along the south wall were spotted. According to the available technical documentation, the entrance to the room west of the central one was very wide - about 3 m

(Petrović, Vasić 1996: Fig. 2).

Between the rooms along the southern facade of the building and the northern half of the building, there was a space with an impressive width of 7.30 m. The length of this space was equal to the length between the walls of eastern and western rooms of the principia turned to the portico. This area was surrounded by walls, except in the central part of the north side, where it relied on the four columns of the portico.

The functional and spatial organization of this building corresponds to the standard organization of principia buildings from the time of the I and II centuries (Johnson 1983: 104-119). According to that organization, the central part of the space is occupied by a yard that was surrounded on three sides by porticoes and rooms. On the left and right side of the yard, there were smaller rooms, which, according to older researchers, were designated as storerooms for ammunition - *armamentaria*.
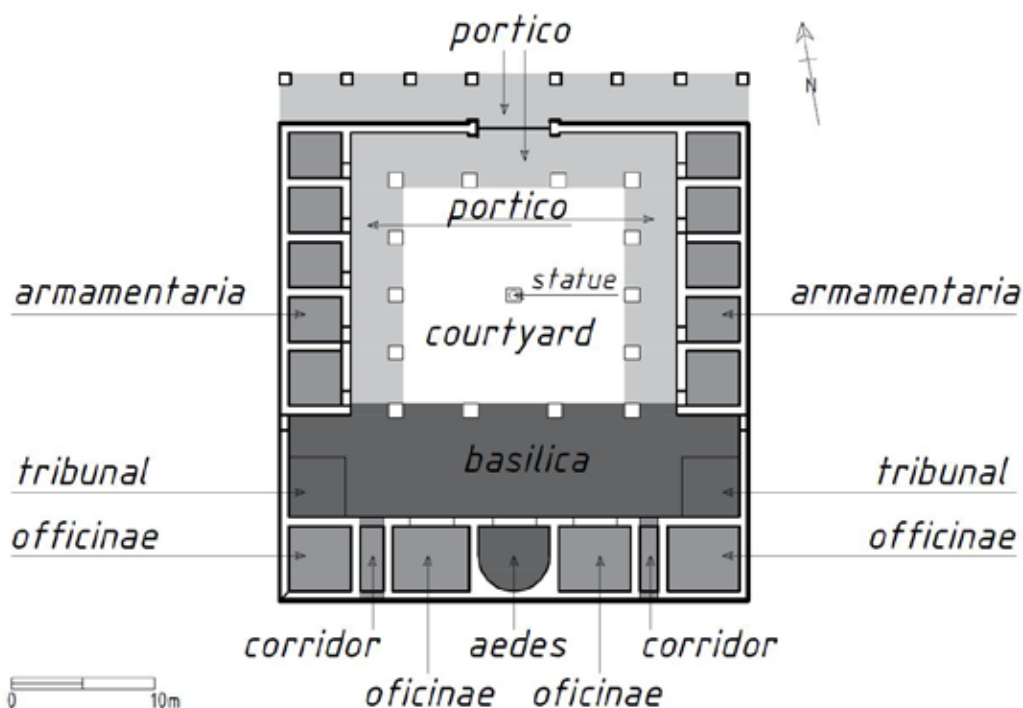
Fig. 6 The reconstruction of functions of separated rooms within Principia of the castrum of Pontes.

Recent reinterpretations in Romania regarding the functions of these rooms indicate that according to the area they occupied, they could also have served as administrative rooms or workshops in fortifications that were chronologically and structurally close to Pontes (Marcu 2009: 39, 73, 131-132, 214, 229-230). As part of a series of rooms in the south that had an administrative purpose, Vasić defined the function of the sanctuary for the central room (Petrović, Vasić 1996: 25), which fits in with the general planning pattern of the principia of Trajan's Time (Johnson 1983: 104).

In addition to the conclusions of earlier researchers regarding the functions of individual rooms, the purposes of other rooms and spaces within the principia can be determined (Fig. 6). The above-mentioned space opposite the entrance was a hall (*basilica*), a more monumental part of the principia according to the span of over 7 m. North of the western corner room within the southern row of rooms, in the area with the side passage that leads from the basilica to the street west of

principia, a construction of weaker material was found on the floor. This construction corresponds to the tribunal (*tribunalia*) - the place for the commander on the raised platform. Traces of a similar construction exists on the opposite, eastern part of principia as well. Its position is identical chronologically and architecturally with close examples in Romania, as in similar examples of auxiliary principiae:Drobeta, Gilau, Racari, Slaveni, Buciumi (Johnson 1983: 111; Gyemant, Gudea 1983; Marcu 2009:73). The narrower spaces located between two wider rectangular rooms within the southern row of rooms served as corridors, which led out of the principia.[4] According to the proximity of the tribunal and the larger number of exits concerning the rooms in the southwest and southeast corner, there is a possibility that people stayed in them more often than in other rooms. It was a

4 Identical corridors were found in chronologically and constructively close examples of the prinicipiae to the auxiliary fortifications in Romania (Marcu 2009: 132, 215). Similar corridors can be observed in much larger sets of command buildings, such as in Lambaesis.

common practice in Roman principiae to plan a hypocaust system in these rooms at that position later or during construction so that the degree of comfort within these rooms was higher. For these reasons, it should be taken into account that the commander-in-chief of the garrison was housed in such a room (Marcu 2009. 39, 73, 214-215).

As was mentioned in the introduction, the investigated part of Pontes Principia indicates an almost identical solution to Principia in Drobeta. Although other examples of principiae have been explored along the Serbian bank of the Danube, their proportions in detail differ significantly from the applied plan of principiae on Pontes (Petrović, Vasić 1996: 23-25). The similarity of the principiae in Drobeta and Pontes is especially related to their internal organization. This circumstance can suggest that the plans of these buildings in the two camps that belonged to the ensemble of the bridge were part of the same concept. Here, it is difficult to distinguish if this concept was of strategic (military) nature, architectural, or if it included both of these reasons. In any case, here we do not have enough evidence to claim that either of these reasons was crucial in the building concept of two castra and theirs principae.

PROPOSED SCHEME OF DIVISION FOR THE PRINCIPIA SPACE

The symmetry of the principia building in Pontes and the pronounced similarity between it and the one in Drobeta contribute to the reconstruction of its plan. With the present symmetry in the plan, right angles, and parallel walls, the more elaborated analysis of the graphic plan according to which the building in Pontes was designed can be justified. Some details indicate a high degree of regularity, such as the square shape of the plan of the central courtyard and the position of the columns of the courtyard porticoes.

The mentioned regularities indicate the possibility that a certain type of scheme was used in the graphic design of the plan of the building. Cer-

tainly, one question is the reason for the builder's need to adopt a certain scheme as a template. The intentions of the ancient builder were manifested not only through the adoption of the scheme as a certain template but also through the process of rational adaptations which deviated from the initial scheme. That the mentioned process was current in antiquity is indicated by the unavoidable architectural manual of that time. Vitruvius explained the correctly performed ancient procedure of planning a building so that at the beginning of the process a systematic scheme based on a unit of division is created. In the second step, Vitruvius indicates that any adaptation of the plan is allowed, according to the nature of the site (i.e., minimal deviation from the given scheme), as long as it does not affect the proper appearance of the building (Vitruvius (2006): book VI, chapters 1 - 4). Therefore, in the process of analyzing the degree of regularity of the plan according to which the principia was built, we should certainly start from the most regular form and go to less regular forms in further analysis.

It is important to take precautions when the analysis of the graphic design of the plan of the building is in issue. Setting out the plan of the building on the ground was done by using graduated rods for measuring, a set square (norma) and groma for determining right angles, sweeping cords for circle segments, a longitudinally carved rod with water in its channel for determining the horizontals, etc. Although there was a standardized tool, there was no standardized Roman way of design and measuring on the ground. The archaeological and architectural evidence also shows that the importance of a project was not a guarantee of higher standards for precision and accuracy. Markets of Trajan in Rome, a plan of the mausoleum of Maxentius, and the Baths of Caracalla are just some examples of such imperfections (Taylor 2003: 66, 69, 70). Additional measurements on long distances and angles could suffer from accumulated errors. Often, according to the previous Vitruvius recommendation, the builders adopted

– changed a bit, the planned measures on-site.

To interpret the measurement of the building of principia, I applied several approaches. The first one was to take as many measurements as possible (length, width, thicknesses of the walls, axial distances) to find if there is a regularity among them. The second approach refers to taking overall long distances, since there is a greater possibility that there is an accumulated error made by the addition of small measurements. Besides this, a difference must also be made in the interpretation of the position and type of some architectural elements. It is not the same if we consider the border architectural elements or within the plan of building. Also, a difference must be made in the measurement of the walls and columns. If we assume for example the columns in the courtyard, there is evidence that their foundations were of almost a meter wide, while carved columns above the ground were much thinner in their diameter. The builder could not rely on the further measurement on the dimensions of the foundation above the ground level, so the planning of the courtyard must have been subjected to this circumstance. Therefore, if we want to interpret the measurements in the courtyard, the right dimensions would not be the widths and distances between the foundations of columns, but the axial distance between the columns.

The rectangular shape of the whole building in the plan (not counting the outer portico towards Via Principia) measuring 32.86 × 33.48 m indicates that there is a slight difference between the width and length of the building. The regular square form of the plan of the central courtyard imposes the definition of the beginning of the analysis for the plan of the principia. Concerning the enclosure of the central courtyard, the number of supporting columns of the surrounding porticoes on each of the parallel sides is symmetrically solved to the two axes of symmetry placed in the north-south and east-west directions. Such symmetrical determination of the position of the constituent architectural elements would not be related to the whole plan of the Principia, in which

there is only one axis of symmetry –the north-south direction.

The width of the *armamentaria* on the east and west sides was harmonized with the mutual distance of the columns in the courtyard. The *armamentaria* rooms are of the same individual lengths and widths. The width of the *armamentaria* rooms is 3.30m, while the thickness of the walls between them is 0.6 - 0.65m. This determines the axial distance between the dividing walls of armamentaria as 3.90 - 3.95 m. The same can be applied to the length of the rooms.

It has already been emphasized that the columns of the central courtyard are precisely defined in the axes of the transverse walls between the rooms of the *armamentaria*, which means that the value of 3.90-3.95m corresponds to the distance between these columns. The length of the central yard (from the axis of one column to the axis of another one) is 15.75m (53 Roman feet). The mentioned range of values expressed in meters fits the value of 13 ¼ R, where R denotes the Roman foot, which in the metric value system would be 0.296-0.297m. Value from 13 ¼ R for the distance between columns indicates that the mentioned measure was obtained by dividing the length of the central yard of 53 feet into four parts.

Similar dimensional relations have been registered between the axes on which the porch pillars are located and the axes of the front walls of the *armamentaria*. The sum of half the width of the foundation of the pillars, the width of the porch, and half the thickness of the front wall also has a value of 3.90 m. At the same time, the sum of half the thickness of the front wall and the width of the interior space of *armamentaria* has a value of 3.95 m.

It is noticeable that the thickness of the western and eastern wall of the Principia is not included in the mentioned calcuation, because otherwise there would be a departure from the value of 3.90-3.95 m. A similar situation can be noticed in the position of the southern wall. The Roman builder must have had clear reasons for the obvious repeating

of a value of 3.95 m (13 ¼ R) within the space of the building and the departure from this value at the plan borders of the building.

The reason for this inconsistency is the deviation of the whole building within the planned central space of the principia in the Pontes castrum plan. The imperfect angles of that central space are equal to the angles between the ramparts of the castrum (89 and 91). These angles caused the difference of two Roman feet between the length of the principa plan and its width . Within borders of the imperfect central space of the castrum the outer faces of all four walls of Principia are defined (Fig. 3). That implies that builders could define the interior arrangement within a space which is smaller by the value of the thicknesses of the western and eastern walls. This explains why the thickness of the western and the eastern wall of the principia was not included in the building concept, according to Vitruvius' recommendations that any adaptation of the plan is allowed according to the nature of the site (in this case to the geometry of central space of castrum). The evidence for this building concept is the fact that the length between the inner faces of the western and eastern wall is exactly twice that of the axial length of the courtyard (Fig.5).

The mentioned division of space into a certain number of squares 3.90-3.95 m wide can be traced on the example of the axial width of the basilica. In that case, the clear width of the basilica space of 7.30 together with half the thickness of columns and room walls gives a sum of 7.90 m, which totals twice the value of the length of 3.95 m.

When it comes to the width of the rooms in the south, we must start again from the dimensional division of the square of the central courtyard. In the previous analysis, we saw that the geometric division of space along the east and west sides of the Principia depends on the distance of the axes of the columns in the central square courtyard. These axes are established on its east and west sides. There was no difference with the division of rooms in the south. Their width depended on the distance between the axes of the columns of the central courtyard on its southern side. The value of 5.25 in the modern metric system coincides with the value of 17 2/3 expressed in Roman feet, which is obtained by dividing the length of the central courtyard of 53 Roman feet by the number three. The width of the entrance to the Principia building was adjusted to a distance of 5.25 m. The depth of the southern rooms was also determined by the same value so that the route of the outer face of the south wall of the Principia was determined at a distance of 5.25 m from the axis of the south wall of the basilica.

The relationship between the width of the central courtyard and the width of the principia explains how the principia was planned (Fig. 5). According to the graphic plan defined by previous analyses, the width of the central courtyard is twice as small as the inner width of the principia. The distance between the individual structural elements in the north-south direction is defined in the value range of 3.90-3.95 m. Around the smaller square which defines the route on which the axes of the columns of the central courtyard are formed, two larger ones are formed. On the route of the first larger square, the front walls of the armamentaria and the north wall of the Principia were determined. On the route of the largest square, the width of the outer porch towards the Via Principalis was determined, then the inner faces of the eastern and western walls of the Principia and the axis of the southern wall of the basilica, i.e. its width (Fig. 7b).

From the previous analysis, a different division of the sides of the smallest square is noticeable, which defines the shape of the central courtyard. The division of the square in the plan of the inner courtyard into three parts in one direction, that is, four parts along the other direction, is not the only one in terms of the Pontes castrum. If the plan of the entire fortification is observed globally, we will notice that both the western and eastern ramparts are divided into three parts, while the northern and southern ramparts are divided into
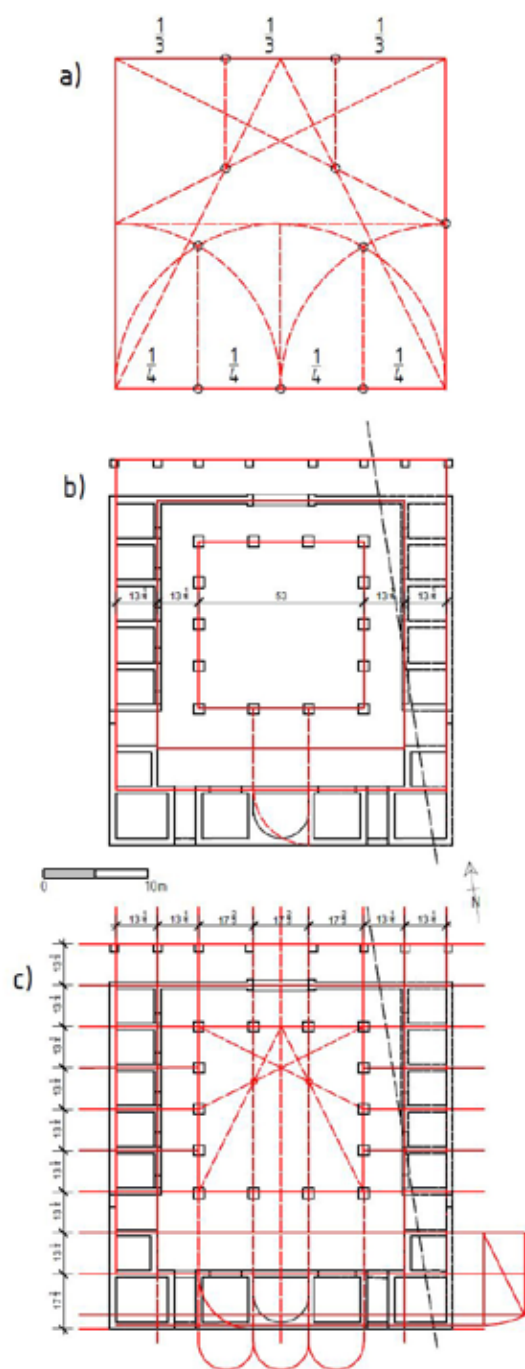
Fig. 7 Geometrical division of Principia space: a) the concept of geometrical division of square edges to its thirds and quarters; b) reconstructed initial scheme based on the geometrical relations between three squares; c) proposed initial scheme of division for the Principia space.

four parts (Fig. 3). The division was established by the positions of the main gates of the castrum and the positions of the towers. Thus, the division of the sides of the square according to the ratio of 4:3 was valid both for determining the position of fortification elements (towers) within the entire defense system of the castrum and for determining the architectural elements (columns) within the most important command building such as the principia. The geometric division of the sides of a square into a different number of parts along two directions could be done as shown in (Fig. 7a). The width of the central rooms in the south is harmonized with the spacing of the columns on the south side of the central courtyard. The depth of all the rooms on the south side is equal to the width of the intercolumnia on the south side of the basilica, as can be seen in the proportions represented in the room west of the aedes (Fig. 7c). It can be seen in (Fig. 7c) that most of the proportions within the building of the principia came from the relation 4:3. The size of the outer faces of both of the tribunals is adapted to the division of widths of armamentaria. The width of corridors is equal to the half of the width of the intercolumnia on the south side of the basilica.

The principia at Pontes, although classical in its design conception for Roman buildings of this type, is distinguished in its plan by a certain effort of its builders to achieve special relations of geometric regularity (Fig. 7c) That is why the Pontes Principia is convenient as a case study for analyzing the extent to which the regularity of its plan influenced social actions and communications within the building itself. For the needs of this type of analyzing buildings in general, special software has been developed in the field of architecture.

POSSIBLE RELATIONSHIPS BE-TWEEN THE SPACE OF PRINCIP-IA AND ITS USERS

The space of the building of principia can be researched by applying the analytical theory of architecture, where the influence of the architecture on its user's behavior is considered (Turner 2002). In other words, we can quantitatively represent qualitative values in architecture, and thus the impact of architecture on user behavior in space (Varoudis 2012). Computer analysis of space is necessary nowadays because the human eye can consider only one position to the rest of the space in which the user operates, while modern software achieves simultaneous interaction of all points on the user in a given space. For such purposes, the analytical method of architecture implies the application of the theory of space (the so-called space syntax) and visibility graph analysis (VGA). Space syntax is defined as a set of analytical, quantitative and descriptive tools for analyzing the layout of space in buildings and cities i.e. the relationships and rules of behavior that space imposes (Hillier, Hanson 1984: 48-51). It is understood that spatial syntax is composed of elementary combinations, elementary objects, relations, and observations (Hillier, Leaman, Stansall, Bedford 1976: 151).

DepthMapX is one of the software packages specialized for the analysis of spatial syntax and the impact of space on social action (Al Sayed 2014: 30). When analyzing the software, the focus is on variables that indicate the social significance of the space, in this case of one Roman castrum principia. By integrally considering the interrelationship of individual sets of points with the rest of the space, the DepthMapX - software singles out certain regions in which the social behavior of users is more or less pronounced. Examples of such regions are communication axes, different regions in which visual communication is more pronounced, remote spaces, and those in which communication is either direct (ie. Physical) or indirect (ie. only visual).

The basic quantitative categories that define the impact of space action on social action are Isovist area, Connectivity, Visual Integration, Mean Shortest Path (Varoudis 2014: 298). A square grid in the software package divides the analyzed space into many small fields, i.e. points. During analysis, the positions of communications (doors and other openings) and obstacles (walls and pillars) must be marked. Each of the values is measured by the number of influences of individual points to the rest of the space.

The geometrically limited part of the space with which the immediate view from one point is realized concerning the visual obstacles is called Isovist. If a certain number of isovists are registered in certain areas, those areas are referred to as Isovist areas (Benedict 1979: 47). The number of physically direct connections that individual points have with the surrounding points in the considered space is considered within the category of Connectivity. This is especially important in the case of analyzing the availability of information by moving users from one space to another. If the user receives less information on that occasion, it affects his slower movement, because he has to visually look for information before moving to the next part of the space. Slower movement directly affects the reduction of the amount of user information in the next radius of action. Circular plans of space (for example conchs) offer less loss of information compared to other forms of plans since there are no corners that visually obscure any new information within a particular space. The visual connection of certain spaces between which there is no direct physical connection is defined by the size of Visual integration (Rohloff, Psarra, Wineman 2009: Ref.094: 03-05). Through the Mean Shortest Path category, the required number of steps in the movement of users is considered to achieve visual accessibility of the location with other spaces. It is directly proportional to the number of changes (i.e. the number of combinations) of the directions of action of the movement so that the number of steps is proportional to the depth
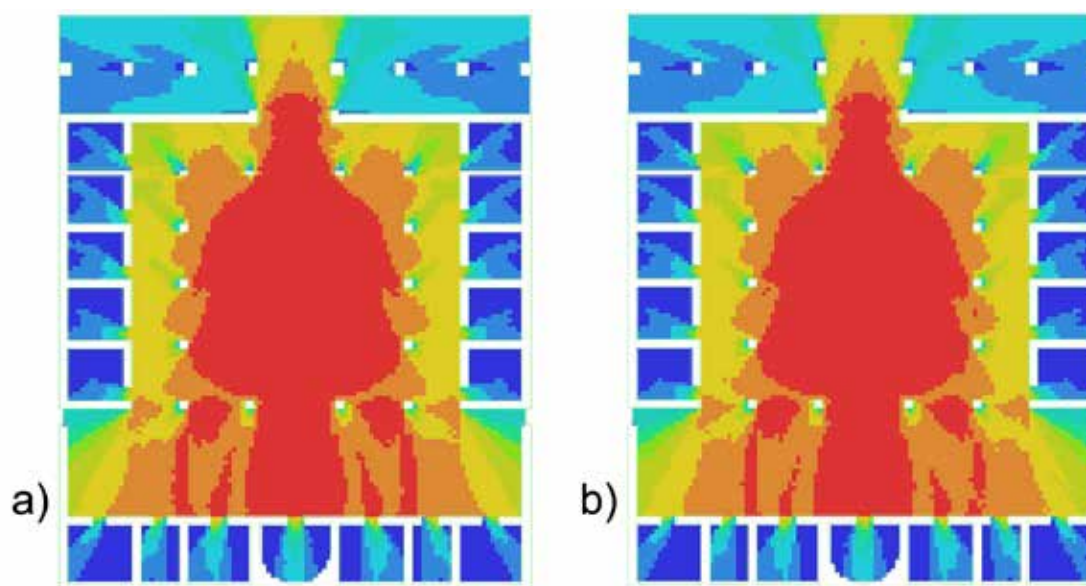
Fig. 8 The visual and physical communication graphs in the conducted state of Principia:
a) Connectivity graph; Isovist area graph.

of vision. The global relationship of one part of space to others is better considered in the case of this category than is the case with Connectivity, which defines exclusively physical contact that offers the mutual relationship between individual spaces (Varoudis 2014: 298; Turner 2003: 663).

The mentioned categories do not have certain units of measurement, because they represent the relationship between sizes of the same character. The numbers that are defined by them represent an overview of the measures of influence in the displayed space, which serves to compare the social influences in a given space. As the most suitable form of presentation for such a comparison in DepthMapX, a graph has been designed where the given color spectrum highlights spaces with more or less pronounced influences of the mentioned sizes. The color range is linearly adapted to the observed categories from its minimum to its maximum values for each point in the specific part of the building plan. Maximum values are expressed in red (the warmest), minimum values in dark blue (the coldest), while the average values are expressed in dark yellow. Other values can be easily calculated from this kind of color range in the graph representation.

The analysis of the Pontes Principia in the selected software brings with it certain specifics. Individual spaces (such as, in our case, the space of the tribunal) do not play a greater role in physical and visual communication but they are understood as an integral part of a larger space (in this case the hall/basilica). When choosing the thickness of the barriers (walls and columns), a correction in the graphical appearance for DepthMapXhad had to be made concerning the remains of the principia, which is mostly preserved at foundation level. Although the walls were almost the same thickness in the foundation and above-ground part, the thickness of the foundations for the supporting columns of the inner courtyard colonnade was much larger than the width of the columns in the above-ground part, and above all in the height of the man's field of vision. Since fragmentary parts of the columns on Pontes remained, the same width can be preliminarily adopted for their thickness as in Drobeta, which is about 70 cm (Marcu 2009: 132).

We will analyze the principia within two scenes. The first one shows the real plan of the building, while the second one is connected to the equal numbers of columns on all four sides of the inner yard as an imagined variant.
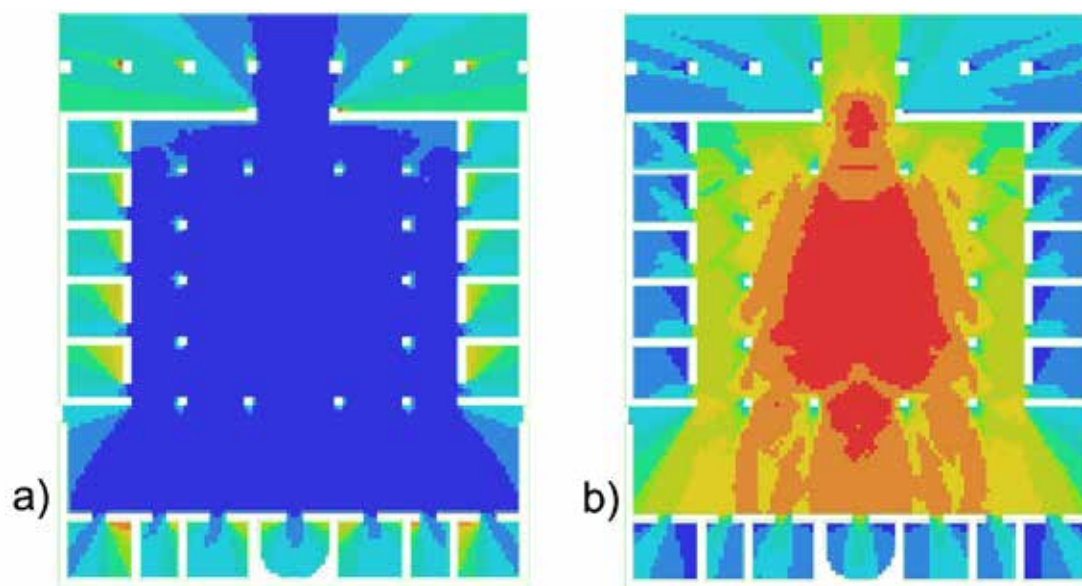
Fig. 9 The visual and physical communication graphs in the conducted state of Principia:
a) Mean Shortest graph; Visual Integration graph.

The graphs for Isovist areas (Fig. 8b) and Connectivity (Fig. 8a) in the first scene (Scene 1) show similarities, although their values differ significantly. By observing the graph for these quantities), the degree of isolation of each of the smaller rooms within the building of the principia is observed. The values that are present for these quantities in the space of the hall (basilica) are almost indistinguishable from those that are present in the space of the inner courtyard of the principia. Within the basilica, outside these values, only the spaces near the side doors of the principia stand out. The expressed minimum values for Isovist areas and Connectivity are characterized by the armamaentaria rooms, while the expressed maximum values of these quantities are characterized by the north-south communication axis. Graphs of both sizes indicate the extent to which the appearance of columns in the inner courtyard affects the visibility of the space inside the porticoes and the inner courtyard. In this regard, certain values of the magnitudes on the route of the columns vary precisely, depending on how close they are to these structural elements. Although these are very slim supports in relation to the building plan, direct communication (Connectivity) is difficult be-tween users inside and outside the courtyard (Fig. 8a) because of the views (Isovist) from individual points that are interrupted (Fig. 8b). When it comes to the size of Mean Shortest Path – Angle, values indicate qualitative characteristics that are practically inversely proportional to the previous ones (Fig. 9a). In the graph for the Visual integration category, most of the maximum values are concentrated towards the central part of the inner courtyard in the width of the central pillars on the north-south route (Fig. 9.b.). At some points on the same route, a sporadic occurrence of maximum values occurs. The rest of the inner courtyard is characterized by slightly lower values, and the maximum values also appear inside the hall space in the width of the courtyard. The mean values of this size are more present in the area of the porticoes around the courtyard, as well as in the rest of the space of the hall, excluding the space along the side exits from the principia.

A different solution in the second scene (Scene 2) can be considered, in which there is an equal number of columns in both directions (Fig. 10, 11). The numbers that are defined in both cases by the considered categories are represented in Table 1. For each point, the number of Isovist views
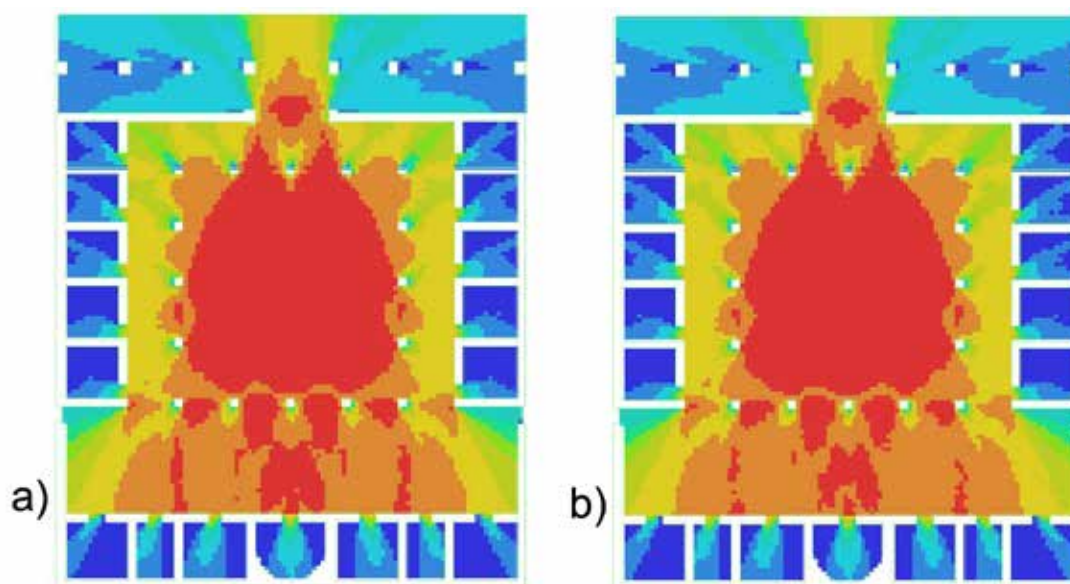
Fig. 10 The visual and physical communication graphs in an alternative solution of Principia plan:
a) Connectivity graph; b) Isovist area graph.

it can cover is calculated. Within the category of Connectivity, the number of physically direct connections that individual points have with the surrounding points in the considered space is calculated. The number of visual connection between each point where there is no direct physical connection is calculated by the size of Visual integration. Within the category of Mean Shortest Path, the required number of moving steps is calculated to achieve visual accessibility of the location with other spaces. It is noticeable to what extent the space of the basilica loses its connection with the inner courtyard. It is also clear that there is a break in the clear north-south communication towards the sanctuary of the principia (Fig. 10a.), while at the same time there are some losses in terms of visibility of the entrance to the southern rooms (Isovist areas) (Fig. 10b).

Since the Mean Shortest Path directly observes the movement of users in space, the appearance of columns in the courtyard and hall space is not a significant factor for different values to appear within these two spaces, which was not the case with previous categories (Behbahani, Gu, Ostwald 2017: Fig. 1). The same minimum values for this quantity are read on the entire north-south

communication route (excluding the sanctuary) (Fig. 11a). A larger change is noticeable in the part of the visual integration of the basilica space with the central courtyard in the case of changing the number of columns. Comparing with the previous existing solution (Fig. 9b), in an alternative solution, most shades of warm colors take cooler tunes and show smaller values (Fig. 11b, Table 1).

INFLUENCE OF BUILDING GEOMETRY ON THE USER

Concerning the specific arrangement of physical and visual barriers, the function of the rooms, and the geometric relations that prevail in the plan of the Pontes Principia, the mentioned analysis indicates the characteristics of the whole building as well as its components in terms of possible user behavior.

Within principia, in smaller rooms, visibility and communication are obscure, which is especially noticeable within the side rooms of the armamentaria, where the entrances are leaning against the transverse walls. Therefore, these rooms could not serve any greater communica-
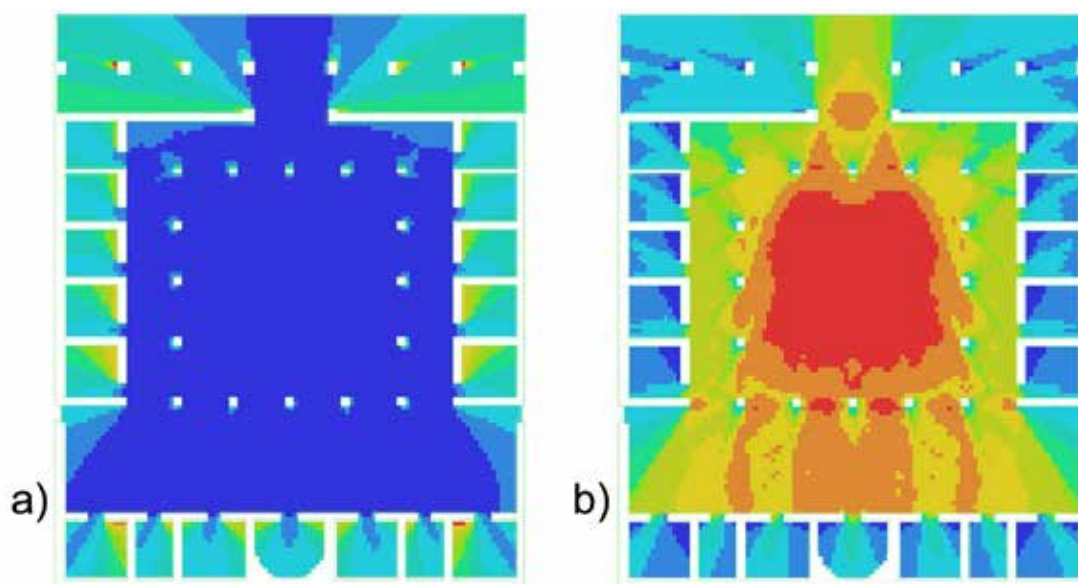
Fig. 11 The visual and physical communication graphs in an alternative solution of Principia plan:
a) Mean Shortest graph; b) Visual Integration graph.

tion, so they did not suit a larger number of users within them, and the possibility of efficient distribution within them was relativized if they were weapons depots. Therefore, in the author's opinion, the possibility remains that these rooms could also have served as administrative ones.

According to the expressed values of the considered sizes in DepthMapX, when speaking about Scene 1, in contrast to the isolation of previous rooms, there is a pronounced visual and physical connection between the space of the basilica and the inner courtyard. The values for the Connectivity and Visual Integration (HH) categories that define physical and visual communication at individual points within these spaces are not equal to each other. The communication on the north-south route is clearly emphasized in that area.

In addition to the existing solution, an alternative was considered, where a statically more favorable solution would be applied on the north and south sides with a larger number of supporting columns of the basilica (Scene 2). That number would be equal to the number of columns on the sides of the courtyard. In the alternative solution, the values of these quantities were analyzed in the case when there are five pillars along all sides of the inner courtyard. It is noticeable that the greater distance of a smaller number of columns in the existing solution on the north and south sides contributes to better visual and physical communication. The specific distance of the columns of the hall on the north side conditions the radial expansion of the view from the access part of the principia to the south wall of the basilica, which achieves direct visual communication to the entrances to the south rooms. The derived solution emphasizes the north-south communication and improves the visibility between the entrance part of the building with the sanctuary and other rooms in the south. The variant with a larger number of columns would significantly jeopardize the communication of the basilica with the central courtyard. The space of the hall was characterized by undisturbed communication and visual inspection. Its architectural structure enabled it to serve as a meeting place for the entire commander-in-chief. Its connection with the inner courtyard is especially pronounced. With the applied solution of the plan on Pontes, there was direct physical and visual communication with Aedes. The spiritual center of the principia, but also for the entire Pontes castrum, was certainly in the sanctuary room, which

Scenario		Node Count	Isovist areas	Connectivity	Visual integration	Visual Mean Shortes Path
Scene1	Min		10.9343	120	5.8394	0.134763
	Aver.	12794	408.238	45720.03	17.7024	0.404552
	Max		684.376	7638	27.2449	1.85267
Scene2	Min		10.9463	120	5.83558	0.138346
	Aver.	12788	392.878	4397.76	17.1032	0.407653
	Max		663.207	7402	26.1624	1.84938

Table 1 Overview of DepthMapX values of the impact of space on social action for an existing (scene1) and alternative solution (scene2) of principia space.

was placed on the dominant axis of communication in the north-south direction.

Analyses of visibility graphs and visual communication are very important for better determination of functions and communications in the corner parts of the principia on the south side. They indicate specific relations on the above issues in the case of the side (east and west) doors, the tribunal area, and the corner rooms in the south with the southern corridors. On all analyzed graphs, there is a noticeable deviation of the value of visual and physical communication in the area around the side door of the principia (on the west and east side) to the rest of the hall (basilica) space. The western side door was very close to the tribunal, sufficiently hidden concerning the main entrance and to the visual connection with the other spaces. The position of these doors and corridors concerning the corner rooms of the southern tract, the tribunal, and the basilica is reminiscent of the solutions of evacuation exits because through them the user could get out of the principia in the fastest way. During a war, these exits were more suitable for an evacuation since they led to the side alley. These side exits were not on the main roads within forts, so they provided visual protection from an invasion on the main roads within the castrum. These kinds of exit also could help the commander to avoid the crowded basilica and courtyard during meetings

in the time of peace and to act faster after leaving the building. This is especially true for those persons who were most familiar with the use of the Tribunal and the corner rooms in the south. It would certainly be the commander-in-chief of the garrison. The definition of the room on the corner within the southern row of administrative rooms indirectly indicates to that solution. All indicators according to the above analysis indicate that the corner room in the southwest served as the working room of the commander-in-chief.[5]

CONCLUSION

The reconstruction of the plan according to which the project of principia in Pontes was created can indicate the basics of the builders' approach to design development. In addition to the usual functional distribution of space in one Roman principia, the builder applied very specific dimensional relations in both directions, according to which the building received a proportional relationship between the individual elements of the structural whole. Modern analyses of the space of the principia have made it possible to get acquainted with the qualitative advantages of such a project idea.

5 Whether a similar case was on the opposite, eastern side should be determined only by future archaeological research.

In the plan of the Pontes castrum, there are certain geometric relations to which the plan of the principia is subordinated, such as the central building of the castrum, and whose position and architectural appearance had to be dominant to other buildings. With its plan, the Pontes castrum satisfied the basic forms of a Roman castrum from the Middle Imperial time, and such was the scheme of its principia. This paper offered reasons for the initial assumptions that plans of castrum and principia were geometrically planned, which corresponds to one of the basic rules of Roman architecture.

The degree of elaboration of the graphic plan of the principia is readable primarily in the basis of the plan on the decomposition of squares, which determines the position and size of individual spaces and rooms. The application of proportional relations does not jeopardize the definition of the north-south direction as the main axis of communication, which is otherwise characteristic of Roman principiae.

Spatial syntax functionality analysis software, such as DepthMapX, allows us to view the qualitative properties of a Pontes principia space through certain quantitative indicators. The application of this software provides direct insight into the functionality of the space, primarily in terms of physical and visual communication.

The analysis of the influence of the geometry of the building was conducted to perceive the behaviour of users, and above all their movement within the geometrically designed plan of the principia. This plan, in addition to geometric regularity, is conditioned by the classical arrangement of rooms for certain functions in one Roman principia, which means that the significance of the analysis of this case can be applied to other *principiae* throughout Roman Limes.

By applying the analysis of the geometry of the plan of the principia and physical and visual communication, the relations and functions of individual spaces and rooms that have not been clarified so far can be presumed. This primarily refers to the specific position of the side doors of the principia, the corner rooms and corridors at the southern end, as well as the spaces of the tribunal between the mentioned elements of the principia. At the same time, the analysis highlighted the role of the central courtyard and the hall as the assembly spaces of the principia.

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REZIME
PRINCIPIJA KASTRUMA PONTES –GEOMETRIJSKI ODNOSI U OSNOVI OBJEKTA I NJIHOV UTICAJ NA PONAŠANJE KORISNIKA

KLJUČNE REČI: PRINCIPIJA, RIMSKI KASTRUM, ANTIČKA ARHITEKTURA, PROSTORNI I GEOMETRIJSKI ODNOSI, PONTES.

Pravilna podela unutrašnjeg prostora pod izgrađenim strukturama unutar kastela Pontes je odredila mesto i površinu Principije. Kvadratni oblik centralnog dvorišta i ritmičan niz pojedinih bočnih prostorija, simetrično rešenje u planu, pojava pravih uglova i paralelnih zidova su nagovestili mogućnost postojanja određenih geometrijskih odnosa u planu građevine. Sprovedena analiza geometrije plana Principije ukazuje da su stranice kvadrata prema kojem je određena osnova centralnog dvorišta u jednom smeru podeljene na četiri dela, a u drugom na tri dela. Takvi geometrijski odnosi su definisali raspone prostorija unutar Principije. Četvrtina dužine stranice ovog kvadrata odgovara rasponu bočnih prostorija i bazilike, dok trećina dužine stranice odgovara širini glavne komunikacije pravca jug-sever, širini i dubini aedesa i pojedinih prostorija u nizu na južnoj strani Principije. Spomenuta podela kvadrata u slučaju Principije odgovara broju delova na koji su podeljene dužine bedema na svakoj strani što ukazuje na istovetan pristup u proporcionalnoj podeli dužina bedema fortifikacija i u podeli prostora Principije.

Geometrijski odnosi su inicirali analizu uticaja plana Principije na ponašanje korisnika po pitanju fizičke i vizuelne komunikacije. Ova vrsta analiza nam je razjasnila prednosti specifične podele kolonade centralnog dvorišta na određeni broj interkolumnija. Ona je takođe postavila osnove za moguća tumačenja funkcija pojedinih prostora, komunikacija i prostorija na jugu, kao što su bočni izlazi, koridori između oficina, prostorije na krajnjim uglovima Principije i platforme za tribunale.

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HERITAGE WE PRETEND NOT TO SEE: AN OLD MINING COMMUNITY IN THE VILLAGE OF KOSTOLAC, SERBIA

ABSTRACT

In addition to Viminacium, an internationally recognized Roman archaeological site and park, there are many other elements of cultural heritage in the Kostolac village situated in northeastern Serbia near the Danube, which are almost unknown for most of the people in Serbia and beyond.

This year, 2020, marks the 150th anniversary of the opening of coal exploitation in the Kostolac village, and the official beginning of the industrialisation of Serbia, determined by this event in 1870. Unfortunately, the remains of the buildings in the mining community which witnessed an important part of the modern development of the country are in the state of ruin, and have been slowly disappearing after the closing of the underground coal exploitation in 1966, following the rapid development of modern strip mining and electric generation. Also, many spiritual elements in the life of Kostolac people connected to the mining are not widely recognized as values, although they represent the precious intangible heritage of this village and whole region.

KEYWORDS: KOSTOLAC VILLAGE, MINING COMMUNITY, MINING HERITAGE, INDUSTRIAL HERITAGE, UNDERGROUND MINE, COAL MINING.

INTRODUCTION

The agricultural fields of Kostolac village (village of Stari Kostolac), in the immediate vicinity of the town of Kostolac, near the city of Požarevac in northeastern Serbia along the Danube, the place of connections and divisions of peoples throughout history, spread across the area where the territory of *Viminacium* - the Roman city and the legionary fortress once existed. At this place, intensive strip coal mining and electricity generation have been carried out for decades, resulting in the disappearance of ancient buildings and the loss of large areas of some of the most fertile land

in Serbia which hides historic remains, but also layers of coal, deep underneath.

In addition to Viminacium, an internationally recognized archaeological site and park (Nikolić, Anđelković Grašar and Rogić 2017; Anđelković Grašar, Rogić and Nikolić 2013: 267-271) proclaimed cultural property of exceptional importance for the Republic of Serbia in 1979 (Одлука 1979; Одлука 2009), and part of the international cultural property *Frontiers of the Roman Empire* being on the Tentative UNESCO World Heritage List (UNESCO WHS List; Korać et al. 2014) since 2015, there are many other elements of cultural heritage on the territory of Kostolac village,

Fig. 1. Arial view of the residential part of Kostolac village with preserved mining community buildings
(Tags: the authors on Google Earth Pro photo printed on November 27, 2020 - historical image from 2020).

which are almost unknown for most of the people in Serbia and beyond. On the plateau above the village there are the remains of the medieval town of Braničevo, dated to a period from the 11th to the 13th century (Поповић и Иванишевић 1988: 167-168; D'Amato and Spasić-Đurić 2018, 29-32; Spasić-Đurić and Jovanović 2018: 151-155), as well as the Church of St. George built from 1923 to 1925 (Богдановић 1928, 46-48), while in the residential part of the village there are several traditional historic houses. The wide area of the village cemetery has a continuity of burial from the 4th century BC (Korać and Mikić 2014: 13-14;) up until today. This village is the place where underground coal exploitation started in 1870, representing an event marking the beginning of the industrialisation of Serbia (Вучетић 2010: 11), and where the remains of the buildings of the former mining community around the old mine shaft are situated. Unfortunately, with the exception of Viminacium and the Church, all cultural properties in the village are still only under prior protection (Просторни план 2015: 65-66) and are mostly decaying.

In terms of tangible heritage elements connected to the old mining community, there is the former entrance to the oldest mine shaft "St. George" closed as early as 1933 (Јовановић, Паклар и Ћосић 1971: 94) with a coal wagon, several houses with apartments for miners, private houses from the same period, as well as an old tavern and administrative building of the mine, while on the hill above the village next to the Church there is the villa of the river captain Dragutin Todić (1880-1928), who was transporting Kostolac coal along the Danube. The Church of St. George was the captain's endowment as well as the house for the village priest (Богдановић 1928: 46-48, 70) (Fig. 1–Fig. 9).

The intangible heritage elements are represented by stories of buried treasures, demonic characters and mythical creatures, cults of sacred trees and medicinal springs, village saints' celebrations, various toponyms, centuries-old use of natural resources whose wealth led to the development of agricultural and building activities, as well as the diverse ethnic structure (Nikolić 2018: 170). Many of these can be connected to the mining.

MINING HISTORY REMAINS AS HERITAGE

The development of the mining industry in the Kostolac area has been a driver of rapid development for the entire Požarevac region since the 19th century (Nikolić 2018, 520). In 1870, coal was found in a test shaft, and in 1873 the privilege of opening a mine in Kostolac was issued to the owner of a steam mill and spirit factory in Belgrade, the Czech Franja Všetečka (Анђелковић 2010: 15; Grgašević 1923: 5). However, in 1881 Ђорђе Vajfert (1850-1937), industrialist and later lifetime Honorary Governor of the National Bank of the Kingdom of Serbia and the National Bank of the Kingdom of Serbs, Croats and Slovenes, became the owner of the mine. Together with the Czech engineer Franjo Šistek (1854-1907) he developed it significantly (Анђелковић 2010: 133) as well as the mining community for its workers (Пејић и Јаношевић 1971: 63; Симић 1971: 77-78; Grgašević 1923: 15). In 1889, the Kostolac mine was the only one in Serbia with permanent production and exports of coal while Serbian industry and traffic were almost entirely operating on its basis (Пејић и Јаношевић 1971: 64).

Except for buildings for the accommodation of managers, staff, workers and miners, many industrial facilities with a river dock were built in the village of Kostolac. The electric plant produced electricity to illuminate the village and operate machinery in the mine (Вучетић 2010: 15). In order to exploit the mine's fine coal, a factory of bricks and roof tiles was built in 1885. Its products were used for the erection of buildings in the community, but it was soon closed because it could not withstand the competition of small, peasant manufacturers. The steam mill built in 1890 worked until the mid 1950s (Пејић и Јаношевић 1971: 63, 68-69). The glass factory erected in 1906 produced flat glass and packaging products but was destroyed in the First World War. The City park in Požarevac was decorated with amorphous clumps of raw glass mass remaining after the factory's

demolition, between the two world wars (Фелдић 1990: 223), while the building material left over was used for the construction of industrial buildings in the nearby Kostolac area (Влашковић и Славковић 1971: 117). Several decades after the Second World War, all industrial facilities of the Kostolac mine disappeared, and the mining community fell into ruins (Fig. 3).

The appearance of the mining community in the village of Kostolac is evidenced by a few photographs and drawings, as well as by several records of travel writers from the 19th century (Nikolić 2018: 162; Стојковић 1893: 158-159; Каниц 1989: 190). The peasant village of Kostolac had 212 homes in 1887, while the workers' community had ten residential buildings for miners, a few private residential buildings, a tavern, a mine administration building, a butcher's shop, and a grocery store (Фелдић 1971: 214-215). At the end of 1902, the mine owned 626 ha of land and a community of over twenty buildings (Симић 1971: 84-85). From the beginning of the 1930s, a library and reading room in the village and the mine were established, with a choir of peasants and miners as well as a mining drama section. There was also a tamburitza orchestra, which was founded in 1927 and lasted until the period close to the beginning of the Second World War (Шегрт 1971: 231-234) (Fig. 4). In 1939, it was noted that the village of Kostolac had many craft shops, among which were four tailor's shops, the only shops of this kind in all villages of the Požarevac area. Also, there was a medical institution in the village and the mine itself had its own doctor. The only sport club in the whole rural area of Požarevac was the football club "St. George" in the village of Kostolac, with miners as its players (Вуловић 1939: 52-57).

Apart from traditional rural and townhouses, a worker's house was an important form of housing. As in other mining areas of Serbia, community flats built during the 19th and the first half of the 20th century in the village of Kostolac represent a "distinctive element of mining culture". They
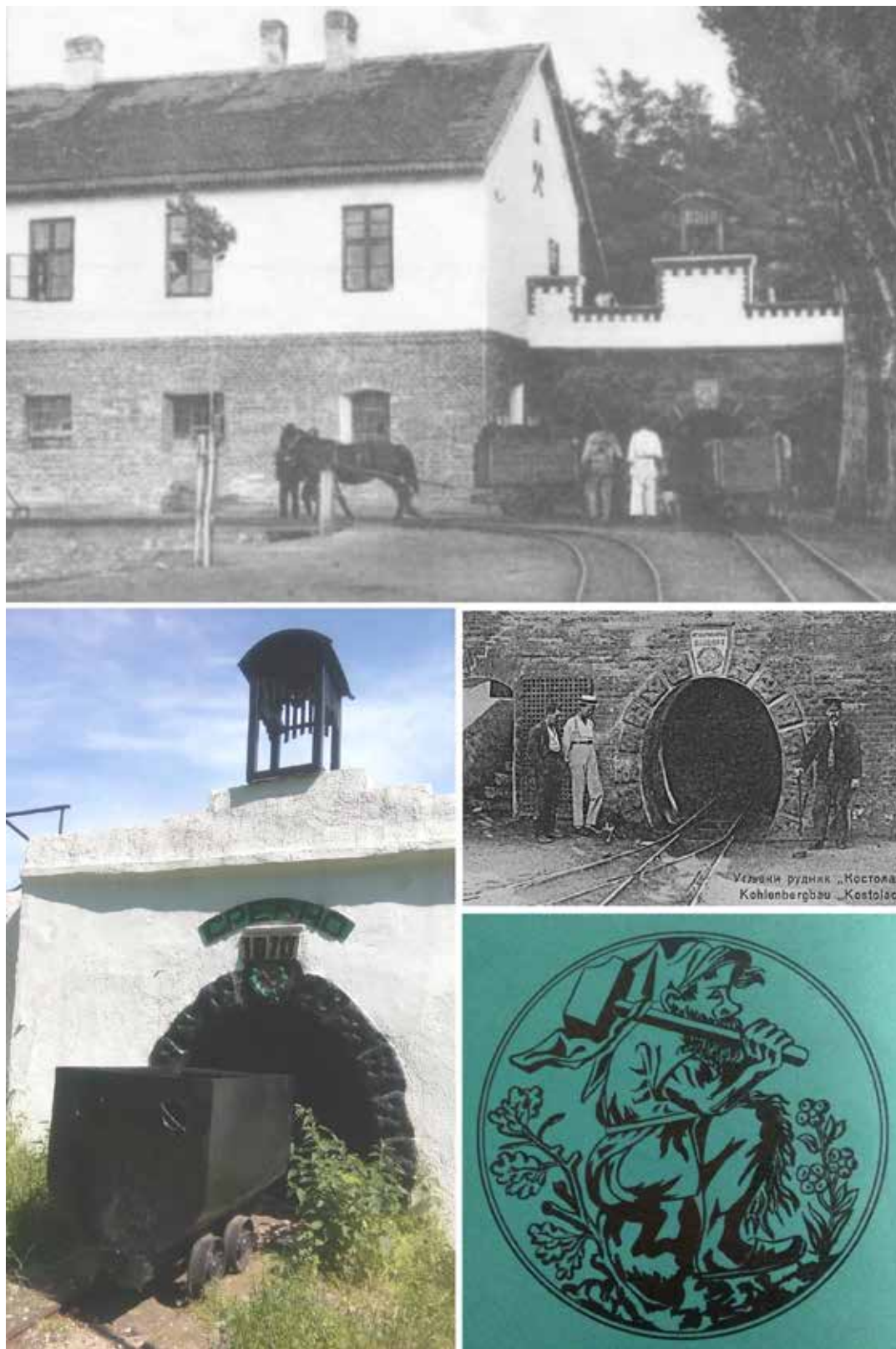
Fig. 2. Entrance to the underground mine shaft. Up: the entrance with the surrounding area in the end of the 19th century (Simić 1971, 79); down left: the entrance today (the photo made by the authors in 2017); middle right: the old photo of the entrance (Simić 1971, 99). Down right: Badža the Dwarf as seen by the artists (Marković 1971, 6).

were created according to the specific way of life of the miners and the change of life of the peasantry (Ромелић 2000: 225- 226). The community represented a kind of "urban agglomeration" that differed in content and form from its rural ambient. Although created at different times and under different conditions, the village and community soon became the entity we recognize today as the village of Kostolac (Фелдић 1971: 214). After the foundation of the nearby town of Kostolac during the Second World War and the beginning of strip mining and extensive electricity generation in the area (Јовановић, Паклар, Ћосић 1971: 101), the miners started to move from the village and community to the town, and after the underground mine was closed in 1966, life in the community soon ended (Fig. 5).

It is evident that residential buildings for shared housing of miners in Kostolac village were built according to the same architectural plan and facade composition, having modest exterior decoration. They have small apartments accessible from the backyard porch and stairs (Fig. 3; Fig. 4). However, the main administrative building of the mine was designed as a monumental facility with more complex composition and ornamental facade which is also visible on some other small mine buildings (Fig. 7a). Architectural values of these buildings should be carefully researched in future studies, always having in mind that they are connected to historic, social, artistic, cultural, technical, technological, and many other aspects of a building creation, existence and eventually, abandonment.

The wider Kostolac area has been inhabited for millennia, and throughout its history various peoples have met and mixed here, leaving their traces in it (Nikolić 2018: 195), from Roman Viminacium as a cosmopolitan centre of the time, to the Kostolac town built in the 20th century. In the 19th century, the first Serbian miners lacked expertise and experience, so apart from the locals, miners and engineers from Europe started to work in the Kostolac mine, including settlers from the present-day Czech Republic and Banat region. The original gap and mistrust of Serbian farmers who became miners towards the settlers disappeared, friendships and family ties were formed, while the habits of the settlers slowly merged with local customs (Шегрт 1971: 231). In 1878, the Czech Slavibor Brojer opened the first school in the village (Вучетић 2010: 41). The Slovenes, together with other former miners from today's Croatia, Slovakia, and Austria came to the village of Kostolac during the First World War as Austro-Hungarian soldiers were sent to work in the mine because most of the farmer miners were mobilized into the Serbian army. In the period between the two wars, a new population of Slovenian origin immigrated with the engineers to the mine (Шегрт 1971: 231). Most of the miners from the village mine and their descendants today inhabit the town of Kostolac (Fig. 6).

Many spiritual elements of the life of Kostolac people are connected to the mine. Beliefs in imagined beings of supernatural power are deeply rooted throughout northeastern Serbia (Зечевић 1981: 8). Badža the Dwarf is a demonic character found in the stories of Kostolac village, actually being a variant of the mining demon present in European underground mining sites, having many different names (Толстој и Раденковић 2001: 506-508) (Fig. 2). The wealth of ancient remains in the vicinity of Kostolac led to the connection of many places with buried treasures. The toponyms kept traces of different peoples living in the area (Ђокић и Јацановић 1992: 61-110) and all had in common their attachment to land and nature, expressed through agriculture and other exploitations of natural resources, while maintaining traditional crafts - including brick production, active in the area from the Roman period to the present day (Nikolić 218: 209-210, 519-520). The deposit of the natural building material locally called "crvenka" ("reddish") has been used in the area of Kostolac throughout history and is situated along with the former underground mine. It represents a layer of rock that underwent metamorphism due

Fig. 3. Apartments for the miners (the photos made by the authors in 2017).

Fig. 4. Apartments for the miners (the photos made by the authors in 2017).

to the combustion of the lower coal layers after its contact with oxygen and sunlight and thus we can call it natural brick. Viminacium Romans used it for building (Nikolić 2013: 28; Nikolić, Rogić and Milovanović 2015: 66-67) and until recently it was used for covering industrial roads and making building blocks. Today, its exploitation is prohibited due to ground instability. The deposit is a valuable geoheritage, connected to the particular soil type and the existence of coal, not often encountered in the world (Nikolić 2018: 213-214;

Nikolić and Roter-Blagojević 2018: 788-789). It is also connected to the local intangible heritage, because the cause of its formation, that is, the coal self-ignition, until recently was associated with the powers of God among the villagers, although the scientific explanation for it has been known here for a long time (Nikolić 2018: 213; Nikolić, Tapavički-Ilić and Delić-Nikolić, in print).

Fig. 5. The private house and the grain storage with the tavern and its surrounding area. Up: the area in the beginning of the 20th century (Feldić 1917, 215); middle left: the surrounding area, the private house and the grain storage today (the photos made by the authors in 2017); down: the old tavern today (the photo made by the authors in 2017).
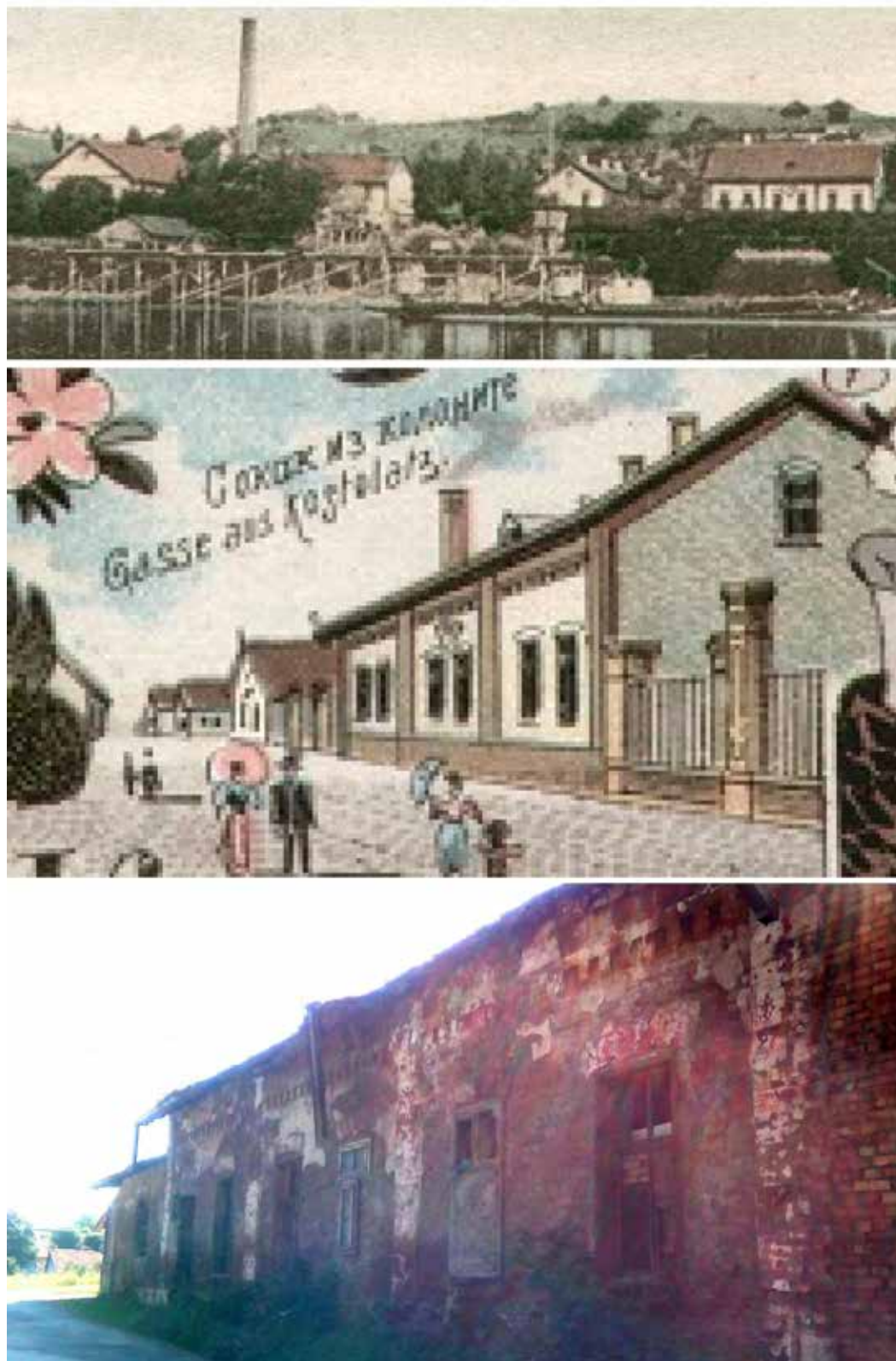
Fig. 6. One of the old buildings in the mine. Up: the mine viewed from the river in the beginning of the 20th century, with the building visible on the right (EPS); middle: the building shown on the old postcard from the beginning of the 20th century (Korać, Nikolić and Tapavički-Ilić 2016, 120, Fig.4); down: the building today (the photo made by the authors in 2017).

DESIRE AND OBLIGATION VS. OPPORTUNITY AND REALITY

Industrial heritage carries social value as a witness to the lives of people, and it has technological and scientific values in the history of production, engineering and construction, as well as the aesthetic value of architecture or planning (Ratkajec 2014: 253). The need for the preservation of industrial heritage has long been recognized in scientific and professional conservation communities in Serbia; some buildings and complexes are part of the *European Industrial Heritage Network* but still the practical protection of this heritage almost does not exist (Nikolić 2018: 492). The only coal mine in Serbia protected and presented on the network list, also having a museum, and - what is interesting, where coal exploitation is still ongoing, and where the community is still alive, is the old Senje coal mine (ERIH). However, its wide promotion failed, and visitors are rare (Nikolić 2018: 765-766). What can one expect for the Kostolac mine, whose remains are almost destroyed?

After the Second World War, the properties of Đorđe Vajfert were nationalized. The current owner of the buildings of the mining community is the Electric Power Company of Serbia, while the empty captain's villa on the hill is managed by the Church administration as well as the priest's house. A restoration project for the villa was made many years ago with the intention of adapting it to be the Museum of Medieval Braničevo, since the Church allocated it for this use by the Požarevac National Museum (Nikolić 2018: 472), whose recent excavations have shed a new light to the medieval history of the area (D'Amato and Spasić-Đurić 2018: 29-67; Spasić-Đurić and Jovanović 2018: 151-173) but the project has only remained on paper. On the other hand, the Electric Power Industry of Serbia has no economic interest in the reconstruction of buildings in the former mining community, so they have been decaying for decades, illegally inhabited by the Roma people, who settled here mostly as refu-

gees after the events in the former SFR and SR Yugoslavia in the 1990s (Nikolić 2018: 202, 403, 461; Стратегија 2009: 27). For many years, closing eyes to the housing problem of Roma people and the decay of the buildings, has not only made the situation worse for them as people who lack basic living conditions, but also for the industrial heritage, which they also recognize as such (Nikolić 2018, 495). One of them said, "It's good for the museum, but not for life" (Dukić 2012: 70-73) (Fig. 3, Fig. 4, Fig. 7).

The demolition of industrial facilities from the 19th century around the old Kostolac mine and its river dock, filling the wide neighbouring area with ash during contemporary mining activities which destroyed the multilayered archaeological site of Selište (Спасић-Ђурић 2012b: 10) and the condition of the buildings in the mining community represent the relationship of the generations after the Second World War to the industrial heritage. Regardless of the type of works performed on the remaining buildings of the community by the Roma people who live in them, some of these buildings owe it to Roma families that they still survive in some way (Nikolić 2018: 403). Currently, the most important problem for any planning in this area is the resettlement of Roma people, identified in the *Action Plan for Improving the Position of Roma on the Territory of the City of Požarevac* from 2016 to 2020, which has foreseen their relocation to empty rural households, but also to purpose built or renovated old buildings (Акциони план 2015: 89-94); proposals, however, have not yet been implemented (Nikolić 2018: 403-404).

In the process of rehabilitation of industrial heritage buildings, the issue of ownership and management, the provision of financial resources, and setting clear goals for future uses are very important issues, since a potential investor cannot be expected to "recognize, understand and affirm a cultural property unless he recognizes or receives adequate economic profit" (Димитријевић Марковић и Сретеновић 2008: 267, 272). Thus, the question of the destiny of Kostolac mining

community buildings may be raised in connection with the future ownership and involvment of private sector. The development of a comprehensive adaptive reuse project and the promotion of industrial heritage in Serbia could play a key role in this, also fitting into the social responsibility policies that the buildings' owner - Electric Power Industry of Serbia - fosters throughout its work (Nikolić 2018: 461), connecting its own investments with private investors. The mining community itself is not mentioned in the official regional spatial plans, but it is recognized in the spatial plan for the Viminacium archaeological site, which emphasizes the need to preserve this valuable industrial heritage by seeking mechanisms for its inclusion in all future plans (Просторни план 2015: 60). In the spatial plan of Požarevac (Просторни план 2012: 133), a project made as a part of the plan for the permanent work suspension of a nearby village Klenovnik small strip mine was noted. The project envisages a Mining Museum with a closed collection in the existing and adapted mine administrative building and an open collection with original equipment and machines, as well as the reconstruction of the underground mining shaft (Радосављевић и др. 2014: 58-60) This project has not yet even started.

Industrial buildings are suitable environments for cultural activities and creative economies, and contributions to the preservation of this heritage in the world more often come from the initiatives of the creative sector rather than from the state. Activation of abandoned industrial buildings often helps non-affirmed professionals, connecting them with clients, and when major adaptations of the buildings occur, they generally become those who defend buildings from market interests (Čizler 2014: 27-29). The failure of the state project for the Kostolac Mining Museum shows that successful worldwide examples of smaller building reuse projects should probably be followed as well, enhancing the role of the creative sector. Even a partially restored Kostolac village mining community would be able to accommodate some creative ac-

tivities that could bring further social and economic development, getting precious experiences that could help in more extensive future reuse (Nikolić and Roter-Blagojević 2018: 789). The role of local creative individuals can be very important in the future preservation of the mining community. This is supported by the existence of a large number of individuals living in the small town of Kostolac who cherish and perform fine and applied arts, as well as music culture, within numerous local art associations and rock bands (Fig. 9).

Local communities in the Kostolac area have been closely related to mining for one and a half centuries, changing it's the area's agricultural occupation during industrialization, while forming new mining communities with the miners from Europe who settled here. As in other mining areas in Serbia, where different migrations occurred, the process led to the dissapearance of an ethnically and culturally homogenous environment, and the formation of the so-called mining culture (Ромелић 2000: 226), which needs to be valued as one of the elements of Kostolac's intangible heritage. Thus the remains of the Kostolac village mining community are witnesses to the beginning of modern industry in Serbia, and to the social development of the territory in the pre and post war periods (Nikolić and Roter-Blagojević 2018: 790; Robinson 2008: 24). Interestingly, a small private museum is located in the town of Kostolac, where a former underground miner, Petko Popović, born in 1933, exhibits in his house over 3,000 mining artefacts he has collected for decades across the former SFR Yugoslavia - tools, equipment, uniforms, helmets, photographs, wagons from the 19th-century Kostolac mine, as well as over 3,500 other exhibits from the post-World War II period and the time of SFRY (Večernje Novosti Online 2015) (Fig. 10).

The Kostolac mining history is commemorated on Miners' Day on August 6th, when flowers are laid at the "St. George" shaft entrance. However, only two elements of tangible heritage that symbolize it are preserved - a mining locomo-
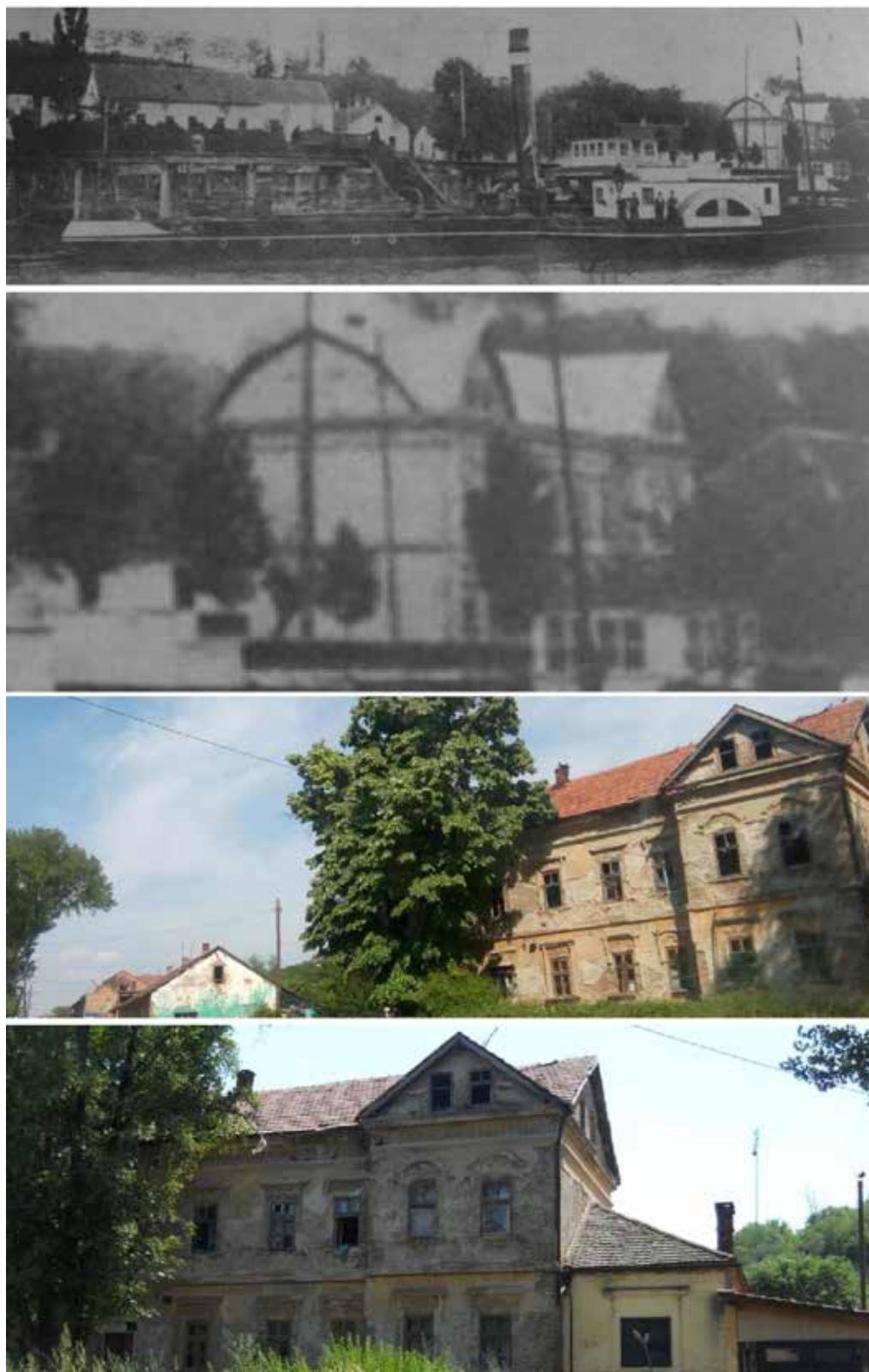
Fig. 7. The main administrative building of the mine. The old river dock with the building visible on the right and its detail (Simić 1971, 86); the building today (the photos made by the authors in 2017 and 2009).

Fig. 7a. The main administrative building of the mine. Details of the facade today
(the photos made by the authors in 2017).
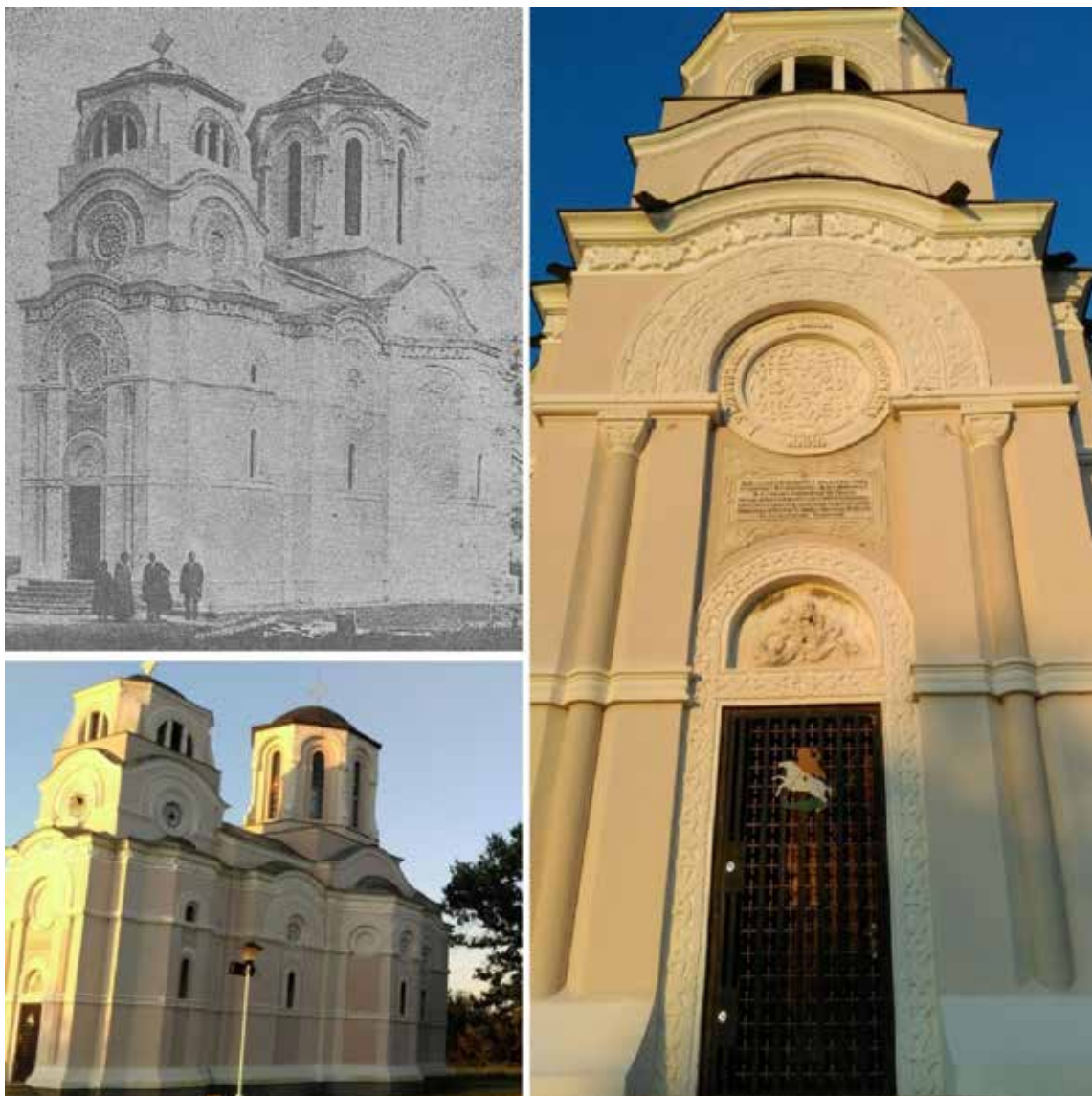
Fig. 8. The Church of St. George. Up left: the Church soon after it was built (Bogdanović 1928, 68); down left and right: the Church today (the photos made by the authors in 2017).

tive in Kostolac town (manuafactured in USA in 1945 and operating in the area from 1948 to 1997), and the mentioned entrance whose mining bell was stolen a few years ago (Nikolić 2018: 402-403; Спасић-Ђурић 2012a: 1-2; Đurić, Spasić-Đurić 2018). The older locomotive, once also operating in Kostolac, produced in Philadelphia in 1916/1917 and bearing the nickname "Two-headed Dragon" and the name "Kostolac", is one of the valuable exhibits of the Railway Museum Belgrade, being declared cultural property and one of

only two remaining locomotives of the type in the world. It was used on the Salonica front for the needs of the allies, and in 1940 was brought by the Germans to Kostolac, where it worked until 1951. "Kostolac" was exhibited in 2018 in Paris on the occasion of a centenary since the end of the First World War (Железнице Србије ад 2019; Политика 2017; Đurić, Spasić-Đurić 2018). There is also a mine clock under prior protection as a valuable industrial product from 1900, located in the tower of a building in the town of Kostolac,

but almost unknown to local people. According to old community photographs, this clock originally operated in the building of the mining community, being one of its important symbols (Спасић-Ђурић 2012a: 1-2) (Fig. 12).

The central plateau above the village of Kostolac includes the remains of the medieval town of Braničevo, the endowment Church, as well as a sacred tree as part of village religious rituals (Fig. 1). Based on the connections between these elements and those in their immediate surroundings, including the magnificent Danube, Viminacium archaeological site and several monasteries, many stories can emerge, as well as a concept for presenting the entire ladscape (Fig. 13). The story of the secondary use of ancient Viminacium elements as spoliae can further take us to the nearby monasteries where they were built in (*cf.* Milovanović and Anđelković Grašar 2017: 167-182), learning also stories about local cults, which bring us to the village church on the plateau. The role of its founder in the functioning of Kostolac mine connects us not only to underground mining and its community, but also to "crvenka" and its use in ancient Viminacium (Nikolić 2018: 430-432). The exploitation of this natural building material in the bed adjacent to the underground mine has been stopped, and after the past demolition of some of the community buildings, a spacious plateau between the entrance to the old shaft and the deposit itself retained, which can be used in future for creative presentations of the area (Nikolić and Roter-Blagojević 2018: 788-789). In the Czech Republic, this material is often called "červenka" (Itras), and with the knowledge that the Czechs were some of the first miners to settle in Kostolac, new stories can emerge (Nikolić 2018: 445; Nikolić, Tapavički-Ilić and Delić-Nikolić, in print; Nikolić and Anđelković Grašar, forthcoming).

Such storytelling links nature and local beliefs, as well as the development of the techniques and technologies that came along with the remains of tangible cultural heritage. The spatial connections of these elements create short paths of history and culture for visitors across the Kostolac landscape, formed on the basis of the interconnections of its tangible and intangible heritage, where the mining history has one of the most important roles (Nikolić 2018: 430, 432).[1] However, this process cannot be complete without the stories of local people. It is the last opportunity to record the tales of still living miners of the underground mine, or even their descendants, because soon it will be too late. These stories form the precious treasure of the intangible heritage of Kostolac mining history which is connected to older stories – even those of Roman Viminacium. It was Đorđe Vajfert, Dragutin Todić, mine managers and enginners as passionate antique lovers who for decades collected Viminacium stone remains left to free distribution and spread in agricultural fields, thus saving them, and afterwards leaving them to museums (Спасић-Ђурић 2015: 14).

The characteristic of small mining communities is the nature of their work – dirty and unhealthy, but nevertheless a source of pride and cohesion (Warwick and Littlejohn 1992: 30). The protection of the mining community in the village of Kostolac can be the first step in the preservation of the mining heritage of the whole Kostolac area, which includes traces of underground mining, but in the future will also include contemporary strip mining. The reconstruction of the post-industrial landscape in the German Lusatian strip mining area which introduced new tourist facilities so that the area is now visited by hundreds of thousands of visitors a year, is often received with the dissatisfaction of the local population during the process. "They are very conflicted", said one of the tour guides, because "they want to be proud of their past." He asked a question: "How to work with locals, how to celebrate the mining history and at the same time create a nice and interesting new area?

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1 The authors of this paper have already stressed the enormuos potential of this region and importance for greater interconnection of the heritage within it pointing on the long process in sharing of heritage by linking the archaeological heritage of Viminacium and other heritage forms (Anđelković Grašar and Nikolić 2019: 77-98).

Fig. 9. The captain Todić's villa and the priest house. Up: the villa soon after it was built (Bogdanović 1928, 6); middle: the villa today (the photo made by Zoran Cekić in 2008); down: the priest house today (the photo made by the authors in 2017).

Fig. 10. The industrial part of the mine. Up: the old glass factory (Feldić 1990, 224); middle: the view to the industrial railway from the hill above the village (EPS); down: industrial railway transporting coal to the Danube (Simić 1971, 76).

Fig. 11. The postcard from the beginning of the 20th century showing the buldings of the mine
(Korać, Nikolić and Tapavički-Ilić 2016, 120, Fig.4).

Угљени рудник »Костолац« — Kohlenbergbau »Kostolac«

Угљени рудник „Костолац"
Kohlenbergbau „Kostolac"

Костолачки угљени рудокоп
Kohlenbergbau zu Kostolatz
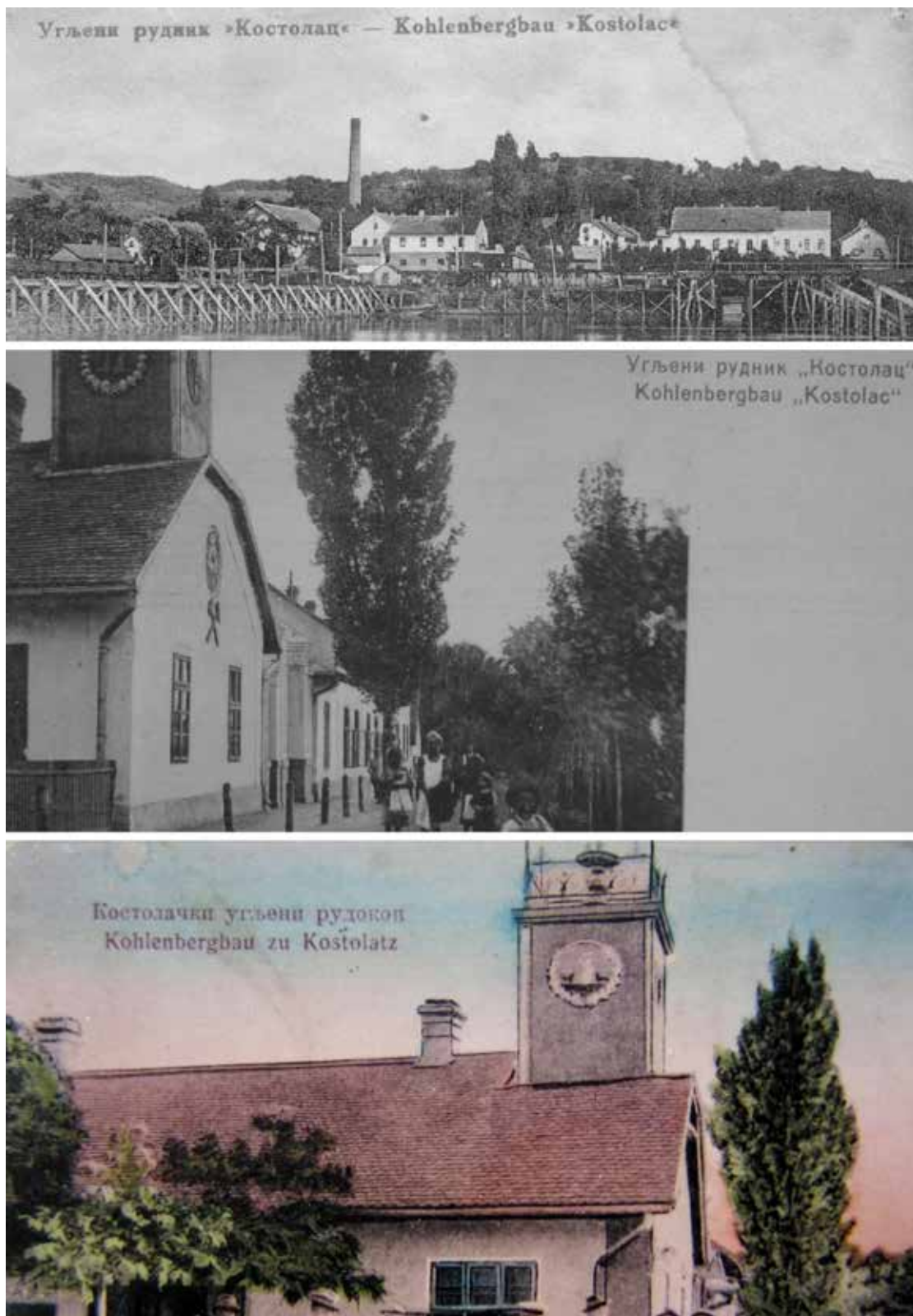
Fig. 12. The building with the clock. Up: the old mine viewed from the river with the mentioned building visible on the right in the beginning of the 20th century (Spasić-Đurić 2012b, 7); middle: the building and its neighbourhood (EPS); down: the building in the beginning of the 20th century (Spasić-Đurić 2012a, 3).
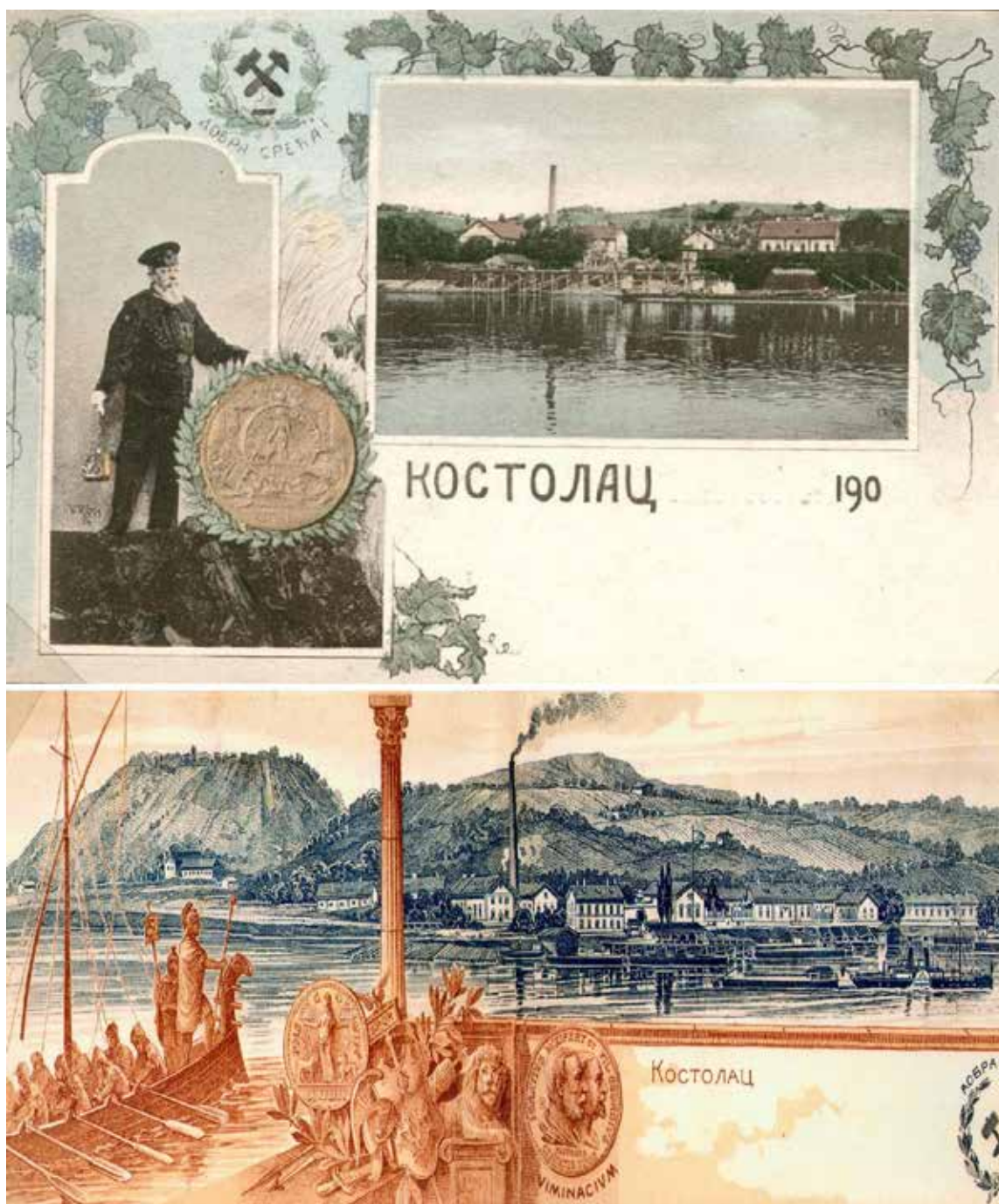
Fig. 13. The old postcards of the mine with artistic imaginations connecting mining and archaeological heritage of Kostolac area (EPS). Up: A man in ceremonial mining unform (Ignjat or Đorđe Vajfert (?)) holding the medal with ancient Viminacium coat of arms, and the view of the mine; down: the Roman fleet on the Danube coming to the old mine with the mining and Viminacium motifs connected into unity (EPS).

Their whole lives they believed this was an area where work is important. It was dirty and polluted because it had to be." (The Guardian: 2014). We can cite here the statement that "man (community) separated from the natural environment and the appropriate cultural environment, loses the natural and created impulse that creates the need to enjoy beauty", and the destruction of the natural environment and underdeveloped cultural environment creates a community "which is unresponsive and

passively confronts beauty", "does not demand anything on the aesthetic level and subconsciously accepts the low quality of its environment" (Kurtović-Folić 2000: 129). However, a large number of residents of this German landscape hope that their future belongs to tourism (The Guardian: 2014), which necessarily brings the need for the landscaping and improvement of the natural environment. The need for beauty, as "one of the most vital psychological needs of every man", can be suppressed, but it does not cease to exist (Kurtović-Folić 2000: 129). Thus, the whole process of the possible future protection and adaptation of the Kostolac village mining community should be undertaken very carefully and consider the involment of the local community - by listening to their needs and wishes, but shaping them further with proper education about heritage values and their responsibility towards it, showing them the benefits it can bring, in any aspect of their life.

CONCLUSIONS

Activation and sustainable use of the industrial heritage of Kostolac village have to include protection and rehabilitation of historic buildings, protection and presentation of landscapes with natural resources exploitation, but also careful integration of future infrastructural interventions in the landscape, with the constant participation of the local community in heritage protection.[2] Although the long-term sustainability of historic places is hard to achieve because most of them need state support everywehere in the world, we learn from statistical data that in the first decade of this century, rehabilitation of historic buildings generally created a 13% higher return on invest-

ments, produced 1.243 times less waste, and created 16.5% more jobs than new constructions, while the sector of cultural heritage created from 10 to 26.7 jobs for each direct one, generating in Europe incomes in trade and services of 335 billion euros per year (Nypan 2008: 59). Thus, the solution for the succesful functioning of rehabilitated areas of cultural heritage can be found in the so called "constructive conservation", when the protection and adaptation of historic buildings is done through "actively managing change". This promotes balance between the safeguarding of the unique building's qualities and its change, seeking for a result which can be attractive in architectural and commercial terms (Catling 2013: 4). In the other words, the aim of the reuse of industrial cultural heritage includes the preservation of its values, but in a way which allows its use in modern times (Roter-Blagojević and Tufegdžić 2016: 152). The partnership between different stakeholders is a must here (Catling 2013: 6) The decisive role of tourism is also inevitable, which, in the case of Kostolac area, can bring numerous opportunities for the entire area development when coal mining is completed. However, we must remember that possible future processes in the village, including the careful renovation of the old mining community, must also bring back a sense of pride to the local population - the members of the last generations of miners who worked in the underground mining until 1966 and still live in the village and the town of Kostolac, but also to their descendants who lived a hard mining life along with their fathers and grandfathers (Nikolić 2018: 512). They should all help in the future development of "a community that is built on the pride, strength and power originating from its cultural and historical heritage" (Korać, Nikolić and Tapavički-Ilić 2016: 122).

The old undergroung mine in the village of Kostolac was founded 150 years ago. The ruined remains of the mining community may not look today like buildings we are used to calling monuments. However, they are monuments – of a

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2 An important step in the involvement of the local community of Kostolac village in the protection of heritage occured with their employment in the nearby Viminacium Archaeological Park, where cultural heritage started to become sustainable and attractive to wide public which is elaborated in other contributions of the authors of this paper (Anđelković Grašar, Nikolić and Tapavički-Ilić 2020: 259-270).

historic period, of the region's development, and to the destinies of different peoples that lived and worked here. Looking at these buildings, it seems impossible to repair them, and many questions arise about the possibilities of their protection and presentation. During such thinking, we realize that the tangible heritage elements of the village cannot be separated from the intangible ones that cannot be strictly determined by time and space, since some of them are common to a number of temporally and spatially distant activities (Nikolić 2018: 170).

The old mining community is valuable industrial heritage of Kostolac, Požarevac, as well as of Serbia, which is supported by its various mutually interconnected tangible and intangible values. The old underground mine and its mining community now represent industrial heritage, just as the industrial architecture of modern mining and electricity generation in Kostolac area is likely to represent it in the future. However, if we do not protect the heritage we have today, we will not recognize the future one as such. We would wish that this paper could be a small contribution to the preservation of the mining community in the village of Kostolac, hoping that the officials in Serbia will more seriously recognize the values of this extremely important industrial heritage before it is too late. It is our obligation towards the local people, towards their memories, and towards their mining past which is unseparable from their lives, and thus, the life of Kostolac village.

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REZIME
NASLEĐE PRED KOJIM ŽMURIMO: STARA RUDARSKA KOLONIJA U SELU KOSTOLAC, SRBIJA

KLJUČNE REČI: SELO KOSTOLAC, RUDAR-SKA KOLONIJA, RUDARSKO NASLEĐE, IN-DUSTRIJSKO NASLEĐE, PODZEMNI RUDNIK, RUDNIK UGLJA.

Iako je Viminacijum već godinama međun-arodno poznato i priznato arheološko nalazište koje se nalazi na teritoriji sela Kostolac (Stari Kostolac), ali i turistički potencijal regiona Gra-da Požarevca i čitave Srbije, osvešćivanje o ce-lokupnom kulturnom nasleđu ovog sela na nivou lokalne zajednice i šire javnosti deluje kao neiz-vestan i težak proces. Predeo sela Kostolac u severoistočnoj Srbiji i zaleđu Dunava važan je sa aspekta arheološkog nasleđa, ali i industrijskog nasleđa iz prethodna dva veka, koje je sačuvano kroz različite materijalne ostatke i nematerijalno nasleđe vezano za viševekovnu rudarsku aktiv-nost u ovom kraju.

Ove godine obeležava se 150 godina od otva-ranja podzemnog rudnika i početka eksploataci-je uglja u selu Kostolac, što je u isto vreme i jubilej industrijalizacije moderne Srbije 1870. godine. Nažalost, suprotno važnosti ovog jubile-ja, građevine rudarske kolonije čiji su nekadašnji stanovnici bili učesnici i svedoci modernizacije i razvoja tadašnje države, potpuno su ruinirane i polako nestaju pred očima meštana i stručne javnosti, nakon zatvaranja podzemnog rudnika 1966. godine. Kasniji ubrzani razvoj savremenog površinskog kopa uglja „Drmno" i otvaranje ter-moelektrane „Kostolac B", pažnju privrede, pa tako i šire javnosti vezanu za eksploataciju uglja u ovom predelu, usmerio je u drugom pravcu, pot-puno zanemarujući vrednost rudarskog nasleđa iz 19. veka u selu Kostolac, pa se prostor rudarske kolonije zaobilazi i u saobraćaju i dnevnoj komu-nikaciji. Takođe, mnogi duhovni elementi života stanovnika sela oblikovani su pod uticajem ak-tivnosti rudnika, a do danas nisu šire prepoznati kao vrednosti, iako predstavljaju veoma značajno nematerijalno nasleđe celog regiona.

Ostaci stare rudarske kolonije u selu Kostolac predstavljaju vredno industrijsko nasleđe ne samo prostora Kostolca i Grada Požarevca, već i ce-lokupne Srbije, jer prikazuju vezu materijalnog i nematerijalnog nasleđa: ostataka graditeljstva, ek-sploatacije prirodnih resursa sa rudarenjem, inter-kulturalnih dijaloga doseljenika rudara i njihovih porodica sa starosedeocima, verovanja i običaja, legendi i mitova. Autorke su ovim tekstom želele da ukažu i ponovo skrenu pažnju naučne i stručne javnosti, zvaničnika i institucija, na važnost rudar-skog nasleđa ovog kraja, potrebu njegove zaštite i potencijal buduće prezentacije prostora rudarske kolonije sela Kostolac, u cilju socio-ekonomskog i kulturnog razvoja lokalne zajednice, dok ne bude kasno da se bilo šta učini.

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THE EXPLOITATION AND REUSE OF THE ROMAN RUINS FROM TIBISCUM, STARTING FROM THE MEDIEVAL TO THE MODERN AGE

ABSTRACT

This article wishes to discuss the reuse of monuments, construction materials and of other objects from the Roman period discovered at Tibiscum, starting with the Medieval Age and until the Modern Age. The locations with such discoveries are located near the Roman site, at Jupa, Căvăran- Ct. Daicoviciu, Caransebeș, Turnu Ruieni and possibly at Cărbunari- Țigănești and Obreja. In general, the materials that were reused included construction materials, stone, brick and especially fragmentary or complete monuments; small, precious objects such as ancient gems were also reused, being mounted in medieval rings. The vast majority of such spoils was reused in building or rebuilding medieval churches, the medieval keep from Turnu Ruieni or the medieval fortress at Caransebeș. The spoliation of Tibiscum begins for certain from the 14th century and continues in the next one, based on the policy of the Hungarian royalty of building new places of worship and repairing the royal fortresses given the danger represented by the Turkish expansion.

In the Modern Age, the Roman monuments have been used to embellish the houses of the inhabitants from Caransebeș or the manor from Jupa, belonging to the Capra family of nobles. Fortunately, located nowadays in the archaeological reservation from Jupa, Tibiscum is most carefully unearthed and researched. Still, many of the objects unearthed at Tibiscum in the period before the reservation was created remain lost to this day, while many of the monuments plundered from the Roman centre and encased in the walls of modern buildings, no longer exist.

In loving memory of professor Doina Benea

The Roman centre from Tibiscum represents an important point on the map of Roman Dacia, being comprised of the Roman fort and city, both located at the junction of the imperial roads coming from Dierna and Lederata, passed through Tibiscum and led towards the north of the province. The Roman ruins are currently located on the territory of Jupa village – where the Tibiscum archaeological reservation protects them – as well as on the territory of Iaz, both villages are located near the city of Caransebeș.

Our article discusses the plundering of the ruins of Roman Tibiscum and their reuse in the building of several medieval or modern monuments located in its close proximity, especially the building of medieval Caransebeș, as well as the reuse of the objects discovered in the Roman centre, during the Medieval and Modern ages. With regards to the plundering and the reuse of the ruins of Tibiscum, we mention that this topic has been only partially discussed until now, in studies regarding Roman monuments (Crînguș 2001: 91-95; Balaci Crînguș

2013: 367-371), ancient gems and cameos discovered in medieval contexts (Hamat: 2016, 69-76; Hamat: 2017, 417- 437), medieval monuments (Bona: 1993; Săcară: 2002, 189-192) and even in the context of studies dedicated to archaeologic historiography (Hamat: 2017a, 2015- 2018). Unfortunately, the presence of information in different fields has prevented the creation of a complete picture for the level of plundering endured by the Roman city. In general, when discussing the Romanian historiography, both sides involved, the ancient and the medieval one, have tried to evaluate this type of intervention, especially for what is entitled by the reuse of Roman monuments and building materials or even for the irreversible destruction of the ancient monuments – detected by analysing the medieval mortar, or in the archaeological marks of the medieval or modern lime whorkshops situated in the ancient sites (Rusu 2008: 24- 37). The chemical analyses have highlighted the fact that the medieval mortar contained crushed Roman age tegular materials. Currently, we have bibliographic references for the reuse of ancient monuments from Dacia by overlapping or by looting theirs remains from Romula/ Malva- Reșca (Tătulea: 1994, 9), the termal edifice of Legio VII Cl. from Cioroul Nou (Bondoc: 2015, 29, 33, 45, 59, 75), roman fort from Slăveni (Tudor, Popilian, Gudea, and Bondoc 2011: 16-17, 26, 29), Drobeta- Drobeta Turnu Severin (Matei 2016: 348), Ad Mediam- Băile Herculane (Steube 2003: 40-44), Berzobis- Berzovia (Țeicu 1996: 38; Medeleț and Flutur 2002; Hamat 2018: 26), Ulpia Traiana Sarmizegetusa- Sarmizegetusa (Marinoiu 2000; Rusu 2008: 24- 37; Nemeti and Nemeti 2011: 436; Băeștean and Albulescu 2012: 12-18; Mărgineanu Cârstoiu 2013), Micia- Vețel (Tutilă 2009; Nemeti and Nemeti 2011: 436- 437; Tutilă and Barbu 2019: 65-71), Aquae- Călan, Germisara- Geoagiu (Nemeti and Nemeti 2011: 436- 437), Apulum- Alba Iulia (Nemeti and Nemeti 2011: 437; Izdrăilă and Florescu 2012; Ota and Florescu 2016: 205- 234; Matei 2016: 348), Ampelum- Zlatna, Alburnus Maior- Roșia Montană

(Nemeti and Nemeti 2011: 437), Potaissa- Turda (Nemeti and Nemeti 2011: 437; Matei 2016: 348), Cluj- Napoca (Antal and Pupeză 2012: 92-93), Porolissum- Zalău (Deac 2018; Deac and Zăgreanu 2011: 167), roman fort from Certinae – Romita (Nemeti and Nemeti 2011: 437; Piso and Deac 2019: 253-256) and Brâncovenești (Protase 2008: 250), roman settlement from Jebucu (Ardevan and Zăgreanu 2012: 73-84), roman villa from Chinteni (Deac and Zăgreanu 2011: 165- 167), the the settlement from Miercurea Sibiului- La Mălăiești, Apoldu de Jos, the statio from Miercurea Sibiului- Cunța (Urduzia and Pinter 2016: 235- 237) and others. From this examples we can observe a similar situation to what is happening also in the rest of Europe (Jacks 2008; Kinney 2013; Špehar 2019). Included in this list, we consider that Tibiscum also deserves its own discussion concerning the areas with Roman discoveries reused in medieval and modern contexts.

INTRODUCTION

The Roman city Tibiscum, raised to the rank of *municipium* by Septimius Severus, is an important military and especially economic centre, located on the south- western border of Roman Dacia (Benea 2013: 158), at the crossroad of imperial roads coming from the southern border of the province, towards its north. Although the city's ruins have attracted the attention of people from the Middle Ages (Hamat 2017a: 206), the systematic archaeologic research has been conducted in the area only from the second decade of the past century and until today, is one of the Roman sites with continuity in terms of research and publication of the discoveries (Benea and Bona 1994; Ardeț and Ardeț 2004; Ardeț 2009; Benea 2011; Benea 2018) and in the last years it has benefitted from research conducted with the help of the newest methods (Pl. I/2).

The ruins from Tibiscum are truly known however starting from the Modern Age. Numer-

ous scholars or travellers through these lands in between the 16th and 19th century, have noticed in the courtyards of the inhabitants from Jupa and Caransebeș, but also on the fields located between the borders of Jupa, Ciuta and Iaz villages, Roman remains. The first written information about Tibiscum can be found in a manuscript written by Ioan/ Ianos/ Ioannes Mezertius or Mezerzius, canon at Alba Iulia and afterwards archdeacon at the Cluj-Mânăștur Chapter. His notes, from the beginning of the 16th century, contain also references to several Roman inscriptions discovered at Caransebeș, probably originating from Tibiscum (Opriș 1994; Benea and Bona 1994: 9; Rusu and Rusu-Bolindeț 2007: 94- 96). The interest for these ruins is also present in the work of Luigi Fernando Marsigli, an officer in the Austrian army and also eminent scholar (Morărescu and Codrea 2011: 89). He works for the Habsburg Empire and publishes a book about Banat at the beggining of the 18th century, in it mentioning for the first time the location of the ruins of Tibiscum (Marsigli 1726: 67). In the second half of the 19th century, Tibiscum is visited by F. Milleker who describes the Roman habitation from both sides of Timiș river (Milleker 1899: 93-94). Ortvay Tivadar (Marsigli 1726: 67; Milleker 1899: 93-97) also located the Roman city in the area of the Jupa, Iaz and Obreja villages, at the end of the 19th century. The first field research was conducted by him in 1875, at the behest of Th. Mommsen (Benea and Bona 1994: 10) and in the context of the creation of a Banat Historical Society, located at Timișoara. The systematic research was begun only in the interwar period, when in 1923-1924, the professor G. G. Mateescu from King Ferdinand University, Cluj – present-day Babeș-Bolyai University – and the Greek-Catholic bishop I. Boroș from Lugoj have conducted the first researches, later continued in between 1964-1976 by M. Moga and D. Benea in following period (Benea and Bona 1994; 10-11; Ardeț and Ardeț 2004: 16; Benea 2013: 158; Benea 2018), currently the scientific manager is D. Rancu.

Unfortunately, until 1923-1924 when G.G. Mateescu conducts the first systematic, important, research in the Roman site, the ruins underwent a systematic destruction, a result of search for valuables or just of the plundering of stone, brick or architectural elements. Such destructions are visible for the period of the Middle Ages through the discoveries of architectural spoils or ancient objects in medieval contexts, while for the later period we even have documents detailing the plundering of the site from Jupa – this action is favoured by the fact that until the beginning of the 20th century the ruins were still visible above the ground (Hamat 2017a: 208).

Jupa village and Capra manor

The first area with discoveries plundered from Tibiscum is the village Jupa, where the archaeologic reservation is located. Jupa is mentioned by documents from 1440 (Teicu 1998: 341-342) and the medieval and modern village is located much further to the west from the contemporary village, at least until the 18th century, as proven by the Austrian cadastral maps1. The contemporary village is located at a distance of 6 kilometres, in a straight line, from Caransebeș. It is certain that the ancient ruins were known and exploited during the Middle Ages, proof of this is given by the habitation traces discovered near the Roman fortification (Benea, Bona 1994: 68). The reason for this presence might be the need for building materials, both for the development of the medieval centre from Caransebeș, starting from the 14th century and especially during the reign of Louis I and then that of Sigismund of Luxembourg, when the entire medieval Banat, as part of the Hungarian kingdom, enjoys an increase in the building projects. This building effervescence is partially the result of the

1 According with the First Military Survey from 1769-1772, see Mapire, https://mapire.eu/en/map/firstsurvey-banat/?layers=137&bbox=2457422.076554418%2C5691437.889882898%2C2483200.464343594%2C5699081.592711415.

religious policy conducted by the Hungarian royalty and its conflicts with the Ottoman Empire.

The history of the Capra family of nobles is very important for the study of the antiquities from Jupa. At the end of the 18th century, they build in the village that was moved to its present-day location, an imposing manor (Balaci Crînguș 2013: 368) (Pl. II/1,2). The family's heir, the baron Alexandru Capra (1851- 1889) (FD 1889: 5), a person with a vast culture and a European education, is the one who discovers and harnesses the potential of the ruins located next to his manor, housing the scholars who came to study them and helping the Hungarian National Museum to acquire objects from this area (Barbu 2018: 69-71). Many of the artefacts unearthed by the villagers in search of treasures were bought by the baron and even today they are valuable and even singular discoveries in the archaeologic landscape of this site. A representative of his period, the baron collects with pleasure ancient artefacts, corresponds with the Budapest museum or discusses with the specialists who came to visit the site. Unfortunately, his life comes to an abrupt end, dying without direct heirs and his collection is lost in the tumultuous events at the end of the 19th century.

Only the family mansion remains from this fortune, with a fragment of a funerary stela, looted probably from Tibiscum (Balaci Crînguș 2013: 368.) (Pl. II/3) and encased on its northern outer wall. The stela can be included in the category of architectonic, aniconic funerary stelae, in fact the only one of all the aniconic stelae of south-western Dacia. It has a clear, triangle shape fronton, with acroteria on both sides. The beginning of the funerary inscription is still visible: D(is) M(anibus). The stela is fashioned from white-yellowish limestone, other monuments from Tibiscum are fashioned from this material, especially architectural pieces that probably adorned the different buildings from the civil settlement or the Roman fortification (Balaci Crînguș 2013: 368). With regards to the Capra manor, we must also mention the archaeologic tale stating that the basement of the manor is paved with Roman bricks, among them one with the stamp of the legion IV Flavia Felix (Milleker 1899: 93-95; Benea 2018: 137). Unfortunately, the manor was nationalised after 1949 and is undergoing restauration for several years, thus archaeologists could not visit it and the presence of the legion at Tibiscum and the tegula from the manor's basement bearing its stamp, cannot be proved beyond the story.

The plundering of Roman monuments continued in the 19th century, a series of interested travellers discovering in the houses of the peasants from Jupa Roman monuments and certainly artefacts for sale. The monuments gain a mythical aura, even becoming for some peasants, protectors of the houses and the fields or patrons of human luck and fate and so, they prefer to destroy them on the spot, rather than sell them or see them being taken away.

It is in this context that a young priest name Iosif Mircea, comes to Jupa at the beginning of the 20th century. He will serve in the village's church between 1910-1938 (Hamat 2017a). Due to his role of parish priest, he listened to the confessions detailing stories about treasure hunts taking place in the middle of the ruins near the village, which he could still see them standing. He realizes the importance of the area and tries to do everything possible so that they can be preserved for future generations and first of all, researched. And because he is not an archaeologist, decides to do what he knows best, namely write about them and help the people in the area know about them and by using education, to save them from forgetfulness and especially from the ignorance that had as an immediate effect, the treasure hunt. Thus, in the newspaper *Foaia Diecezană* published on the 10th of May, 18th of October and 25th of October 1922 an article discussing the ruins from Tibiscum was included. The title of the first article *Excurzia elevilor Liceului Traian Doda la cetatea Tibiscum* (Mircea 1922a: 4) (The trip undertook by the students from Traian Doda High School at Tibiscum fortress), becomes a pretext for a dis-

course in favour of preserving the Roman ruins, further strengthened by the second title *Crâmpeie din zbuciumul trecutului nostru. Cetatea Tibiscum* (Mircea 1922b: 5-7; Hamat 2017a: 208) (Fragments from the struggles of our past. Tibiscum fortress). The story starts simply: *În hotarul parohiei mele Jupa, încă se află o cetate vestită odinioară, Tibiscum* (Mircea 1922a: 4). (A once famous fortress, Tibiscum, still exists on the border of my parish, Jupa). This parish priest details the destiny of the fortress, especially of the remains and the inhabitants of the area, some of them have their names mentioned – such as Constantin Capra – many others are anonymous. The name of the area is also mentioned – *at the walls* (Mircea 1922b: 6), currently the area is still known as *at the walls, fortress* (Benea 2013: 158). The fortress is believed to have encompassed a large area and the priest mentions that in the crops of the people one can find walls destroyed with dynamite by the inhabitants, so that they can use the land as they want (Mircea 1922a: 4). The archaeologic preserve currently includes a territory of approximately 17 hectares and is organised starting with 1977 (Benea and Bona 1994: 12), following the discoveries that were the result of the systematic research. The reservation is administered by the County Museum of Ethnography and Border Regiment Caransebes (Muzeul Județean de Etnografie și al Regimentului de Graniță Caransebeș). The dangers faced by the ruins from Jupa are mentioned in the descriptions contained in the articles, whether it is the greed of the people, the treachery waters of Timiș river, the modernisation of the area or just the passage of time. Thus, one of the parishioners told the priest that he used stones from the fortress, also mentioning an important detail, namely that the walls he had broken were painted with a dark blue colour (Mircea 1922a: 4). It is interesting that given the systematic research that will later be conducted in the area, there is no mention in the bibliography about the painted plaster walls. I. Mircea wonders whether the walls on the other side of Timiș river, at the border of

Iaz village, are part of the same fortress, belong to the civil settlement or to a different fortification (Mircea 1922b: 7). A century later, due to the archaeologic research (Pisz, Tomas, and Hegy 2020), we know that the Roman city spanned on both sides of Timiș river and that the walls mentioned by the priest most likely belonged to the civil settlement, researched by D. Benea and more recently by A. Ardeț.

Beside gold, the people plunder the stone from the walls still visible above the ground at the beginning of the 20th century. Given the ruins from Iaz, we note that I. Mircea probably did not know about Marsigli's writings, who mentions the existence of another fortification on the other bank of Timiș river (Marsigli 1726: fig. XXXV), or those of Ortvay Tivadar, who discusses the Roman ruins covering both banks of Timiș river (Hamat 2017a: 209). The existence of the Roman remains on the other bank of Timiș river was investigated and published by Ortvay Tivadar in 1873 and 1876 (Ortvay 1873: 103- 104; Ortvay 1876: 32-33). Just like his predecessors, the priest mentions the discovery of inscriptions, bricks (with the stamps MID, MAZY), coins, jewels or funerary lions. With regards to one funerary lion, the local folklore mentions that it was discovered at the mill, in fact the area immediate next to the building 1 from Tibiscum – the headless lion. When discussing the tile stamps mentioned by the priest, it is noticeable that MID is a usual discovery at Tibiscum, being restored as M(aurii) I(uniores) D(aciae) by D. Benea and S. Regep (Benea and Regep 2015: 191), while the second stamp was probably incorrectly read, it is probably MASY – M(arcus) SY(rus) (Benea and Regep 2015: 194). The gold rush affected Jupa and represented one of the reasons for its destruction, just like in any other area touched upon by history. It is interesting to note that during the course of time the archaeologic research dug up very few gold objects, among them two gold rings and a pendant fragment (Hamat 2018a). However, the priest was told several stories about the gold found here. Thus, one of the

men working at the Jupa mill, dug after gold and found a gold coin that the miller sold for a large sum at Vienna. Another peasant who had found a gold ring, sold it to baron Capra for 40 florins. Two individuals found gold also at Iaz. Also, the priest could see the palpable evidence of this gold rush with his own eyes in the village, where an unnamed woman wore a necklace fashioned from gold coins found in the fortress. *The fortress however, fiercely guards the vast majority of riches, only the dancing flames of gold can be seen here at night.* This information is part of the traditional curse attached to any place touched upon by history, repository of valuable artefacts but also of past suffering, the words about the end of the place are proof of this. This, he says, *must have been caused by fire, because those who dug at the fortress discovered charcoal and human and horse bones mixed together* (Hamat 2017a: 210-211).

Modernity is the last factor to play a part in destroying the ruins, being mentioned the fact that during the construction of the railroad that currently connects the city of Timișoara to the capital, passing in the immediate vicinity of Jupa village, walls were discovered, walls that had to be destroyed in order for the work to be completed. The location of the Roman fortification is about 600 meters away from the railroad but until now there are no certain mentions about Roman discoveries being made in the area of the CFR depot, besides those recorded by I. Mircea. Thus, modernisation took its toll on Tibiscum, many of the remains becoming lost forever (Hamat 2017a: 211).

Medieval church from Cărbunari- Țigănești

It is also in this area, from the administrative territory of Jupa village and near the Roman fortification, that the church located at Cărbunari-Țigănești was researched at the beginning of the 1990s. It was identified as the church of the medieval village Răcoviță, mentioned in the documents at the half of the 15th century and which

no longer exists now (Țeicu 2007: 150-151; Țeicu 1998: 364). A necropolis was identified around the church. The monument and the cemetery were dated with the help of coin, in the first half of the 14th century (Țeicu 2007: 151) – thus we know that the village existed for certain at least 100 years.

The medieval church overlaps a Roman building whose functionality is unknown, located in the proximity of Tibiscum, on the side of the imperial road Dierna – Tibiscum and it is here that Roman materials were discovered, including a coin from Gordian III (Ardeț 1996: 415-422). Although the author mentions that the Roman building was reused in the construction of the medieval on (Ardeț 1996: 416), we consider there is not enough evidence to support this and we are faced rather with just a reuse of the respective area. Therefore, we are not dealing with an intentional reuse of the ruins from ancient Tibiscum.

Medieval church from Căvăran- Ct. Daicoviciu

The medieval town named Caran is located 16 km north of Caransebeș and 12 km from Tibiscum, on the southern bank of the river Timiș and on the main road from Severin fortress to Timișoara, in the area of modern Căvăran village (today named Ct. Daicoviciu). The inhabitants of this small town (called by the documents *cives et hospites de Karan*) built a church in Cetate/Săliște point, sometime in the late fourteenth or early fifteenth century, which was excavated by I. Miloia in 1930s (Pl. V/1). The nave, in the form of an elongated hall, had a bell tower in the western part of the space. On the exterior, the church has pairs of support elements arranged on the west side of the nave and at the altar (Țeicu 2007: 111-112). When building the monument, the medieval craftsmen used Roman bricks (Pl. V/2), tiles, stone blocks, fragments of mosaic and marble monuments. They use the roman spolia for building the elevation of the church, to pave the

interior, and also in the manufacture of medieval mortar (Daicoviciu and Miloia 1930: 15; Miloia 1930: 47-48; Miloia 1931: 36-37). Therefore, we are dealing with an intentional reuse of the ruins from ancient Tibiscum.

The modern town of Caransebeș and the church of the Franciscan monastery

Caransebeș is the most important area where the ancient spoils were used. The city is located at the confluence of Timiș and Sebeș rivers, in the southeast of the Roman Tibiscum, being mentioned in documents since 1290 (Țeicu 1998: 309), under the name Sebeș and in 1325 as a royal fortress (Țeicu 2009: 108-109). In fact, Jupa is currently just one of its neighbourhoods.

On the current territory of the city were also discovered the ruins of a villa rustica in Măhală point and those of a temple in Câmpul lui Corneanu point (Petrovszky 1975: 367; Petrovszky and Petrovszky 1977). Besides these ruins, various inscriptions were, in the second half of the nineteenth century, embedded in several houses in Caransebeș (Ortvay 1873: 103- 104). The plundering of the Roman ruins by the inhabitants of the medieval fortress of Caransebeș (Bona 1993: 70) and later on, those of the modern city, was probably something usual and not a singular event, which span in time from medieval to modern times, and included from bricks and monuments up to small objects, such as is the case of the artefacts discovered in one the city's necropolis, to be discussed below.

Based on the information we have at our disposal so far, we can date the massive plundering from the beginning of the Angevine dynasty and intensifies during the reign of Sigismund of Luxembourg. This period marks an important step in the urbanisation of the medieval centre from Caransebeș. Therefore, between the middle of the 14th century and the 15th century, the medieval fortress underwent a series of changes, one of the most important being the relocation of the

small local nobility, which will move to the newly created city to live following the western model, including the use of ancient gems and cameos. In general, as it is shown by the medieval sources but also by the more recent testimonies, as well as the local archaeological research, the Roman city and fortification were systematically plundered of everything that could be capitalized, and the fact that the ruins remained visible above the ground until the beginning of the last century turned them into a sure target for all those interested (Hamat 2017: 429-430).

The most important point, so far, on the map of the Roman spoils, is the church of the Franciscan monastery from Caransebeș (Pl. III/3), where many reused Roman elements were discovered (Hamat 2016) (Pl. IV). But, let us not forget, that the case of the medieval church is not a singular one, the whole town benefits during the Middle Ages from the construction materials originating from the ruins. Thus, the locals knew that at the edge of the settlement, there was marble, which they systematically robbed to build what was necessary (Mircea 1922b: 7) and it was used either as construction material for houses or it was burned in order to make lime, a practice that spread from the Middle Ages onwards and is known to have been done in several well-known archaeologic dig sites such as Apulum or Ulpia Traiana.

The ruins of the Franciscan monastery in Caransebeș were discovered in 1988, during the demolition works of the buildings located in the centre of the city, to make way for blocks of flats. The importance of this location is proven by the Medieval documents, which mention several Franciscan headquarters in the Banat area (Severin, Orșova, Caransebeș, Chery, Cuiești- Bocșa, Armeniș, Haram and Cuvin), half of which were created with the support of King Louis I (Țeicu 2007: 1), due to his confessional policies, which include also the Caransebeș monument (Țeicu 2007: 59). With the Ottoman expansion taking place in the Balkans, it seems that these headquarters suffered, together with the whole Banat area,

great destructions at the beginning of the 15th century, following the raids. Thus, the Franciscans demand support from Pope Eugene IV in December 1437 in order to rebuild the churches that were affected. It is now that the third group is created, comprised of laymen that follow the order's spiritual precepts and life style; this group included, besides the king and queen of Hungary, the nobles from Caransebeș Iacob of Măcicaș and his wife, Ioan of Mâtnic and his wife as well as Mihai of Mâtnic (Țeicu 2007: 18). This aspect is extremely important because it is testimony for the existence of a local catholic nobility, included in the third group and whose probable resting place might be in one of the crypts from the Caransebeș church (Țeicu 2007: 59), adorned with Roman gems.

The Franciscan monastery is currently located in the area delimited to the N-NE by the M. Halici street, to the E by Ardealului street, to the V by Ș. Herce street and to the S by the Revolution Square, in the centre of the city and 6 kilometres away from Tibiscum. A church with the crypts located inside was discovered in this area, as well as the necropolis around it, alongside the remains of a perimeter wall (Bona 1993: Pl. 2-3.). When discussing the dating, we have to say that the 13th century was proposed for the first phase of the church (Bona 1993: 68), however, other researchers put forward as certain a later date, based on documents[2]. The church has a single nave, its walls are supported by buttresses and the entrance is located on the western side. It houses 11 crypts beneath the floors, alongside other funerals separated in the first third of the church, near the entrance. The authors of the discovery state that the monastery ceases its existence at the half of the 16th century (Țeicu 2007: 59). It is probable that the total destruction happened only after the Austrian rule was imposed, when the whole area was rebuilt after the Ottoman- Habsburg wars from the 16th- 18th centuries.

When the church and its crypts were built in Caransebeș, among other funerary objects, four

intaglios (Pl. VII/ 2, 3, 4, 5), between them three gems and a cameo, were discovered alongside bricks and chiselled stones, as well as fragments from monuments from Tibiscum. Two of the gems were republished 10 years later by C. Timoc (Timoc 1998: 115-116), again in 2004 three of them were published by M. Vasile and in 2009 all four were discussed by D. Țeicu (Vasile 2004: 2-3; Țeicu 2009a: 253). Unfortunately, M. Vasile considers the rings to be Roman. The four gems however are mounted in medieval rings and thus we are clearly dealing with an example of how the inhabitants of Caransebeș reused jewels in the 15th-16th centuries.

Different Roman materials (marble pieces, construction elements, fragments from funerary and honorific monuments, bricks, tiles and others) (Bona 1993: 68- 70) were preserved in the ruins of the church. They were most probably plundered from Tibiscum[3]. Thus, both the foundation and the elevation of the walls contain chiselled stones probably initially in the walls of the Tibiscum Roman fort, as well as bricks used in building the buttresses (Bona 1993: 69). The most important discoveries however are the fragments of Roman monuments discovered encased in the walls of the church (Bona 1993: 69), in the buttresses, around the altar and in the stairs. The most interesting are half a Roman gable depicting Hercules catching the erymanthian wild boar (Pl. III/2) as well as a fragment from a funerary stela. The gable might originate from a temple or a sacellum, as yet undiscovered in the field. The funerary monument fragment comes from a large stela, fashioned from marble, very damaged (Crînguș 2001: 91-92). Besides them, it is worth mentioning the marble fragments discovered in the altar; they come from an honorary inscription, the dedicant being an augustalis from the Colonia Ulpia Traiana Sarmizegetusa, the artefact is dated in the 2nd century (Bona 1993; 70).

2 The Franciscan monastery is mentioned in documents from the 14th until 15th centuries, see Țeicu 2007, 58.

3 All kind of materials and also objects obtain by despoliation are commonly named by the specialists spolia, see Kinney 2006, 234.

The crypt number 6 housed 11 graves containing 13 deceased (Bona 1993: 75-78) and includes in its building materials, roman bricks alongside hypocaust tiles (Bona 1993: 66). When it was discovered, M6 was considered to be a woman's grave. The deceased has her hands on her chest and on her left finger a ring with a sardonyx cameo engraved with the image of a child's head (Hamat 2017: 421). The piece is the only inventory object mentioned by the researchers who note that it is an ancient cameo (Bona 1993: 76), which can be dated based on the analogies from the 2nd century AD. (Hamat 2016: 71).

Crypt 4 housed 6 graves containing 10 skulls, dated based on the inventory in the 14th-16th centuries (Bona 1993: 72-73). M3 contained a complete skeleton, positioned on its back, with the hands on its chest. The inventory consisted of a gold ring with an ancient gem with the image of a satyr engraved on it (Bona 1993: 72; Hamat 2017: 421).

Crypt 5 housed 8 graves containing 12 skulls, being dated in the 14th-15th centuries (Bona 1993: 73-75). It was paved with 80 Roman brick fragments, some of them bearing stamps (MID, MASY, ARF and CIV) (Bona 1993: 69), stamps also encountered at Tibiscum (Benea and Regep 2015). Two of the roman gems were discovered in this crypt. M5 contained a completely preserved skeleton, positioned on its back, with the hands resting on the chest and on her left ring finger was a ring with an ancient carnelian gem engraved with Apollo's image (Hamat 2017: 421). M7 contains the skeleton of a man, very well preserved, positioned on his back with the hands resting on his chest; he has in the area of this torso a ring, probably fallen off his hand, a ring with a carnelian gem engraved with the face of a man. The funerary inventory contained besides the ring a silver coin from Sigismund de Luxembourg and two iron horseshoes from the heels of the boots.

One of the important areas containing discoveries is also represented by the medieval fortress of Caransebeș. The fortress is currently located on one of the hills, somehow flanked by the streets Grădinilor, Potocului, Decebal and Muntele Mic, being almost entirely destroyed by the contemporary destructions. Fragments from a funerary stela were discovered in 1872 in the fortress's perimeter, on Potoc street. Such a discovery was witnessed by K. Torma in 1880 in the walls of the house number 410, situated very near of the Franciscan church. It seems that the owners of the house 410 had encased four inscriptions in the walls and has sent several Roman monuments to the Austrian general Stanojlovic – other inhabitants from the city proceeded in the same manner. There is a strong possibility that the owner of the modern house 410, found the Roman monuments on his property, which was located on the ruins of the Franciscan monastery and did not rob them directly from Tibiscum, at least not all of them. In this case we would be dealing with a modern reuse of the medieval spolia.

Stones with roman inscriptions might be encased in the wall of the Roman-Catholic church, build in the 19th century on the site of an older church in the centre of the present-day city and near the Franciscan monastery. Unfortunately, they are lost today and the transcript of their inscription as made by K. Torma is also lost. Another epigraph, a votive text dedicated to Apollo and Diana, was encased in the walls of house 9, on Retezat street. The tiles with the stamp of the XIII Gemina legion was discovered when the ground was dug up for the foundation of a house, on Episcopiei street, in the centre of Caransebeș, also at the end of the 19th century (IDR III/1: 142-144).

Medieval church from Obreja

Another Roman plunder was located nearby Obreja, approximately 6 kilometres from Tibiscum. The late archaeologist D. Țeicu researched a church located in the area known as *Sat Bătrân*, on the border of the current village. The edifice was dated at the beginning of the 15th century. Around the church is a necropolis with burials dated in

two distinct periods and with a modest funerary inventory (Țeicu 2009: 109; Hamat 2018: 27). A Roman jasper gem was discovered here, bearing the image of Minerva *Nikephoros* (Hamat 2016: 422; Hamat 2017: 423; Hamat 2018: 27) (Pl. VII/1). Unfortunately, the exact place of discovery of the gem is not known, the inventory register of the Museum of the Highland Banat from Reșița mentions only the fact that it was discovered inside the church (Hamat 2016: 422). In this case, as in the case from Cărbunari-Țigănești, we cannot say exactly if the gem is reused, in the absence of the exact context of the discovery.

The medieval keep from Turnu Ruieni.

One of the most beautiful medieval monuments from the area, the keep from Turnu Ruieni (Pl. VI), is located in the immediate vicinity, 10 kilometres away from Caransebeș, on the road towards Muntele Mic. The keep is positioned on the Stârminița hill, the ruins being almost 10 metres in height. Blocks of marble probably coming from a Roman monument were encased during the construction of the walls (IDR III/1: 141; Miloia 1930: 47; Săcară 1975: 306-307; Săcară 2002: 190), also Roman tegular materials was used for straightening the walls. The keep is mentioned in the documents from the middle of the 15th century as belonging to the Romanian noble family from Mâtnic. But the historians agree that it must have been the result of the Angevin policy and initially a royal possession (Țeicu 2009: 50-51).

An inscription was still visible on one of the blocks in the 19th century, now the inscription cannot be observed anymore. The inscription was discussed by those who still saw it at the end of the 19th century and the beginning of the next one. The text, with only several letters still visible … OVI… were noted down and it is because of this that the tower was named Ovid's Tower, being connected with the name of the famous poet who died at Tomis and who is placed in the area by the

local legend. We consider that this Roman inscription also originates from Tibiscum, based on the proximity of the discovery to the Roman centre (IDR III/1: 141).

CONCLUSION

To conclude, the territory of ancient Tibiscum and the Roman ruins are known and exploited during the Medieval Age, with evidence of their reuse at Caransebeș, Ct. Daicoviciu, Turnu Ruieni and possibly to Obreja and Cărbunari- Țigănești, for the period of the 14th-15th centuries. The first evidence for the reuse of roman spolia dates back to the 10th-12th centuries and comes from the archaeologic research of the habitation layers from Tibiscum (Benea and Bona 1994: 68). Let us not forget that at least in between the 7th-11th centuries, Tibiscum is once again an important settlement, being mentioned in 1018 among the dioceses subordinated to the Ohrida archdiocese with the name Divisiskos- Dibisskos (Benea and Bona 1994: 123).

It is more that certain however, that the exploitation of the ruins begins with the birth of medieval Sebeș, present- day Caransebeș and also for the building purpose in Caran- modern Ct. Daicoviciu. The medieval town Caran and also Sebeș fortress developed at the expense of the territory occupied by the ancient settlement. This is due to the shift in the travel on the ancient road in this area, because of the exclusion of the section in between Tibiscum – Obreja. After Obreja, the road is still widely used until today, as proven by the repairs and the reuse of the Roman bridge from Pons Augusti – located north of Caransebeș, in the Marga- Voislova area, in 15th century (Rusu 1996: 249-252). The modification of the road, through the exclusion of this section, is possibly a consequence of the destruction of the Roman bridge from Tibiscum by Timiș river. The pillars of the Roman bridge survived at least until the 19th century, their ruins were still visible on the terrain,

now they are destroyed and their location lost. It is certain that in the 14th century the bridge was no longer usable, otherwise it would have been mentioned in the documents, as is the case with the bridge from Pons Augusti. The reuse of the Roman roads and even roman bridges in the Middle Age is also documented in other parts of former Dacia - medieval Transylvania (Toda 2008: 225-241; Cociș, Chiorean and Ciobanu 2018; Chiorean, Cociș and Bere 2019).

It is also important to mention that currently on the territory of Caransebeș there are traces of ancient habitation, in the points Măhală, Orthodox Episcopate-centre and Câmpul lui Corneanu. The area near the medieval fortress, where the ancient settlement is located, is mentioned in 1440 under the name of Tyvisk, in 1447 as Tyws and in 1470 as Tews (Benea and Bona 1994: 123), proof that supports our idea that the ancient settlement was still known and used as a quarry in that period. The fact that the area of the Roman fort and city was no longer inhabited but the ruins were still visible, favoured their being plundered and the reuse of the materials for the construction of the fortress or of medieval churches from the close vicinity, as a direct consequence of the Angevin policy conducted in the area, to strengthen the habitation nuclei existing at the beginning of the 14th century, then to build new Catholic churches aimed at spreading the Catholic faith in the area and last but not least by extending the cities as a base for the noble elites due to the prosperity of the Hungarian Kingdom at the end of the 14th century and for repairing the cities when faced with the Ottoman peril at the beginning of the 15th century.

Along with the development of the city, the importance moved from the noble courts to the house located in the city and the noble families from the area bought estates in Caransebeș. Their members lived mostly here and they were buried in the Catholic churches from the city, such as the church of the Franciscan monastery. Tibiscum offered for this category of population other types of plunder, such as jewels. Only the ancient gems

and cameos, mounted in medieval jewellery, have reached us. The gold rush, sometimes led even by the ruling class, is mentioned in the medieval legislation (ACRT: 54, 1) or even the modern one – in 1839 (Stoica 1998: 8). The legislation punishes treasure hunting, which is why the metal jewels discovered in the ruins were probably melted down in order to prevent authorities from taking action and that is why today we only find reused ancient gems and cameos. The reuse of ancient gems and cameos is well documented in Banat and at the court of the Hymfi family from Remetea - near ancient Berzovis[4], where a noble lady, Iuliana widow of Nicolae Himfy, while at Gyor in the early 15th century, seals personal letters with an ancient gem (Magina 2017: 355). We also mention the similar case of the gems reused in medieval Hungary (Gesztely and Rácz 2006; Gesztelyi 2011) including Transylvania, in medieval Serbia (Bikić 2016), France (Simonet 2019), Germany (Kinney 2011), Italy[5], England (Henig 2008: Zwierlein- Diehl 2014: 88), modern Croatia (Kaić 2015) but also in the rest of today's Romania, in the area of Târgu Jiu, Romula or Craiova (Marinoiu and Hamat 2020; Hamat 2017, 430), from the Middle Ages until the modern era. A famous example is the necklace of Maria Severeanu[6], made in 1922 from gold and 44 gems and cameos, most of them antique.

Like in the rest of the Central Europe, also in Romania, finding of reused Roman gems is most often linked to the proximity of a Roman site (Gesztelyi 2011: 259; Simonet 2019: 361). For medieval people, gemmed seals were advan-

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4 The seal in question will be the subject of another study.

5 One of the most famous portrets from the Middle Age is the one of beautiful Simonetta Vespuci, painted by Sandro Boticelli in early- mid 1480, curently found in the collection of Städel Museum - Frankfurt am Main – Germany; Simonetta was painted with a necklace which contains a large antique cameo engraved with the image of both Apollo and Marsyas, see Städel Museum - Frankfurt am Main – Germany, https://sammlung.staedelmuseum.de/en/work/idealised-portrait-of-a-lady; For this topic see also Tassinari 2019, 43-47.

6 Muzeul Bucureștiului, http://muzeulbucurestiului.ro/colectia-aur-si-metale-pretioase/

tageous in many different ways, from magical, medical, artistic, social, even religious and diplomatic point of view (Simonet 2019: 362; Zwierlein- Diehl 2014), up to the fact that they were much easy to procure. The importance of reused gems for medieval people come also from the situation that these kind of jewelry are part of the economy of prestige goods, which is generally the same from one culture to another. As wealth, they facilitate the distribution and transmission of power and as representations of wealth they maintain or assert power through displaying (Kinney 2011: 105; Sena Chiesa 2011: 229), hence the appearance of the great noble houses collections. Unlike the rest of the Europe, we know that on the territory of Banat region the Roman gems were reused starting with XIV century, for the earlier periods we do not have confirmed information.

In the modern period, with the movement of Jupa village closer to the ruins where its actually located today and being inherited by the Capra family, Tibiscum suffers new destructions, much more important. The monuments from the area being reused in building the manor of the Capra family from Jupa, the Roman-Catholic church from Caransebeș or the houses of private persons from the city or even being shipped to Budapest or Vienna. Unfortunately, the vast majority of such reused monuments were completely lost when the buildings were demolished or are hidden under layers of daub, their memory remains only in the writing from the end of the 19th century.

This is also the period when the ruins located in the area, interest the authorities and especially the researchers that now start the first mappings and field research. Some of the important pieces are now discovered at Tibiscum. Among them we have military diplomas attesting to the presence of the Roman army, epigraphs with the names of civilians, jewellery and other evidence of habitation during the Roman- era. The fact that the Romanian administration took over Banat at the end of World War I, initially intensified the destruction up to an unprecedented level, the people nearby using the stone and bricks for constructions. But, it also meant acknowledging the importance of the ruins for the local and national history. The first attempts at salvaging the ruins are led by the inhabitants of the area, the priests Iosif Mircea from Jupa or Ioan Boroș from Lugoj, the archaeologist Constantin Daicoviciu – from Căvăran, I. Miloia from Timișoara and others. The first systematic research is conducted between 1920-1924 and the archaeologic reservation is created after World War II, the Roman fortification and part of the settlement being now protected.

Today the inhabitants and the local authorities protect the ruins but the danger represented by the treasure hunters has not disappeared, especially with regards to the areas located outside the archaeological reservation. As envisioned by those from the beginning of the 20th century, Tibiscum has developed into a real focus for research and erudition that has long extended outside Romania's borders.

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REZIME
EKSPLOATACIJA I PONOVNO KORIŠĆENJE RIMSKIH RUŠEVINA IZ TIBISKUMA, OD SREDNJEG VEKA DO SAVREMENOG DOBA

KLJUČNE REČI: DACIA, TIBISCUM, RIMSKE SPOLIJE, SREDNJI VEK, SAVREMENO DOBA, SPOMENICI, NAKIT.

Važno pitanje koje smo pokušali da pokrenemo u ovom radu jeste ponovno korišćenje spomenika, građevinskog materijala i drugih objekata iz rimskog perioda pronađenih u Tibiskumu, počev od perioda srednjeg veka pa do savremenog doba. Mesta gde su takvi nalazi otkriveni nalaze se blizu ovog rimskog lokaliteta, u Župi, Kavaranu – Konstantin Daikovičiju, Karansebešu, Turnu Rujeniju, a moguće i u Karbunariju – Ciganeštiju i Obreži. Uopšteno gledano, materijali koji su se ponovo upotrebljavali obuhvataju građevinski materijal, kamen, ciglu, a posebno fragmentovane ili cele spomenike; mali, dragoceni predmeti kao što su antičke geme takođe su bivali ponovo upotrebljeni, tako što su postavljani na srednjovekovno prstenje. Velika većina ovakvih spolija bila je ponovo upotrebljena za gradnju ili obnavljanje srednjovekovnih crkvi, glavne kule u Turnu Rujeniju ili srednjovekovne tvrđave u Karansebešu. Pljačkanje Tibiskuma je počelo, zasigurno, od XIV veka i nastavilo se tokom sledećeg, sudeći po politici mađarske kraljevske porodice da se grade nova mesta za bogosluženje i popravljaju kraljevske tvrđave zbog opasnosti od turskog prodora.

U savremeno doba, rimski spomenici su korišćeni za ulepšavanje kuća stanovnika Karasebeša ili imanja koje je pripadalo plemićkoj porodici Kapra, u Župi. Budući da se danas, srećom, nalazi u arheološkom rezervatu u Župi, Tibiscum je vrlo pažljivo iskopan i istražen. Ipak, mnogi predmeti koji su bili iskopani u Tibiskumu u periodu pre nego što je oformljen rezervat ostaju izgubljeni, dok mnogi od spomenika koji su bili pokradeni iz ovog važnog rimskog grada i ugrađeni u zidove modernih zgrada danas više ne postoje.

* * *

I/1 Map with the reuse of roman ruins from Tibiscum in Medieval and Modern ages.
I/2 Roman ruins from Tibiscum, after Pisz et al 2020, fig. 12.

II/1 Capra manor today, after https://adevarul.ro/locale/resita/foto-video-conacele-boieresti-caras-severin-glorie-ruina-1_51776e1b053c7dd83f3ee330/index.html.
II/2 Capra Manor at the begining of the XXth century,
after https://adevarul.ro/locale/resita/conacul-capra-vremurile-glorie-7_517a105a053c7dd83f4a33ec/index.html.
II/ 3 Capra Manor, roman stela reused, after Balaci- Crânguș 2013, fig.1.
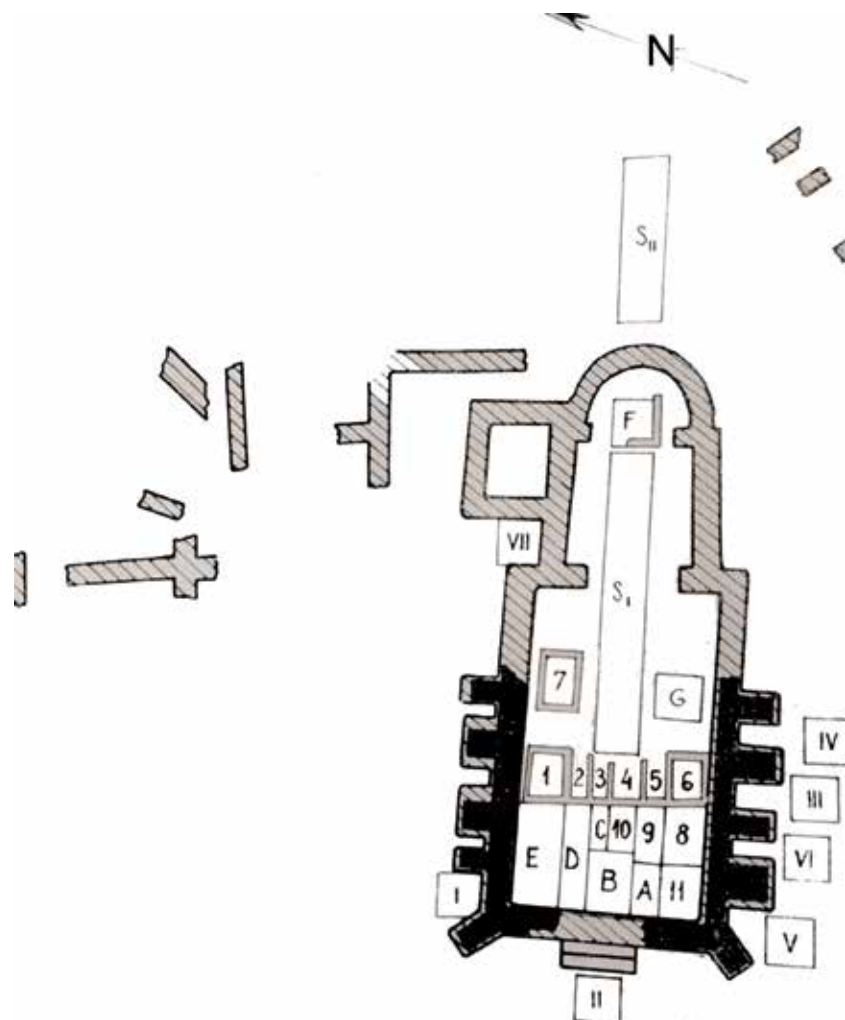
III/1 Medieval church of the Franciscan monastery from Caransebeș, after Bona 1993, pl.3.
III/2 Roman monument discovered in the medieval church of Franciscan monastery from Caransebeș, personal photo.
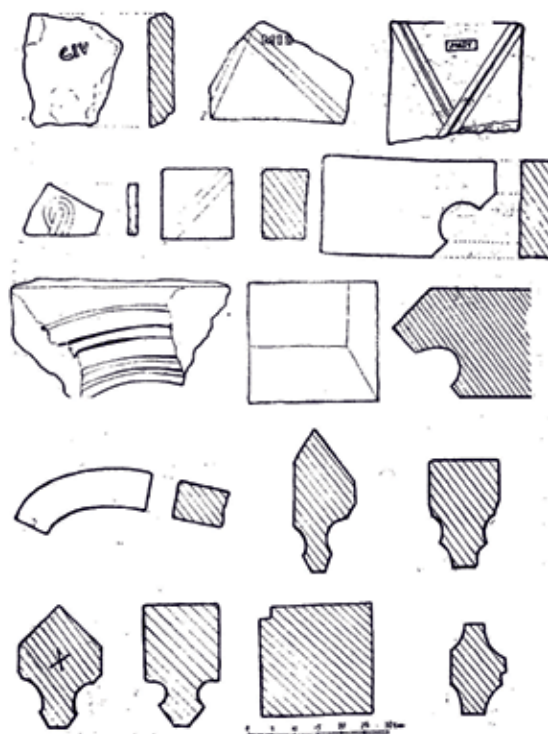
1

2

IV/1 Roman tegular materials discovered in the medieval church of Franciscan monastery from Caransebeș,
after Bona 1993, pl. 5.
IV/2 Roman monuments discovered in the medieval church of Franciscan monastery from Caransebeș,
after Bona 1993, pl. 6.
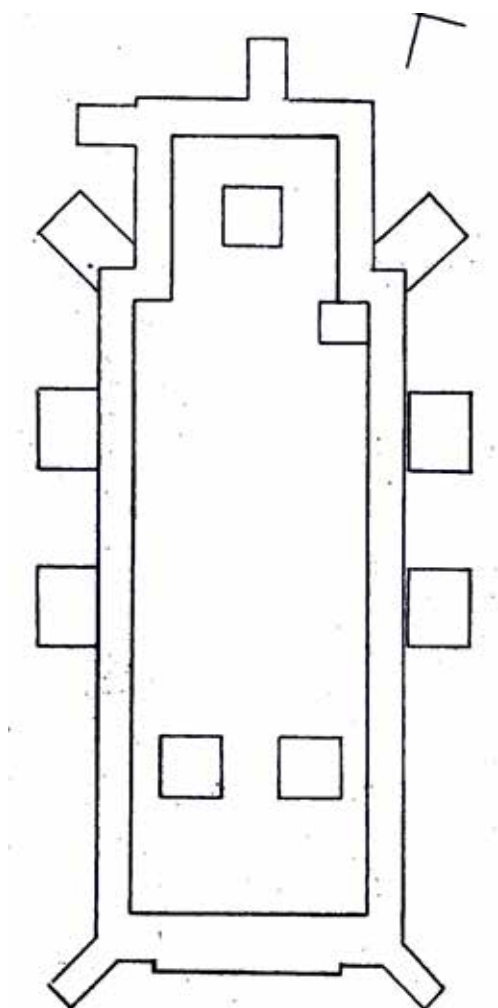
V/1 Medieval church from Căvăran/ Ct. Daicoviciu, after Miloia 1930, 32.
V/2 Roman tegular materials discovered at the medieval church from Căvăran/ Ct. Daicoviciu, after Miloia 1930, 37.
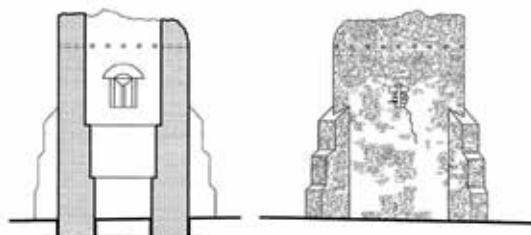
VI/1 The keep from Turnu Ruieni with a detail of roman spolia, personal photo.
VI/2 The keep from Turnu Ruieni, after Teicu 2009, pl.16.

VII/1 Roman gem discovered at the medieval church from Obreja, personal photo.
VII/2, 3, 4, 5 Roman gems and cameos discovered at the medieval church from Caransebeș, personal photo.

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SERBIAN ARCHAEOLOGY IN DIGITAL ERA – THE STATE OF THE ART

ABSTRACT

The paper gives an overview of cultural heritage digitization in the Republic of Serbia. Ever since 1990-ties, there have been various attempts to digitize parts of Serbia's cultural heritage. These included both artefacts kept at various museums or data gained during specific archaeological excavations. However, those attempts were conducted as isolated cases. In recent years, digitization of cultural heritage has become an imperative for all of the institutions that deal with it. This is why there are attempts to establish a strategy at the national level and implement it throughout the country. Although the goal is to digitize Serbian cultural heritage, special attention needs to be paid to accessibility, since digitized data are easy to misuse. Further on, over-digitization should also be prevented. Therefore, it is necessary to define how, why and to what extent pieces of cultural heritage need to be digitized.

INTRODUCTION

This paper deals with identifying existing research and projects about digitization and electronic management of archaeological heritage and protective institutions in Serbia (by the term "cultural heritage institutions" the authors refer to museums, archives, libraries and institutes for the protection of cultural monuments). Paper deals with the period from introducing computer technology and information systems into the protective institutions in Serbia during the late eighties of the 20th century until recent efforts of the Serbian Ministry of Culture and Information to regulate processes of digitizing cultural heritage and dig-ital transformation of the protecting institutions. This overview aims to assist all the researchers interested in comprehending the existing state of the art and to highlight potential challenges, as well as potentials for future research in the area of managing cultural heritage.

In accordance with "The Law on Cultural Heritage" (Службени гласник РС, 71/1994) and "The Law of acceptance of the European Convention for Protection of Cultural Heritage" (Службени гласник РС, 42/2009) in this paper, the term "archaeological heritage" includes archaeological research and excavations, archaeological sites, archaeological artefacts and archaeological documentation. According to „The Law on Cultural

Heritage", archaeological heritage, most of all archaeological sites, can be categorized as established cultural property (established by the government of the Republic of Serbia) or as real estate enjoying prior protection (established by the Institute for Protection of Cultural Monuments) (Службени гласник РС, 71/1994), regarding the fact that processes for the acknowledgement of cultural heritage is often rather long-lasting.[1] Further on, in the Republic of Serbia, archaeological research and excavations can only be conducted by institutions specialized in protection (institutes for protection of cultural monuments and museums)[2] and scientific institutions (faculties and institutes),[3] both with the approval of the Ministry of Culture and Information (Ibid.; "Request Form Template for archaeological excavations and research," 2020). Finally, the process of documenting archaeological heritage is regulated by law.[4] In May 2020, the new regulation on documenting was accepted, regarding archaeological excavations and research (Службени гласник РС, 67/2020). It can be concluded that managing archaeological heritage in the Republic of Serbia is conducted by the government and its departments[5]

and mostly financed from the state budget.[6] At one hand, this means stability and security, but on the other hand, lack of autonomy" (Dragićević-Šešić 2018: 78).

The focus of this paper is digitization and electronic management of archaeological heritage in the Republic of Serbia. The new regulation on documenting archaeological research prescribes that documenting should be conducted electronically, within a unique information system for keeping incorporated archaeological documentation (Службени гласник РС, 67/2020) that should be secured by the Ministry of Culture and Information in order to "incorporate data and information accessibility for institutions of protection and other state institutions" (Службени гласник РС, 76/2018). Although these regulations are rather new and until recently, it was expected that archaeological documentation should be kept on physical forms in the shape of cards and sheets exclusively (Службени гласник РС, 102/2006), the authors tend to show that the idea of digitization and electronic management of archaeological heritage in Serbia is several decades old and they also want to identify efforts in its conducting.

Digitization of cultural heritage is a relatively new field of research and due to its dynamic development there is still no general definition (Ognjanović 2019). Since in its early developing phases it was technologically determined and conditioned, it was regarded exclusively as

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1 It is stated for example that in Serbia there are more than 20.000 archaeological sites (Crnobrnja, 2019). However, in the priod from 1948 until present time, only 194 have been recorded (see Central Register of Archaeological Sites in Republic of Serbia); eleven of them were categorized as cultural heritage of great importance and tweny-five as cultural heritage of big importance (see Immovable Cultural Property - IMP).

2 There are one Central Institute for Protection of Cultural Monuments (at the national level) and thirteen Regional Institutes for Protection of Cultural Monuments (two at the provincial level, two at the city level and nine at the regional level) (see Drača Muntean, ibid; Network of Institutes in Serbia), as well as Cultural Heritage Museums.

3 There is the Institute of Archaeology of the Serbian Academy of Sciences and Arts and Department of Archaeology at the Faculty of Philosophy, University of Belgrade.

4 See e. g. "The Law on Cultural Heritage (1994) or Rules on the forms for documents kept on archaeological excavation and research (2006).

5 It is managed at three different levels: state (e.g. Ministry of Culture and Information, Sector for Cultural Heritage Protection), provincial (e.g., Provincial Institutes for Protection of Cultural Monuments, Provincial Secretariat for Culture and Public Information) and local level (e.g.,

regional and local government / museums / institutes) (Drača Muntean, ibid).

6 In Serbia, funding projects in the field of cultural heritage "can be divided into three subgroups: budgetary financing, financing from the European pre-accession funds and financing through the private sector, corporate philanthropy and corporate social responsibility" (Drača Muntean, n.d.). It is estimated that protecting institutions in Serbia "get more than 90% of the funding from the Ministry" (Cvijetičanin cited in Dragićević-Šešić, 2018, 78), out of which 50% goes on salaries and mere functioning of institutions (Ibid.). When it comes to archaeological research in Serbia, an information has been revealed that in the period from 2018 until 2020, some 11% of the total budget of the Ministray of Culture and Information has been assigned for protection of cultural heritage (Ministry of Culture and Information of the RS, August 28th, 2020).

a converting process of analogue contents into their digital form, into a row of zeros and aces that could be recognized by a PC (Hughes 2004: 4). In the meantime, it overgrew technical issues of converting and it became a complex procedure of managing cultural heritage in a technological environment, encompassing philosophical, social, cultural and economic aspects and consequences (Manžuch 2005: 37). With regard to the choice of objectives, technologies, standards or funding models, this process varies from organization to organization, from country to country. When it comes to the Republic of Serbia, it is defined as a comprehensive procedure for managing cultural heritage in the digital environment, which includes, but is not limited to, translation from analogue to digital form; establishing a metadata system and a description of digitized and digital material; development of tools, electronic catalogues and information systems and long-term preservation, presentation and providing access to data (Ognjanović 2019). This procedure is recognized as part of a complex system of preservation and management of cultural heritage in cultural heritage institutions in Serbia (Ognjanović 2019).

The rest of the paper is structured as follows: Part 2 reveals an overview of information system development within protecting institutions (cultural heritage institutions) in Serbia. Part 3 shows a brief history of digitizing cultural heritage in Serbia. Part 4 deals with the issue of regulating digitizing processes in protecting institutions in Serbia. Part 5 includes a conclusion.

OVERVIEW OF CULTURAL (ARCHAEO-LOGICAL) HERITAGE INFORMATION SYSTEMS IN SERBIA

The main activities of the cultural heritage institutions in Serbia include documenting and preserving cultural heritage ("Law on Culture," 2009). Documenting is understood as "an organized process of recording information possessed

and emitted by objects and units of heritage" (Maroević 1993: 190). Numerous information languages and systems for analyzing, indexing and storing information have been established so far, with "the goal of their subsequent successful locating, transfer and exchange" (Crvčanin 1983: 9). Development and wider use of personal computers in the 1990s transformed the environment in which data is created, searched, interpreted and stored, hence the need emerged for simpler practices of documenting.

In the Republic of Serbia,[7] there is a decades-long practice of documenting cultural heritage in an electronic environment, but the challenge is to monitor continuity of its development because research on this subject varies from area to area.[8] Apparently, activities on the development of *Scientific and Technological Information System of Serbia* (SNTIS) in the early 1990s gave impetus to the development of centralized computer networks, information systems and national databases.[9] In order to identify information systems

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7 It should be borne in mind that in the period up to 1992 the Republic of Serbia was part of the Socialist Federal Republic of Yugoslavia, from 1992 to 2003 part of the Federal Republic of Yugoslavia, from 2003 to 2006 part of the State Union of Serbia and Montenegro, and since 2006 an independent state, as the Republic of Serbia.

8 There are detailed historical reviews of the automatization process in the field of library science in Serbia (see, among others, Kosanović 1996; Trtovac 2017). However, the authors could not find similar historical reviews related to automatization and digitization in the field of archaeology.

9 The Strategy of the System of Scientific and Technological Information of Serbia (SNTIS), adopted in 1991, was derived from the concept of the Scientific and Technological Information System of Yugoslavia (SNTIJ) presented in 1987, as well as the accompanying analysis published in 1988 (see "The system of scientific and technological information of Yugoslavia: a feasibility study", 1988). Unlike SNTIJ, that aimed at centralizing development and construction of a homogeneous computer network with a single central "host", SNTIS was conceived as a distributed information system that "should connect academic and other scientific research through appropriate computer network and documentation organizations and enable connection with similar systems and networks in the world" (Lazarević 1996, I) Therefore, SNTIS, as a set of a number of local networks and subsystems with a single physical computer-communication network based on public PTT traffic, was supposed to enable each organization to be-

used in cultural heritage institutions in Serbia in the period from 1987 to 2018, Chart 1 provides an overview of the most widely used systems with an emphasis on institutions responsible for management and preservation of archaeological documentation and heritage. (It should be kept in mind that in 2018 a special law was issued in Serbia obliging these institutions to implement specific information systems. This issue is further discussed in Section 4.) According to the data given in Table 1 and regarding development of information systems within Serbian institutions for protection, four phases can be identified. The first phase includes the period from 1987 to 1995. During this phase, initial strategies about implementing information systems were developed, while institutions form protections (mostly libraries) cooperated with software companies and developed and introduced some aspects of information systems based on DOS and Unix operating systems (Fig. 1). Unfortunately, due to the lack of means for purchasing equipment, the lack of support, educated experts and quick technological development, these solutions did not last very long. During the next phase, from 1995 to 2000, the awareness of information systems' importance grew bigger. This is why apart from libraries, also museums, archives and institutes for protection of cultural heritage sought cooperation with software companies or scientific institutions and developed and tested pilot systems based on Windows/Linux operating systems. Just like in the previous phase, the main challenges of this phase included lack of understanding from the leading positions, the lack of equipment and educated experts and incapability of exchanging data. The following period from 2000 to 2018 is marked with upgrading the existing and developing new solutions, as well as orientating towards Web operating systems. However, although the focus lied on achieving uniformity, there was no coordinating mechanism and this is why the implemented systems differ re-

come part of it and to define and realize its own role in it, in accordance with general development plans (*Ibid.*).

garding applied technologies and standards. This is why the Ministry of Culture and Information is trying to establish regulations about information systems within institutions of protection, thus marking the beginning of a new phase (about this see Part 4). Table 1 also shows that the Institute of Archaeology SASA was the only institution that considered specialized information systems in archaeology, although these considerations remained at the level of pilot projects.

OVERVIEW OF CULTURAL (ARCHAEOLOGICAL) HERITAGE DIGITIZATION IN SERBIA

The wider use of personal computers, global computer network and Web browsers have given impetus to development of digitization of cultural heritage in Europe and therefore also Serbia. The earliest attempts in this field were made in the mid-1990s (Ognjanović 2019). When it comes to digitization of archaeological heritage, apart from pioneering models of electronic archaeological databases (Korać 1994), one needs to mention the project PANDORA implemented in 1995–1996 in cooperation with the Institute of Archaeology SANU and the Mathematical Institute SANU. This project is considered the first one in digitization of cultural heritage in Serbia (Mijajlović 2002: 12) and its goal was to create a prototype of an expert system for dating archaeological material based on digitization of available archaeological sources (Korać 2006b: 119). It was inspired by similar systems in the field of medicine (i.e. MYCIN expert system) and despite the fact that it was not fully implemented (Radio Television of Serbia, November 2019), it gave a boost to the wider use of new technologies in the field of culture. Thus, for instance, the next endeavour of the Institute of Archaeology SANU and Mathematical Institute SANU was digitization of selected collections of the Belgrade City Museum and the storage of digitized content on optical discs

Chart 1 Overview of information system in institutions for protection (1987-2018).

Year	Title	Institution	Technology	Users
1987	Library Information System (BIS) of Scientific-Technological Information System of Yugoslavia (SNTIJ)	Institute of Information Science Maribor (IZUM)	ATLASS software platform; homogeneous computer network of VAX-Digital computers; centralized databases; UNIMARC format (Lazarević 1996: 2; Trtovac 2017: 105)	Up until 1992, around 30 libraries in Serbia were included in the system of mutual cataloguing. (Trtovac 2017: 105-107)
	Library Information System of the Belgrade City Library	Belgrade City Library Energodata	BIBLIS computer program; Xenix operating system (Petrović 2002: 190)	Belgrade City Library
1989	Information System for Archaeology (ISA)	Institute of Archaeology of the Serbian Academy of Sciences and Arts (SASA) (Korać 1991b: 287)		
1991	Library Information System of the Belgrade City Library	Belgrade City Library OSA computer engineering	LIBNET computer program; Clipper programming language; MS-DOS operating system (Petrović 2002: 190)	Belgrade City Library
	Proposal for application AGORA BBS	Institute of Archaeology SASA	Online Bulletin Board System (Korać 1991a: 31-41)	
1994	Archaeological database model proposal	Institute of Archaeology SASA	Clipper; MS-DOS operating system (Korać 1994)	

1996	Library subsystem SNTIS	A group of institutions led by the Faculty of Natural Sciences and Mathematics of the University of Novi Sad	BISIS v1.0 Library Software System based on CDS / ISIS program developed by UNESCO; programming language C; database db Vista; operating systems UNIX, DOS, VMS, Windows; UNIMARC format. (Lazarević 1996: 6-8)	Until 2019, this system, i.e. its improved versions (the latest version is version 5) were used in 33 public libraries at the territory of the Republic of Serbia. ("Libraries in the BISIS System," n.d.)
	Information System of Cultural Monuments (SINS)	Republic Institute for the Protection of Cultural Monuments	Alphanumeric User Interface (Temerinski 2002: 52)	Even though the first proposal was in 1993, out of eleven SINS modules, only two were established in 1996 – records of cultural monuments and records of exports of movable cultural property. Since the system used alphanumeric user interface, it was soon replaced by new proposal in 1999. (Temerinski 2002: 52-53)
	Museum Information System of Serbia (MISS): Information subsystem Central Registry (CR)	National Museum in Belgrade	Clipper programming language; MS-DOS operating system; Museum Documentation Association (MDA) standard for museum object information (Gavrilović 2015: 2)	A total of 46 museums on the territory of RS were included until 2009, when this system ceased to be used (Gavrilović 2015: 2).
1999	Proposal for application of SUPERBASE for Archaeologists	Institute of Archaeology SASA National Museum in Požarevac	Windows-based Database Management Systems (Korać, 1999).	
	Proposals for an Electronic Documentation Center (DEC)	Republic Institute for the Protection of Cultural Monuments	MS Access	The idea to create a Web based Information System was partialy established in 2001, as Data Base of Conditions and Protective Measures of Monuments Sites was implemented (Temerinski 2002: 53).

2002	Integrated museum information system	Historical Museum of Serbia	IMUS software program; Museum Documentation Association (MDA) standard for museum object information, Spectrum, CIDOC CRM Reference model (Bojković 2016: 52; Vulikić 2018).	Since 2007, this system has been jointly developed by the Historical Museum of Serbia and the Museum of Vojvodina, and until 2018, this system, i.e. its improved versions were used by 32 museums or 34% of museums in Serbia (Vulikić 2018).
2003	Virtual Library of Serbia (VBS)	National Library of Serbia The Matica Srpska Library Svetozar Marković University Library	COBISS software platform developed by IZUM in 1991 as the successor to ATLASS; COBISS.net network; COBISS.SR mutual catalogue; COBIB.SR database; formats based on UNIMARC format ("COBISS Platform," 2016).	In 2020, a total of 223 libraries in Serbia are included in this system, i.e. in its improved versions. ("COBISS.Net in numbers," 2019)
2009	Museum Information System of Serbia (MISS): database	National Museum in Belgrade "Software Information Systems" Belgrade	MS SQL Server 2008 r2 relational database, Microsoft Access-based Desktop application (Gavrilović 2015: 2)	Used by 33 museums in Serbia. (Gavrilović 2015: 2)
2011	Museum Information System of Serbia (MISS): Eternitas web application	National Museum in Belgrade	Web application; programming language C #; open source (Gavrilović 2015: 3-4)	
2014	ZIMUS Information System	Museum of Vojvodina Institute for the Protection of Cultural Monuments of the City of Novi Sad	ZIMUS software package for cataloguing and digitizing documentation on immovable cultural heritage (Vulikić 2018)	Used by 2 institutes for the protection of cultural monuments in Serbia (Vulikić 2018)

| 2018 | Rulebook on Detailed Conditions for the Digitization of Cultural Heritage | Ministry of Culture and Information | | This act obliges libraries to use the unique system managed by the National Library of Serbia; archives to implement a unified Information System for Archives (ARHIS) managed by the Archives of Serbia; museums to implement a unified Information System (IMUS) managed by the Historical Museum of Serbia; and institutes for the protection of cultural heritage to use the system developed and managed by the Republic Institute for the Protection of Cultural Monuments (Службени гласник РС, 76/2018). |

(Mijajlović, Novaković 2002: 43).[10] It should be mentioned that the term 'digitization' was not used in this period, nor did the participants in these projects declare themselves as digitization experts (Mijajlović 2002: 25). These included archaeologists, museologists, archivists, librarians, computer scientists and mathematicians who examined, through joint ventures, the possibilities of interdisciplinary cooperation in creating infrastructures for preservation and presentation of cultural heritage in electronic form (Ognjanović 2019).

At the beginning of the 21st century, the term and concept of digitization of cultural heritage has entered into wider usage in Serbia under the influence of the European Union (EU)[11] and owing to the efforts of the National Centre for Digitization (NCD). This Centre was established in 2002 by a group of scientific and cultural institutions in Serbia, following the example of similar centres in Hungary and Bulgaria, for the sake of defining national strategies and standards, as well as coordinating the process of digitization in the field of culture in Serbia ("The Proposal to Establish National Centre for Digitization," 2002: 3).[12] Even

10 Although literature offers no information, it appears that this project was directly or indirectly inspired by the projects of the Library of Congress in Washington, D.C., which has stored its digitized collections on optical discs since 1980s (Andre 1989: 327; Cohen 2005). From 1994 it has made them available on the Web (Cohen, 2005). Its project "Making of America" was a great success and inspired many other cultural institutions around the world to digitize and present their collections on electronic media, as well as on the global network (Mandić 2008: 43).

11 Having recognized the potential of digitization of cultural heritage in conservation, education and tourism, in 2000 the EU determined, as one of its goals, the incentive to present European digital content on the global network (European Commission 2002: 24-26). Following the meeting of European Commission representatives and members of the European Union in Lund in 2001, it drew a series of conclusions regarding digitization of European heritage ("The Lund Principles," 2001).

12 These include the following institutions: Institute of Archaeology SASA, State Archives of Serbia, Faculty of Mathematics of the University in Belgrade, Mathematical Institute SASA, National Library of Serbia, National Museum in Belgrade and Institute for the Protection of Cultural Monuments of the Republic of Serbia.
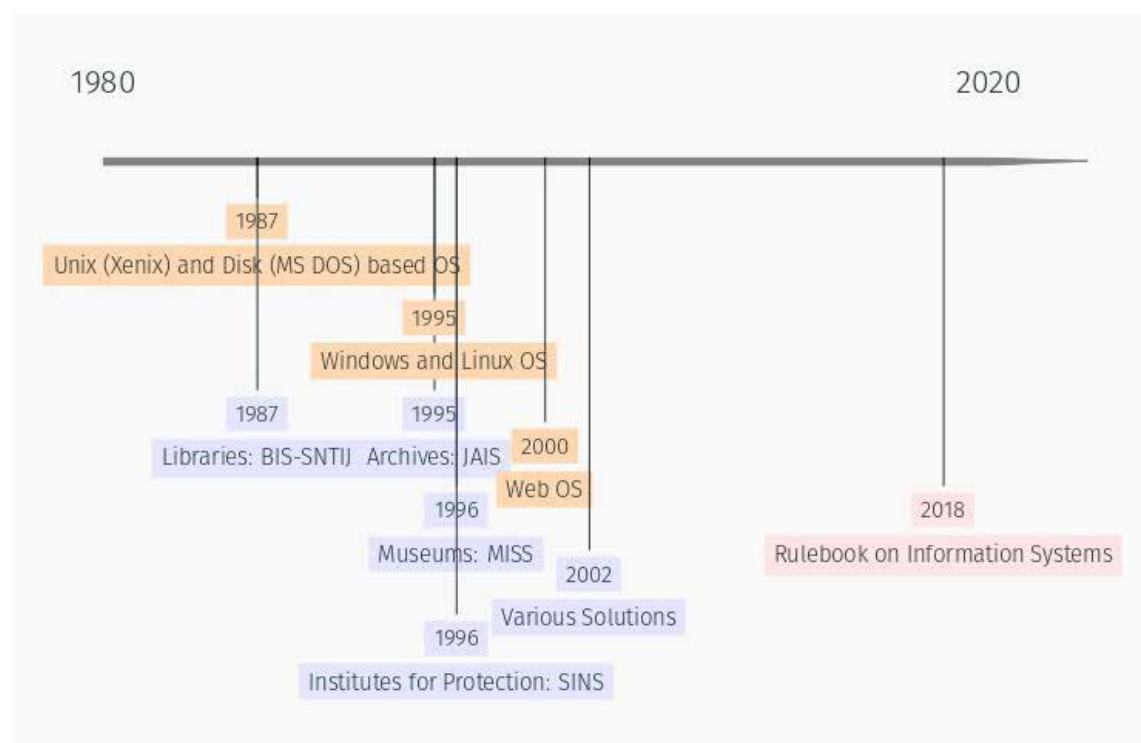
Fig. 1 Phases of information systems development within Serbian institutions for protection.

back then, it became evident that there was no equal development in the field of digitization of cultural heritage in Serbia and that it was therefore necessary to form a mechanism for encouraging and improving this process, which would be financed from the state budget (Ibid). Although the attempt to formalize the activities of the NCD failed,[13] through its journal *Review of the National Centre for Digitization* and scientific conferences, the Centre enabled interested institutions and individuals to present results of their work and network to share knowledge and future common ven-

tures.[14] However, the lack of an official national strategy in the field of culture resulted in further unequal development of the digitization process in cultural heritage institutions in Serbia. Whereas some institutions sought to integrate this process into their missions and services as soon as possible, often with the support of international initiatives (such as the EU and UNESCO support programs), others, especially in less developed areas, were unable to do so due to lack of funds, equipment and technical support. Hence, digitization was understood as a project activity rather than a regular activity (Aćimović 2016: 46). Furthermore, in the absence of official guidelines, institu-

13 In 2002, NCD representatives submitted a proposal to the Ministry of Science and Technological Development of the Republic of Serbia and the Ministry of Culture and Information of RS on the official establishment of the National Center for Digitization ("The Proposal to Establish National Centre for Digitization," 2002). However, despite the fact that the state authorities supported and promoted this idea (Stefanović 2002: 3), in the end they were not able to formalize it: "The possibilities of this Ministry are such that we can only continue to give support for your initiative" (Despotović 2003).

14 For example, at the third scientific-professional meeting of the NCD held in Belgrade in 2004, the South-Eastern European Digitization Initiative (SEEDI) was launched, constituting an "open forum" consisting of experts in the field of heritage protection, information technology, humanities and basic sciences with the aim of "developing awareness about digitization of cultural and scientific heritage" primarily in thirteen SEE countries ("SEEDI - General Guidelines" 2006).

tions that had a chance to implement new technologies in their practice have developed their own policies regarding digitization of heritage (Ibid). The consequence has been the application of different standards and systems for the description and management of cultural heritage, which has called into question the consistency and possibility of migration, preservation and availability of digitized content in the future.

When it comes to archaeology, it should be noted that a special *Subcommittee on Archaeology and Monument Protection* was originally intended to be opened at the NCD, which would consider the application of new technologies to archaeological methodology, as well as the importance of regulating the very application process in the field of archaeology ("The Proposal to Establish National Centre for Digitization," 2002, 6 and 9). Although this idea did not take hold in this form, it can be recognized to some extent in the activity of the *Viminacium Centre for New Technologies*, founded in 2003 with the task of developing and applying methods of non-destructive field research (Korać 2005: 7),[15] as well as the *Centre for Digital Archaeology of the Faculty of Philosophy in Belgrade*[16], founded in 2004 with the task of introducing computer technologies into archaeological methodology (N.M. 2006; Tasić 2010). In addition, in 2005 the journal *Archaeology and Natural Sciences* was launched for the purpose of publishing results of the application of new technologies within archaeological research (Korać 2005: 7). Chart 2 attempts to identify and categorize some of the initiatives related to the process of applying digital technologies in the field of archaeology in Serbia in the period from the first known

project in 1995 to the adoption of the new Law on Culture in 2009 (see Section 00). Based on the data in Chart 2, it is concluded that the focus was primarily on gathering interdisciplinary teams and the launch of formal organizations through which the necessary resources for development and application of new methods and technologies in the field of archaeology could be obtained. For example, multispectral scanning, infrared thermal and geo-radar non-destructive field surveys for obtaining, interpreting and storing data in digital format gained particular prominence in this period (Tasić 2007; Korać 2003; Redžić 2005; Miletić 2009). The establishment of electronic systems for managing, preserving and making available digitized and digital content likewise came to the fore. Notable instances include creating e-libraries (Ajdačić op.cit), electronic databases (Tasić 2003; Temerinski 2003; "Cultural Monuments in Serbia," op.cit) and virtual presentations (Miljković 2004b; Korać 2006a). Finally, international cooperation has been set up to exchange expertise regarding application of new methods, web databases and dynamic presentations in the field of archaeology.[17] It should be highlighted that this period was still an experimental phase of applying new methods and technologies in the field of archaeology in Serbia, in which traditional research methods were still used in most cases.[18]

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15 This center was founded by three members of the NCD, the Institute of Archaeology SASA, Mathematical Institute SASA and the Faculty of Mathematics of the University of Belgrade, as well as the Faculty of Mining and Geology of the University of Belgrade (Serbian Business Registers Agency, 2020).

16 Also known as Innovation Center for the Implementation of Information Technologies in Archaeology and Anthropology (Tasić quoted in Tasić 2020).

17 For example, although there was no official project, the Institute of Archaeology SASA has collaborated with the Temple University of Philadelphia since 2003 and the University of Wisconsin-Madison since 2008 in the field of data mining, when the project Viminacium already reached 100,000 artifacts for processing.

18 This can be seen according to description of research in the field of archaeology undertaken in Serbia in the period from 1995 to 2009, whose results were published in eminent national scientific journals, such as *Starinar*, *Glasnik Srpskog arheoloskog drustva* and *Zbornik Narodnog muzeja – arheologija (Recueil du musée national – archéologie)*.

Chart 2 Review of some of the initiatives for the application of new methods and technologies in the field of archaeology in Serbia in the period 1995–2006.

Year	Project	Organization	Topic
1995	Project PANDORA (Mijajlović 2002: 12; Korać 2006b: 119)	Institute of Archaeology SASA Mathematical Institute	Expert system for dating archaeological material
1996	Project Viminacium ("Viminacium-History of Exploration," n.d.)	Institute of Archaeology SASA	Introduction of new methods and technologies in archaeological field research
1998	Project Rastko (Stefanović 1998)	Project Rastko - Library of Serbian Culture on the Internet	E-library of journals and literature of various scientific fields, including archaeology
	Project Vinča (Tasić 2014: 25-27; Ignjatović 2010: 9; Tasić 2007)	Department of Archaeology, Faculty of Philosophy in Belgrade	Introduction of computer technologies in archaeological methodology
2000	Anarheologija (Filipović 2000; Starović n.d.)	Archaeology Program at Petnica Science Center	Popular-science electronic journal in the field of Archaeology and related sciences
2001	Project Vinča - Belo Brdo systematic geophysical surveys (Tasić 2007: 8)	Department of Archaeology, Faculty of Philosophy in Belgrade	Geoelectric terrain surveys
	Data Base of Conditions and Protective Measures of Monuments Sites (Temerinski 2003)	Republic Institute for the Protection of Cultural Monuments	Provides basic facts about the monument, give an up to date history of previous protective activities, and determine the necessary conservationist measures and their urgency.

2002	Proposal on the establishment of the Subcommittee for Archaeology and Monument Protection ("The Proposal to Establish National Centre for Digitization," 2002: 6 and 9)	National Digitization Centre	Regulation and coordination of the digitization process in the field of archaeology
	Project Viminacium, systematic geophysical surveys (Korać 2003: 52)	Institute of Archaeology SASA	Georadar, geomagnetic and geoelectric terrain surveys
	Digitization of archaeological documentation of Miloje M. Vasić (1912-1934) (Tasić cited in Miljković, 2004a)	Department of Archaeology Faculty of Philosophy, University of Belgrade	Digitization of 870 glass plates (photographic negatives), 20 plans on a hammer paper, 2000 illustrations and 7 volumes of Vasić's diaries
2003	Establishment of the Viminacium Center for New Technologies ("Serbian Business Registers Agency" 2020)	Institute of Archaeology Mathematical Institute Faculty of Mathematics Faculty of Mining and Geology	Development and application of non-destructive field research methods
	ArheoPackPro! Project (Tasić 2003)	Department of Archaeology Faculty of Philosophy, University of Belgrade	Software system for input, processing and interpretation of digital archaeological documentation
2004	Establishment of the Centre for Digital Archaeology (N.M. 2006; Tasić 2010; Tasić 2020)	Department of Archaeology Faculty of Philosophy of the University of Belgrade	A service center that connects archaeology with digital technologies
	Project Digitization and electronic presentation of Medieval Serbian Monasteries (Ognjanović 2005)	National Centre for Digitization UNESCO	Development of electronic database and web presentation of immovable cultural property
	Virtual Belgrade of 15th Century (Miljković 2004)	Faculty of Philosophy, University of Belgrade	3D reconstruction of archaeological artifacts and VR presentation
2005	Journal Archaeology and Natural Sciences launched (Korać 2005: 7)	Viminacium Centre for New Technologies	Publication of the results of the application of new technologies within the framework of archaeological research

| 2006 | ''Viminacium lumen meum'' interactive CD-ROM (Korać 2006a; Joksimović 2006) | Viminacium Centre for New Technologies Institute of Archaeology SASA Multimediaworx | Application of VR Panoramas in visualisation of Cultural Heritage |
| | GPR Research in the Area of Upper Town and Lower Town of Belgrade Fortress (Miletić 2009) | | Application of new geophysical methods and digital technology in the development of digital terrain model |

REGULATION OF THE PROCESS OF CULTURAL (ARCHAEOLOGICAL) HERITAGE DIGITIZATION IN SERBIA

Taking into account that the existing digitization projects of cultural heritage in the Republic of Serbia differed in terms of applied systems and standards for description and management of heritage, including archaeological heritage, the issue of consistency in preserving and making digitized and digital content available in the future arose. Under these circumstances, back in 2006, the Ministry of Culture and Information formed an inter-sectoral working group with the task of drafting a national strategy for digitization of cultural heritage, in which representatives of the *National Centre for Digitization* also took part. The first strategy draft was created in August 2008.[19] However, since this draft was not officially adopted at the time, Serbia failed to join European countries that were among the first to adopt national strategies regarding digitization of cultural heritage (European Commission, 2008: 17-18; European Commission, 2014: 10). Apparently, this draft was premature and did not correspond to the actual situation in Serbia, because not until the adoption of the *Law on Culture* in 2009, did the inclusion of digitization process into the agenda of cultural heritage institutions become mandatory. For this reason, they could not contribute to creating and improving a unique information system in the field of cultural heritage protection (Ognjanović 2019). The 2009 law has therefore provided a legal basis for integration of the digitization process into the missions and services of cultural heritage institutions. Although digitization of cultural heritage in Serbia was not grounded in strategic documents before 2009, some institutions of national importance carried out the digitization process even before that period (Ognjanović 2019).

The *Law on Culture*, adopted in 2009 and amended in 2011, has influenced the process of cultural heritage digitization to be further recognized through distribution of budget funds. Thus, in the period 2013–2017, the Ministry of Culture and Information co-financed and financed several digitization projects in the field of cultural heritage. When it comes to archaeological heritage, these included projects aimed at purchasing digitization equipment, digitization of archaeological collections and documentation, 3D laser scanning and development of information systems, such as those for field archaeological documentation. As leaders of the projects under consideration, one finds not just cultural heritage institutions (i.e., institutes for the protection of cultural heritage and cultural heritage museums), but also educational and scientific institutions (Faculty of Philoso-

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19 This information was provided through conversation with Professor Zoran Ognjanović, Head of the Mathematical Institute SASA, who participated in compiling the aforementioned draft strategy ("Draft of the National Strategy for Cultural Heritage Digitization for the 2008–2015 period," 2008).

phy of the University of Belgrade and Institute of Archaeology SASA), as well as civil society organizations (Centre for Urban Development) (Ministry of Culture and Information of the RS, 2013-2017).

Notwithstanding the fact that since 2013 considerable funds have been invested in digitization in the field of culture, there is still no clear national strategy or transparent records of how many state funded digitization projects were actually implemented. Hence, the Ministry of Culture and Information, inspired by the efforts of the EU (Masliković quoted in Tanjug, 2019), presented several strategic initiatives and documents in order to determine further direction of digital transformation process in the field of culture.[20] It likewise established the Sector for *Digitization of Cultural Heritage and Contemporary Creativity* as a mechanism for coordination and organizing that process. (Ministry of Culture and Information, May 2019). Particularly noteworthy is the adoption of the *Rulebook on Detailed Conditions for the Digitization of Cultural Heritage*, since it is the first bylaw in Serbia regulating the process of digitization in the field of culture. This act obliges cultural heritage institutions to determine the digitization program within their annual action plan and to digitize the entire cultural heritage in the period of five years, with the exception of archives, as well as to establish information system determined by the very act (Службени гласник РС, 76/2018). Therefore, it also obliges institutions responsible for preservation and protection of archaeological heritage

to implement the information system required by law and to send the data entered into that system not only to the state data centre for management and permanent storage ("Law on Electronic Governance," 2018; Vulikić 2019), but also to the national aggregator / search engine of cultural heritage in order to be publicly available ("The Cultural Heritage Browser," 2019). In practice, this meant overcoming several challenges, including the adoption of the prescribed system, regardless of whether another (maybe better?)[21] system had already been used for managing archaeological and other cultural heritage. Furthermore, it included finding solutions on how to make data open and publicly available, yet protect them and respect privacy in accordance with the *Law on Protection of Personal Data* ("Law on Protection of Personal Data," 2018). Last but not least, although the ultimate goal was to move to a single information system, no single solution for archaeological heritage has been offered. For example, the abovementioned Rulebook obliges institutes for protection of cultural heritage to implement a system with a locally developed standard for description of archaeological heritage managed by the Republic Institute for the Protection of Cultural Monuments (Lajbenšperger 2019), whereas museums use a system based on the Museum Documentation Association / Spectrum standard, coordinated by the Historical Museum of Serbia (Vulikić 2019). Therefore, the assumption is that archaeological heritage will be described following at least two different standards in the future, that it will be stored within different systems, and that the duplication of content is likely to be expected.

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20 These include, inter alia, the draft *Strategy for Cultural Development in Serbia* in the period from 2017 to 2027 and the accompanying action plan in which the digitization of cultural heritage is defined as one of the five areas of cultural development in Serbia with the general goal of preserving digitized content and ensuring its accessibility, exchange and presentation (Ministry of Culture and Information, May 2017). These also include *Guidelines for the digitization of cultural heritage* that provided specific guidelines for implementation of the digitization process in cultural heritage institutions (Ministry of Culture and Information, September 2017).

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21 During unofficial conversation with curators of the Ethnographic Museum in Belgrade, it was repeatedly claimed that the system developed in this institution is of better quality than the system prescribed by law. However, as the director of the National Museum once remarked, "although earlier solutions were satisfactory, they failed in implementation (Borić Brešković quoted in "Beginning of the Project – Implementation of the Uniform Information System in Serbia," 2018).

The backbone of the entire initiative of the Ministry of Culture and Information is "to introduce additional order, technology and the best experts in a pretty chaotically initiated digitization process" (Vukosavljević quoted in Blic, August 2017), as well as to obtain "clear instructions" on how "to preserve cultural heritage in digital form and make it accessible to citizens via one click" (Vukosavljević quoted in Novosti Online, October 2018). In principle, this initiative of the official authorities was positively assessed and part of the institutions of national importance publicly shared the selected material with the most basic data within the national search engine. They included thirteen institutes for the protection of cultural monuments and over fifty museums ("The Cultural Heritage Browser," 2019). However, there is the everpresent criticism regarding the process of cultural heritage digitization, claiming that it is not adequately and precisely defined, that this process is not the only way to preserve and protect cultural heritage and that cultural heritage originally created in digital form is not taken into consideration (Blic, September 2017; Ministry of Culture and Information of the RS, October 2017). When it comes to digitization of archaeological heritage, there is a proposal to provide earmarked funds "for digital archiving of key documents from the history of Serbian archaeology, providing funds for storage and preservation of archival material on archaeology and archaeological documentation" (Ministry of Culture and Information of the RS, October 2017: 3). Since these are recently adopted norms and tools, it remains to be seen whether these measures will contribute to the expected and more systematic and productive process of archaeological heritage digitization.

Certain contribution to the abovementioned issue will be given through the participation of two institutes, Institute of Archaeology and Mathematical Institute SASA, in the international COST project CA-18128, entitled SEADDA (Saving European Archaeology from the Digital Dark Age) (SEADDA 2019). Both of these institutes are represented in the abovementioned project by the authors of this paper.

The SEADDA project was adopted in 2018 and it became operational in 2019. Nominally, project participants can be involved in one of the four working groups, although they are often active in several. The first working group, the so-called *Stewardship of Archaeological Data* deals with legal issues related to legitimacy of storage and disposal of archaeological data. The second working group *Planning for Archiving* builds on the previous one and deals with the issue of storing data over a long period of time and their availability due to advances in technology. The third working group focuses on finding and studying examples of the so-called best practices, which have proven to be the most efficient and successful among fellow archaeologists in Europe. This working group is entitled *Preservation and Dissemination Best Practice*. Finally, the fourth working group, entitled *Use and Re-Use of Archaeological Data*, deals with finding out how to adapt archived data most effectively so that it can be usable now and in the future.

CONCLUSION

The overview of cultural heritage digitization in the Republic of Serbia given in this paper reveals that ever since the late 1980-ties, there have been various attempts to digitize parts of Serbia's cultural heritage. During the last decade of the 20th century, there were many efforts in digitizing both artefacts kept as various museums (their images and IDs) or data gained during specific archaeological excavations. For a long time, cultural heritage digitization was regarded as a converting process of analogue contents into their digital form exclusively. Among the earliest efforts, there was the PANDORA project (1995–1996), implemented at the Institute of Archaeology SASA and the Mathematical Institute SASA. Its goal was to create a prototype of an expert system for dating

archaeological material based on digitization of available archaeological sources. However, all of those attempts were conducted as isolated cases and they depended on the equipment each and every cultural heritage institution possessed at that specific moment.

During the period between 2000 and 2018, upgrading of the existing solutions and developing new ones took place. In that period, owing to the efforts of the National Centre for Digitization (NCD) and under the influence of the EU, the term and concept of cultural heritage digitization have entered into wider usage in Serbia.

In recent years, digitization of cultural heritage has become an imperative for all of the institutions that deal with it. This is why there are attempts to establish a strategy at the national level and implement it throughout the country. There are efforts of the Serbian Ministry of Culture and Information to regulate processes of digitizing cultural heritage and digital transformation of the protecting institutions. The new regulation on documenting archaeological research prescribes that documenting should be conducted electronically, within a unique information system for keeping incorporated archaeological documentation that should be secured by the Ministry of Culture and Information.

It should be mentioned that there is a permanent question of accessibility, due to the fear of misuse of digitized data. Although many institutions tend to keep their digitized data only to themselves or to a narrow circle of experts, initiative of the official authorities was positively assessed and part of the institutions of national importance publicly shared the selected material within the national search engine. Of course, in the future, this question needs to be clarified and very precisely defined, enabling the public and experts to get insight into the digital database but still preventing misuse.

On the other hand, in many cultural heritage institutions of national importance, a tendency was observed of "over-digitizing" their data. For example, dozens of photographs are made of a single artefact, although it does not possess an extraordinary value. 3D images of various objects are designed, although again, many of the objects are simply duplicates.

A step forward will surely be made with many of the international projects currently taking place and with several of our experts taking part in those projects. One of them is the COST Action 18128. It deals with European archaeology as a target to be digitized, but it keeps focus on the questions how, why and when something needs to be digitized.

The authors of this paper hope that in the future, possibly already in 2023, at the end of the abovementioned COST Action 18128, a clear picture would emerge, supporting digitization of cultural heritage, but keeping it within reasonable limits and by doing that – also making it accessible to a broad public.

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REZIME
SRPSKA ARHEOLOGIJA U DIGITALNOM DOBU – TRENUTNO STANJE

KLJUČNE REČI: ARHEOLOGIJA, SRBIJA, DIGITIZACIJA, PODACI, ARTEFAKTI, PREGLED.

U ovom članku, autorke se bave pregledom postupaka digitalizacije kulturnog nasleđa u Republici Srbiji, kao i pregledom projekata koji su za predmet imali bilo kreiranje digitalnih podataka ili digitalizaciju starijih, već postojećih analognih podataka. Ovaj pregled za cilj ima da istraživačima zainteresovanim za postojeće stanje približi tok i razvoj digitalizacije u Srbiji, kao i da ukaže na potencijalne izazove, ali i mogućnosti za buduća istraživanja u oblasti očuvanja kultrnog nasleđa.

Još od 1990-tih dolazilo je do različitih pokušaja digitalizacije određenih delova srpskog kulturnog nasleđa. Ovi pokušaji su se odnosili kako na predmete koji se čuvaju u pojedinim muzejima, tako i na predmete i podatke do kojih se došlo arheološkim iskopavanjima. Međutim, svi ovi pokušaji su zapravo bili izolovani pojedinačni slučajevi. Glavna poteškoća je bila, a čini se i ostala, nedostatak standarda za unošenje i pohranjivanje digitalnih ili digitalizovanih podataka, tako da se često dešavalo da dođe do gubitka istih, usled zastarelosti bilo računarske

opreme ili upotrebljenih računarskih programa.

Poslednjih godina, digitalizacija kulturnog nasleđa je postala imperativ za sve institucije koje se bave njegovom zaštitom. Zato je pokrenuta inicijativa da se na nacionalnom nivou uvede određena strategija i da se primeni u čitavoj zemlji. Iako je osnovni cilj da se u što većoj meri digitalizuje srpsko kulturno nasleđe, posebnu pažnju treba posvetiti dostupnosti tako dobijenih podataka, jer je lako moguće da dođe do njihove zloupotrebe. Takođe, potrebno je sprečiti prekomernu digitalizaciju. Zbog svega ovoga, neophodno je odrediti kako, zašto i u kojoj meri digitalizovati kulturno nasleđe.

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SECURITY OPERATION CENTRE MODULES – TECHNOLOGICAL ASPECT

ABSTRACT

The Security Operation Centre of an organisation represents a platform whose purpose is to provide detection and response services in cases of security incidents. In this paper, the technological focus is on the modules of the Security Operation Centre within an organisation, whose goal is to perform security events operations. Within the analysis of individual modules, their advantages and limitations will be presented.

KEYWORDS: SOC, SECURITY OPERATION CENTRE, INFORMATION SECURITY.

Security Operation Centre (hereinafter: SOC) is a general term used to describe an entire platform or a part of it whose purpose is to provide detection and response services in the event of security incidents. On that basis, we can distinguish four essential operations that a SOC is required to perform [1]:
- generating security events,
- collecting security events,
- storing security events,
- analysis and response in the event of detected incidents.

At this point, it is essential to denote the difference between a SOC and a CERT. CERT is a considerably wider term and, aside from the already mentioned modules and activities, it encompasses a significantly more complex spectre of activities and individuals (starting from raising consciousness, all the way to the creation of strategies linked to information security and, in final instances, the creation of national CERT drafts for laws and bylaws).

In order to ensure easier understanding of the matter at hand, we will use the term "box", which was first introduced into the terminology in *Network Intrusion Detection – An Analyst's Handbook*, a book by Stephen Northcutt and Judy Novak, which, essentially, presents individual system modules, as follows [2]:
- **E-box** for security event generators,
- **D-box** for systems used for storing and keeping events, i.e. events database,
- **R-box** for systems used for generating activities in cases when certain events are detected,
- **A-box** for systems used for analysing events,
- **C-box** for systems used for collecting and formatting events,
- **K-box** for systems used as a knowledge da-
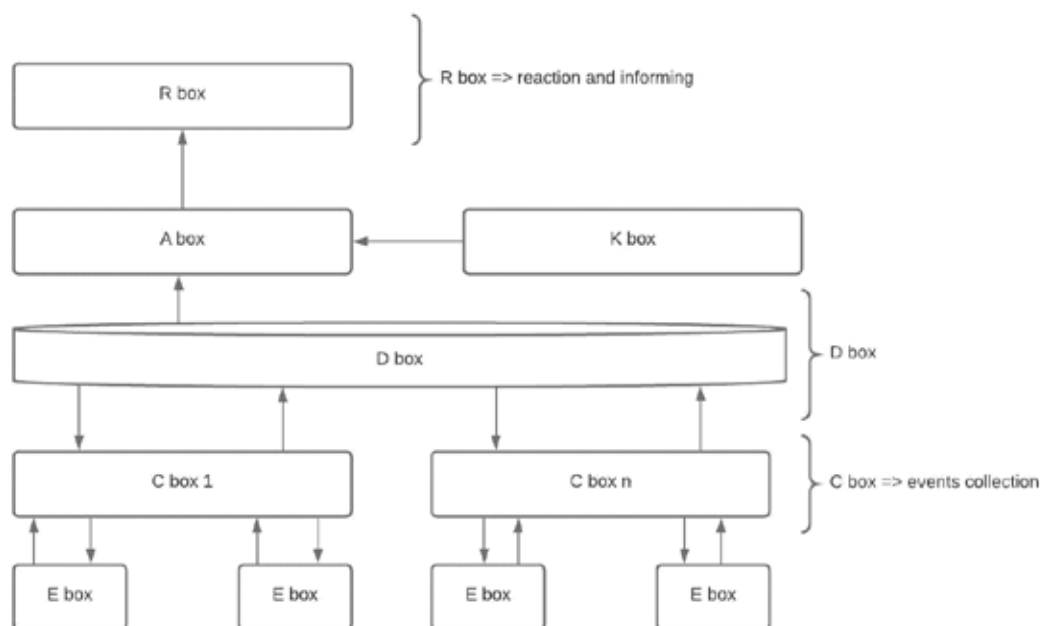
Fig. 1. General overview of the SOC modules

tabase. This system is used for managing knowledge databases for systems that are being monitored, as well as databases of detected vulnerabilities, i.e. systems for managing vulnerability tests of the computer infrastructure.

Each box describes a functional group of "modules" which perform certain operations. As an example, we can take E-boxes, which can, essentially, be any group of applications that generate system events through a standard *syslog* interface of the given operating system on which they are started. Aside from the above, network IDS or any other device or system within the infrastructure which is capable of creating system events can also be a security events generator.

As can be seen from the previous part of the paper, sometimes the term "security event" is used and sometimes simply "event", because some systems do not have a separate subcategory of security-related events, hence, the system itself has to have the option of recognising them and enabling them to be filtered so that they can be suitably categorised.

Generally speaking, all the listed modules should function on the basis of the diagram shown on Figure 1.

Aside from the obvious problem of data exchange between modules, each of the modules also has certain limitations, which will be explained in the text that follows.

E box

Boxes are in charge of generating and sending events. There are two basic types of boxes:

- event-based generators (sensors), which generate events on the basis of certain actions executed on operating systems, applications and computer network, and
- generators which generate events because of certain activities (poolers), which represent a response to an external event, such as ping, data integrity verification, or service status verification.

Sensors

The most widespread example of sensors are IDS systems, which can be organized as host based or network based. This category also includes every traffic filtering system (based on network, applications or work stations, i.e. server surroundings) which can ensure records creation, e.g. firewalls, routers with ACL-s, switches, RADIUS server etc. Finally, we can even include honeypots

and network sniffers within this category.

Every sensor is considered as a separate system, which has to meet some of the following criteria:

- continuous work,
- error resilience,
- external hazards resilience,
- minimal additional load on the system, and
- being adjustable to the system.

Poolers

Poolers represent a separate type of events generators. Their function is to generate a certain system record solely in cases when a certain state occurs, i.e. in the case of a predefined event which occurs on monitored systems. A typical example of such systems are network management systems. In this case, the pooler verifies the status of a system (e.g. via ping/SNMP tests et al.) and, if the system is unavailable (in the "down" regime), it generates a certain record which is sent to the records management system. In the context of information system security, poolers would be responsible for checking services (in order to detect DoS attacks), i.e. data integrity (most commonly in the case of web pages).

The basic limitation with poolers is their performance, because it's very difficult to configure a system so that it would verify the status of a large number of end devices, or systems, very often, without endangering the normal functioning of the system, which is a necessary condition. Aside from that, limitations occur in monitored systems as well because frequent verifications can cause processors, or network resources, to be very busy.

C and D boxes

Boxes for collecting events are used for collecting system records from different sensors and translating them into a standard format which can be comprehended by the system. Thus, a unique homogenous database of all records is made, which can be used by the system later, for further uses. As in the previous case, the main challenge is the availability and scalability of devices. Solving these challenges, however, is manageable through the use of clusters, creating high accessibility systems, similar to the implementation of the server infrastructure.

At this point, it is necessary to stress the fact that standard formatting of collected data is still in the phase of theoretical discussion and is the subject of different controversies within expert organisations linked to information security. Also, it is important to point out that the IETF (*Internet Engineering Task Force*) is working on standards linked to the standardisation of messages, or, more precisely, on the standardisation of formats of messages which are sent to the systems, or modules used for collecting events. For the time being, however, as we can see for ourselves, the situation is such that every solution manufacturer has separate record formats and manners of managing them.

D-boxes represent modules which are present in all implementations of SOC solutions and are most commonly formatted in the form of databases in which already processed system records are being stored.

Aside from classic challenges linked to database availability, integrity and confidentiality (the famous "CIA principle" = *Confidentiality*, *Integrity*, *Availability*), D-boxes face challenges linked to their performances because sensors can generate a large amount of messages over a short period of time (most often calculated in EPS => *Events per Second*). All these messages have to be saved, processed, and analysed in the shortest time possible in order to enable a timely response to attempts of endangering information systems, and with the goal of diminishing damage or completely removing potential risks. When it comes to the "CIA principle" (confidentiality, integrity and availability), the challenge in information security is precisely in finding a good balance between safety and functionality. If something is confidential, and the integrity of it is being protected, but it isn't available to the person who needs to have access to it, then it serves no purpose; similarly, if it is available without being secure, that is not a good situation either. Therefore, it is necessary that all three conditions are met in order to ensure security quality, but it is also necessary to find the optimal balance, without compromising the functioning of the organisation itself [3].

A and K boxes

These boxes (modules) are responsible for the analysis of events previously stored within D-boxes. On the basis of predefined algorithms,

which usually depend on the manufacturers and represent the most responsible factor in determining the quality of monitoring solutions, these two modules perform different operations on records in order to provide an adequate level of quality alarms and reports. It is precisely these mechanisms, or algorithms which are behind the alarm produced by the system, that define, and on the basis of collected system records, which particular design would be used in the SOC implementation. Since it is the SOC which deal with tracking and assessing the security of the information system that we are considering here, we favour the viewpoint which highlights the structural approach to attack analyses, as well as behaviour analyses, in accordance with predefined security policies.

It is evident that analytic processes require input data from the database containing predefined threats, polices, and also algorithms for analyses and intercorrelation of rules. This is, in fact, the essential application of K-boxes.

R boxes

Box is a generic term used to define a group of tools used in reports and incident response processes which are generated in the case of events which endanger, in a manner, the normal operation of monitored systems.

Experience tells us that the display of reports and predefined actions depends on the subjective feeling of the individuals who perform the task of tracking and responding to detected problems, and they include graphic displays utilised by users/administrators (GUI), strategies of application of security polices, legal limitations, as well as contractual obligations which the SOC providers have with their clients.

CONCLUSION

The reality we are facing is that security breaches occur every day and that is why today there is a need for operation monitoring systems. Experience shows us that a pragmatic approach should be applied in order to implement a professional Security Operation Centre in an organisation, which can provide reliable results. We can conclude that the only adequate approach to creating and managing reports is the one which

applies all the measures defined by best business practice. Aside from all the aforementioned, it is also necessary to point out that the use of R-boxes infers certain risks and cannot be left to chance, because inadequate use can lead to a bad or late response, which, in turn, leads to using exclusively "post mortem" analyses, that is to say – digital forensic analyses.

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REZIME
MODULI CENTRA ZA UPRAVLJANJE BEZBEDNOŠĆU ORGANIZACIJE – TEHNOLOŠKI ASPEKT

KLJUČNE REČI: SOC, IDENTIFIKACIJA, INFORMACIONA BEZBEDNOST.

Centar za upravljanje bezbednošću organizacije predstavlja platformu čija je svrha pružanja usluge i detekcije i reakcije u slučaju bezbednosnih incidenata. U radu je istaknut tehnološki fokus na module Centra za upravljanje bezbezdnošću organizacije čiji je cilj sprovodjenje operacija sigurnosnih dogadjaja. U sklopu analize pojedinačnih modula prikazane su njihove prednosti i ograničenja.

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PROCESS MANAGEMENT WITHIN THE SECURITY OPERATION CENTRE OF AN ORGANIZATION

ABSTRACT

This paper comprehends the most important processes performed by the Security Operation Centre of an organization. The main processes, described separately in the paper, provide information for identifying, tracking, prioritizing, analysing, remediating, assessing and revising, in order to solve all incidents and/or illegal activities concerning the security of the organization itself, i.e. its information assets.

KEYWORDS: SOC, SECURITY OPERATION CENTRE, INFORMATION SECURITY.

The Security Operation Centre of an organization (hereinafter: SOC) represents one or more locations where all the data linked to information security of one or more companies are gathered, sorted, stored, analysed, and on the basis of which reactions are taken in accordance with the safety policies of the company in question or on the basis of legislative regulations.

One of the most valuable tools that the person in charge of managing critical systems has is a verification list. The goal of this list is to establish an adequate process for the verification and implementation of all steps, that is to say, to list every step, even the smallest, which has to be taken in order to maintain the required security level, avoid risks, and protect data and important information. The person in charge of creating pro-cesses and procedures is the SOC manager, and all others are required to follow his lead. There is a large list of activities that the SOC team has to perform in the exact predefined manner in order to protect the computer infrastructure in a suitable manner, that is to say, so that all the threats are foreseen, and, if they occur, the team can react in the correct manner and in time. In this part of the paper, we will describe the main processes that a SOC team has to perform with the goal of:

- detecting threats,
- establishing the scope of a threat and its influence on regular business activities, and
- securing an efficient and quick response.

Main processes within the SOC are:

- events classification and triage,
- prioritisation and analysis,

Alarm type	Description	Critical level	Activities of the first level analyst
Research and sounding	Behaviour which indicates activities whose goal is to discover information on the organization	Low	All the listed activities should be compared against the Threat Intelligence database
Attack attempt	Behaviour which indicates a potential attack by activating the detected vulnerability	Low/Medium	All the listed activities should be compared against the Threat Intelligence database
Successful usage of the detected vulnerability and installation of a malicious code	Behaviour which indicates successful usage of the vulnerability or backdoor/RAT which was installed into the computer system of the company	Medium/High	Verification and research – escalation to a higher level necessary (level 2)
Compromised system	Behaviour which indicates that the system has been compromised	High	Verification and research – escalation to a higher level necessary (level 2)

Table 1 Alarms and activities within a SOC

- remediation and restoring a previous version,
- assessment and revision.

The quality of implementation of these processes represents the basis for measuring the quality of services that can be provided by a SOC.

EVENTS CLASSIFICATION AND TRIAGE

The real value of gathering, collecting and analysing data, or system records, is in finding within the forest of data actual data that can have a certain value for the organization itself. The key indicators of the system being compromised can be found in records regarding users' activities, in active monitoring of system log records (IDS, Nagios, Icinga and the like), and accepted/rejected connections to firewall devices, etc. Additionally, a specific combination of the said events, in accordance with determined patterns, can be an indicator that certain activities require additional attention and processing. A typical example of these activities is an attempt to access administrative services from locations where there are certainly no administrators (e.g. attempt to access resources from certain countries via VPN et al.). Here, the key to success lies in the possibility of classifying such or similar events so that they can be prioritized and escalated as critical and requiring special attention.

A first level analyst is required to go over all the events with a high critical level, i.e. severity. Once it is established that the mentioned event deserves attention and further investigation, escalation to the second level of processing is performed, i.e. it is transferred to the second level analyst. It should be stressed that in cases of smaller teams, the role of the first level and second level analyst can be performed by just one person. It is essentially important here that every one of the mentioned events be recorded and documented.
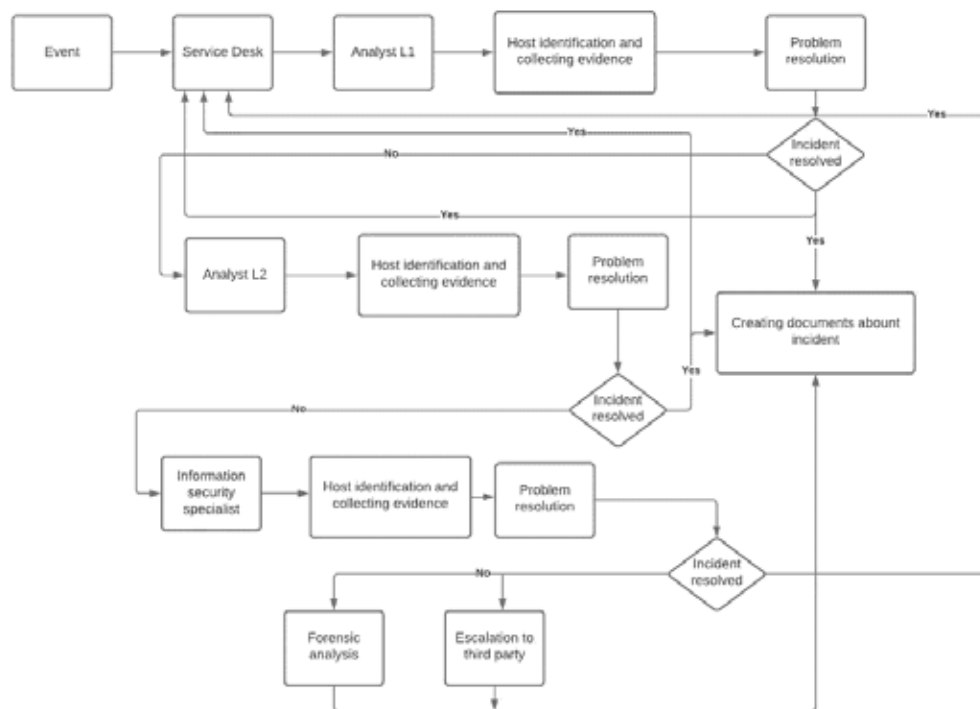
Fig. 1 Incident management process within the SOC

In most cases, the evaluation of events is done automatically, by verifying system records that have been previously correlated to predefined behaviour pattern, which can be found in certain forms of Threat Intelligence systems, which vary depending on the manufacturer but have the same principles.

Almost all alarms can be divided into four categories, on which further activities depend. The alarms and activities are given in the Table 1.

If the first level and second level analysts are not able to handle the incident successfully, it is escalated to an expert in the field of information security, and, if necessary, a CERT (Computer Emergency Response Team) is created – a team which will solve the mentioned problem [3]. In order to solve every detected incident successfully, the SOC has to have defined procedures which are described as follows:

- use of information system resources with the goal of solving incidents,
- overview of all open tickets linked to incidents,

- management of changes in incident status,
- activities taken if there is no response from the client (the client is considered to be integral part of the SOC and, in a certain number of cases, the end user can also be the system administrator),
- adding records in accordance with incident solving,
- additional escalations,
- manner of closing the incidents,
- management of high priority and high impact incidents, and
- activities in cases when a solution cannot be found.

A detailed representation of activities undertaken with the goal of solving an incident is given in Fig. 1.

As can be seen from Fig. 1, aside from the client and SOC, third parties can also sometimes be involved in the incident solving process, in order to perform additional forensic analyses, or to create necessary "patches" on systems or installations if the SOC or the end user do not have ade-

quate resources for those activities.

Aside from a third party in the final instance, we can see that, at the beginning of the process, there is a central point for communication with clients (either internal, within a company, if there is a SOC, or external, if the SOC services are entrusted to others), which is performed through a service desk, or service centre, depending on the terminology used.

The role of the SOC manager in the incident solving process was removed from the diagram for the simple reason that situations where the SOC manager is involved are very rare in communication with end users, which is performed solely on management levels.

PRIORITISATION AND ANALYSIS

Prioritisation is the key to success in any venture, and it is even more critical in information security. The stakes are high, attack rates increase suddenly and show no signs of stopping. In the meantime, the means we have for protecting property from this type of attacks are very limited. It is necessary to focus on those events which could affect the business the most and which demand knowledge about the most critical means. At the end of the day, maintaining business continuity is the most important responsibility entrusted to the SOC team.

In order to prioritise the effects of potential attacks in the best manner possible, it is necessary to previously perform a complete inventory of the equipment which is being monitored. This inventory is not merely a list of equipment, but also a complete analysis of the software which exists in the monitored system, as well as detection and classification of data which are on the equipment itself, that is to say, assessing how critical they are to the company.

Within this process, the SOC has the task of overseeing and adequately responding to any activity which indicates that a malicious user has infiltrated the infrastructure of the company. Infiltration is possible by means of installing malicious software or even the presence of a malicious user. The end result of such infiltrations is communication being intercepted or data destroyed [2]. As in the previous process, prioritisation and analyses are performed on the basis of data correlated to the existing patterns or patterns defined by the user within the technological systems that the SOC has available.

In order to achieve the best possible results of analyses, in accordance with the existing technology and development level of the SOC, there is an increasing use of artificial intelligence and machine learning, whose task is to recognize the increasingly more diverse manners of spreading malicious codes and malicious activities.

REMEDIATION AND RESTORING A PREVIOUS VERSION

The sooner an incident is detected and responded to, the higher the possibility that damage will be completely avoided or reduced to the minimum. There are, however, certain cases when consistency cannot be confirmed with great reliability for all data, that is to say, when the system is compromised to the point that it becomes necessary to restore it to one of the valid previous copies, in accordance with the regulations or the business continuity plans of the company. Usually, the company handles the process of restoring a previous version and not the SOC team. The SOC team generally has an advisory/consulting role in such cases and that of the system verifier, by doing some of the following activities:

- reconfiguration of the system in accordance with the needs of the company,
- reconfiguration of the network and network parameters in accordance with the needs of the company,
- revision of the system security level in regard to the hardware-software protection,

- revision of the capability of the infrastructure to monitor events, and
- upgrading system software and applications in accordance with the recommendations of the manufacturer.

ASSESSMENT AND REVISION

Assessment and revision, essentially represent preventive testing of the information-communication system to vulnerabilities. System vulnerability analysis is very significant from the protection standpoint, so that organizations could know which oversights are present on systems, how difficult it is for an attacker to use them, and which consequences could be caused by them. It is always the optimal solution to deal with potential threats before an attacker actually discovers them. This is most commonly done precisely through system vulnerability testing, followed by a detailed analysis of the results, on the basis of which a report is created, with recommendations on how to enhance the overall security of the information system. These activities, essentially, represent the most widely spread manner of revision of the information-communication system. The revision process itself can be performed by the SOC, an external or an internal revision unit.

It is necessary, here, to point out that certain standards, such as PCI DSS standards, require regular scanning and prescribed levels of system protection so that the company will show required competencies. Aside from what we have already mentioned, it is important to stress that the system should be tested in such a manner so as not to disturb regular work flow. Testing is performed according to the plan made by the IT services for a closer monitoring of the systems which are being tested.

CONCLUSION

A Security Operation Centre within an organization represents one or more locations where all the information linked to the information security of one or more organizations are gathered, sorted, stored, kept, or analysed and on the basis of which measures are taken in accordance with the safety policies of the company in question or on the basis of legislative regulations. Both in the recent and more distant past, we were witnesses of minor or larger security breaches, the result of which was some kind of bad impact on the organization, in terms of either finances or reputation, and which disrupted, in some manner, the regular delivery of contracted services to third parties. The SOC represents a group/team/organizational unit which has the basic goal of protecting information resources, either through prevention, by raising the consciousness on risks, or reactively, in cases of successful or unsuccessful attacks on the computer infrastructure. The SOC consists of a large number of processes, and the most important ones have been examined in detail. Essentially, this consists of people and technology which have to work in a coordinated manner so as to avoid potential problems in detecting and removing the consequences of an attack.

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REZIME
UPRAVLJANJE PROCESIMA U OK-VIRU CENTRA ZA UPRAVLJANJE BEZBEDNOŠĆU ORGANIZACIJE

KLJUČNE REČI: SOC, CENTAR ZA UPRAVL-JANJE BEZBEDNOŠĆU, INFORMACIONA BE-ZBEDNOST.

Ovim radom su obuhvaćeni najvažniji procesi u okviru Centra za upravljanje bezbednošću organizacije. Glavni procesi koji su posebno opisani u radu pružaju informacije za identifikovanje, praćenje, prioritizaciju, analizu, remedijaciju, procenu i reviziju za razrešavanje onih incidenata i/ili protivpravnih aktivnosti koji se odnose na bezbednost same organizacije, odnosno njene informacione aktive.

* * *

PRIKAZI - REVIEWS

IVAN DRNIĆ, KUPINOVO. GROBLJE LATENSKE KULTURE / A LA TÈNE CULTURE CEMETERY, IZDANJE ARHEOLOŠKI MUZEJ U ZAGREBU (MUSEI ARCHAEOLOGICI ZAGRABIENSIS), EDICIJA KATALOZI I MONOGRAFIJE, SVEZAK 12, ZAGREB 2015. Publikacija je štampana dvojezično (hrvatski i engleski jezik). Sadrži 220 stranica, 34 slike, 223 kataloške jedinice, 46 tabli i spisak literature sa 406 bibliografskih jedinica.

Na području Kupinova u Sremu nalazi se više arheoloških nalazišta iz različitih perioda. Najstariji tragovi naseljavanja pripadaju starčevačkoj kulturi (lokaliteti Krstovi i Šanac). Tragovi iz epohe eneolita registrovani su na mestima Selište, Ostojića bašte i kanal Jarčina. Materijal iz bronzanog doba konstatovan je u blizini kupinovske crkve, posvećene Svetom Luki. Iz istog perioda potiče i ostava metalnih predmeta sa nepoznatog lokaliteta. Latenski nalazi otkriveni su, takođe, pored crkva svetog Luke, kao i na nalazištima Krstovi i Panjevi. Antički period zastupljen je rimskim naseljem iz I–IV века na lokalitetu Grobnica, neposredno nadovezanim, etnički i hronološki, na poznolatensko naselje. Na Kutinskom kutu utvrđeno je postojanje kasnoantičke nekropole. O burnom životu u srednjem veku svedoče ostaci utvrđenog grada Kupinika (XIV–XVI vek), pomenuta crkva Svetog Luke (zadužbina srpskog despota Đurđa Brankovića) i ostava novca turskog sultana Bajazita I.

Monografija, čije autorstvo potpisuje Ivan Drnić, publikovana je u okviru edicije *Katalozi i monografije* Arheološkog muzeja u Zagrebu. Posvećena je latenskim nalazima iz Kupinova, otkrivenim gotovo stotinu godina pre njihove stručne obrade. Nalazi, koji potiču iz uništenih grobnih celina, najvećim delom čuvaju se u Arheološkom muzeju u Zagrebu, ali i u okviru drugih zbirki, od kojih je najznačajnija pohranjena u Prirodno-istorijskom muzeju u Beču.

Publikacija je štampana dvojezično (hrvatski i engleski jezik). Cilj publikacije je stručna obrada nalaza i objedinjavanje podataka o njima, budući da su razdeljeni u okviru više zbirki i delimično publikovani u različitim publikacijama. Autor pokušava da odgonetne značaj uništene nekropole i pruži odgovore na pitanja o njenom širem arheološkom, društvenom i istorijskom kontekstu, vezanom za period latena na prostorima južne Panonije i severnog Balkana.

Knjiga započinje *Predgovorom,* autorskim doprinosom Jacqueline Balen, gde su prikazani sadržaj dela i ostvareni dometi istraživačkog rada. Naglašeno je da edicija *Katalozi i monografije Arheološkog muzeja u Zagrebu* ima za zadatak publikovanje muzejske građe u što širem kontekstu. Zaključeno je da delo ostvaruje zadati cilj, jer predstavlja rezultat iscrpnog rada koji obuhvata latenske nalaze iz Kupinova čuvane u depou Arheološkog muzeja u Zagrebu, ali i adekvatne sadržaje pohranjene u drugim muzejima. Na taj način, publikacija doprinosi kvalitetnijoj interpretaciji lokaliteta, ali i čitavog perioda koji predstavlja predmet istraživanja.

Autor monografije, Ivan Drnić, svoje delo započinje opširnim *Uvodom,* podeljenim u dve tematske celine. Prva celina pruža osnovne podatke o epohi latena u geografskim okvirima južne Panonije. Izlaganje ilustruju karta važnijih nekropola latenske kulture na navedenom području i tabela sa hronološkom podelom latenske kulture i lokalnih grupa na prostoru južne Panonije i jugoistočnih Alpa.

Stranice drugog dela uvodnog poglavlja prikazuju okolnosti pod kojima su lokaliteti u Ku-

pinovu dospeli na stranice arheološke literature. Naglašava se značaj organizovane mreže muzejskih poverenika, uspostavljene krajem XIX i početkom XX veka, na prostoru Srema. Kao rezultat aktivnosti muzejskih poverenika brojni nalazi dospeli su u zbirke Arheološkog muzeja u Zagrebu. Nalazi iz Kupinova prvi put su zabeleženi 1900. godine, na stranicama stručnih tekstova Josipa Brunšmida. Autor monografije potom beleži prepisku o otkupu latenskih predmeta sa lokaliteta Klemova ciglana za zagrebački muzej. Na pomenutom lokalitetu se, najverovatnije, nalazila latenska nekropola odakle potiču nalazi obrađeni u publikaciji *Kupinovo, groblje latenske kulture.*

Sačuvana dokumentacija ukazuje da je tada dvadesetak predmeta dospelo i do Prirodno-istorijskog muzeja u Beču. Tekst ilustruju snimci pisama iz prepiske, vezanih za ponudu i otkup navedenih predmeta. Opisana studija slučaja ukazuje na značaj podataka sačuvanih u arhivskim fondovima muzeja, čije proučavanje zaslužuje veću pažnju istraživača.

Naredni redovi nabrajaju poblikacije, na čijim stranicama se mogu pronaći određeni podaci o nalazima sa latenske nekropole u Kupinovu. Autor naglašava da pobrojana dela, ipak, nisu pružila detaljnu analizu celokupne građe. Ovaj poduhvat preuzeo je na sebe Ivan Drnić, predstavivši rezultate stručne obrade i interpretacije nalaza u okviru monografije koju predstavljamo ovom prilikom.

Nakon uvodnog izlaganja, autor pralazi na tipološku i hronološku analizu nalaza, okarakterisanih kao grobni prilozi. Pružen je kratak osvrt na načine savremene analize nekropola, što označava obradu predmeta materijalne kulture prilagane u svojstvu grobnih priloga, ljudskih, životinjskih i biljnih ostataka, ali i pogrebnih rituala, grobne arhitekture, međusobnih odnosa grobova u okviru nekropole, kao i odnosa groblja prema naseljima, odnosno svega što je u stručnu literaturu počelo da ulazi pod pojmom „materijalnost smrti (the materiality of death)".

Autor je svestan da izloženi postulati nisu mogli biti, u potpunosti, primenjeni prilikom obrade stu-

dije slučaja sa kupinovske latenske nekropole, imajući u vidu da su grobne celine uništene prilikom iskopavanja zemlje za potrebe Klemove ciglane. Premda su tada izgubljeni brojni značajni podaci, autor smatra da zbirka od oko dve stotine sačuvanih grobnih priloga predstavlja korpus iz koga se mogu „izvući" zaključci o hronologiji i kulturološkom definisanju nekropole, a time i zajednice koja je na tom mestu pokopavala svoje preminule pripadnike. Pre izlaganja arheološkog materijala, nabrojani su autori, na osnovu čijih predloženih tipologija, su obrađeni i razvrstani nalazi.

Predstavljanje nalaza otpočinje sa mačevima, kao najkarakterističnijim delom latenske ratničke opreme. Predočene su razvojne faze mača kao oružja, uz iznošenje podatka da se on razvio od zapadnoevropskih kasnohalštatskih bodeža koji se, na prelazu starijeg u mlađe gvozdeno doba, u Zapadnoj Evropi (početkom V veka pre nove ere) razvijaju u mačeve. Razvoj mačeva nastavlja se u periodu od V do I veka pre nove ere, što je predstavljeno u okviru tipologije primenjene prilikom analize kupinovskih nalaza. Materijal iz Kupinova obuhvata ukupno 28 mačeva i njihovih delova, kao i još nekoliko konstrukcijskih elemenata, poput graničnika i ovalnih pločica sa drški.

Navedeni broj nalaza predstavlja zadovoljavajući korpus za hronološko-tipološku analizu, predstavljenu od strane autora. Na osnovu analize najkarakterističnije vrste nalaza, izveden je zaključak da je nekropola bila u upotrebi od druge polovine IV do I veka pre nove ere (faze latena LT B2 do LT D1/D2).

Poseban deo posvećen je koricama mačeva. Podvučeno je mišljenje francuskih autora da se, upravo u konstrukciji i izradi korica mačeva, najbolje odražava inovativnost i veština latenskih majstora, kao i da je upravo nastanak korica izrađenih od gvozdenog lima uticao na razvoj mačeva. Potom su, ukratko, predstavljeni osnovni delovi korica latenskog mača.

Na sistematski istraživanim latenskim nekropolama česti su nalazi očuvanih korica. Imajući u vidu da taj vid istraživanja nije sproveden u Kupi-

novu, ovaj tip nalaza zastupljen je samo sa teško oštećenim komadima. Prema tipološkim odrednicama uočenim na očuvanim delovima, nalazi se određuju u tri stepena latenske kulture – LT B2, LT C1 i LT C2. Autor posebno skreće pažnju na nalaze nekoliko dekorisanih fragmenata korica.

Nakon mačeva, autor se posvetio i nalazima povezanim sa latenskim kopljima. U latenskom periodu koplje, uz mač, predstavlja osnovno napadačko oružje koje se sastojalo od nekoliko konstrukcijskih elemenata: vrha, drške i petice. Kao što je slučaj i kod mačeva, vrhovi kopalja su od V do I veka pre nove ere menjali oblik i dimenzije, što je bilo uslovljeno izmenama u načinu borbi, ali je moglo predstavljati i odraz tradicija u proizvodnji.

Autor precizno opisuje promene u oblicima vrhova kopalja, pružajući i grafički prilog sa tipološkom podelom zasnovanom na preseku i obliku lista, kao i dužini i obliku nasadnika. Predložena tipološka podela, na četiri osnovna tipa, može se pratiti na nalazima vrhova kopalja iz Kupinova. Pružen je i osvrt na tehnike i motive korišćene u slučajevima ukrašavanja vrhova kopalja. Poseban deo posvećen je pretpostavljenom izgledu ostalih delova koplja – drškama, peticama i okovima. Naglašeni su nalazi iz Kupinova, uz navođenje brojnih analogija za svaki nalaz.

Sledeću obrađenu grupu nalaza predstavljaju delovi osnovnog odbrambenog oružja, štita. Nalazi vezani za štitove podeljeni su na dve osnovne grupe – središnje okove i ostale delove štitova (okovi drški, okovi ruba, zakovice). Kao i u slučaju ostalih nalaza, predstavljen je razvoj ove grupe nalaza kroz period mlađeg gvozdenog doba. Grafički je predstavljen model latenskog štita sa naglašenim sastavnim delovima. U skladu sa već utvrđenom praksom, kupinovski nalazi su predstavljeni sa adekvatnim analogijama.

Posebnu kategoriju predstavljaju pojasne garniture za nošenje mača. Nalazi su razvrstani na ranolatenske pojaseve sa obručima, pojasne garniture sa lančanim elementima i srednjolatenske pojaseve sa obručima. Grafičkim prilozima predstavljen je razvoj navedenih tipova, dok tekstualni

deo nastavlja da kvalitetno i iscrpno predstavlja značaj nalaza.

Među kupinovskim materijalom iz zagrebačkog muzeja zastupljeni su i noževi različitih tipova čije su funkcije, imajući u vidu oblik i dimenzije, izvesno bile različite. Sledeći uspostavljenu nit prezentacije, autor predočava sve relevantne podatke vezane za ovaj tip nalaza.

Poseban osvrt pružen je na nalaze fibula. Autor smatra za potrebno da naglasi malobrojnost ovog tipa nalaza iz Kupinova u poređenju sa latenskim nekropolama sa očuvanim grobnim celinama. Objašnjenje za ovu pojavu pronalazi se u nestručnom prikupljanju predmeta od strane radnike Klemove ciglane. Sačuvani nalazi su obrađeni, datovani i upoređeni sa poznatim analogijama.

Važan deo latenske nošnje predstavljali su i komadi svrstani u širu grupu, određenu pod nazivom obručasti nakit (narukvice, nanogvice i prstenje). Autor naglašava da su, u ženskim grobovima, zastupljeni nalazi izrađeni od bakra i sapropelita, dok su ređi predmeti od plemenitih metala. Od početka latenskog LT C1 stepena javlja se i stakleni i, nešto sporadičnije, gvozdeni nakit. Za mušku nošnju karakteristične su gvozdene narukvice jednostavnijih oblika. U skladu sa utvrđenim principima u publikaciji, i ovaj tip nalaza je isrpno obrađen i predstavljen.

Kao posebna kategorija nalaza izdvojeni su ženski pojasevi. Opisan je njihov značaj u latnskoj nošnji i predstavljene razvojne faze u vezi sa izgledom i delovima pojaseva. Sa kupinovske nekropole potiču dve pojasne kopče, deo pojasa sastavljen od članaka u obliku broja osam, povezanih spojnicama i dvodelnom kopčom i dva pojasa sastavljena od uvijenih štapićastih članaka, spojenih obručima. U ovu grupu nalaza uvrštena su i tri gvozdena štapićasta priveska, kakvi se javljaju na pojasevima različitih tipova. Za sve nalaze navedene su brojne analogije.

Jedini predmeti izrađeni od stakla su dvadeset i pet sitnih perli kobaltno plave boje. Autor smatra da svi nalazi potiču iz jednog groba i da se ova vrsta nalaza vezuje za ukope pripadnika autohtonih

južnopanonskih zajednica, u čijim su se nošnjama spajali elementi starijegvozdenodopske tradicije sa ranolatenskim uticajima.

U grupu nalaza opredeljenih kao toaletni pribor spadaju makaze, pincete, britve i češljevi. U latenskim nekropolama toaletni pribor najčešće se otkriva u muškim grobovima, dok je ređi u grobovima žena, gde se najčešće pronalaze makaze. Autor posebno skreće pažnju na nalaze britvi, do kojih se isključivo dolazi u muškim grobovima. Naglašeno je mišljenje o važnosti ovog predmeta u konstrukciji muškog, a ponekad i ratničkog, identiteta. Sa kupinovske nekropole poznat je samo nalaz jedne britve.

Kao prilog, u grobovima latenske kulture ponekad se nalaze delovi konstrukcijske opreme za kola sa dva ili četiri točka. Autor smatra da je reč o nastavku halštatskih ili još bronzanodopskih tradicija. Ovoj grupi pripada nalaz iz Kupinova u vidu izdužene karike sa dva jednaka okrugla obruča.

Za razliku od prethodno navedenih predmeta, nalazi oruđa u latenskim grobovima ređe imaju funkciju grobnih priloga, mada se sporadično pojavljuju u grobnim celinama. Iz Kupinova je poznato nekoliko komada oruđa, poput sekire sa sečivom trapezoidnog oblika i tulcem, kosa sa dugim i blago povijenim sečivom i gvozdenog klina za koga se ne može sa sigurnošću reći da li pripada latenskom periodu.

Keramičke posude predstavljaju čest nalaz u latenskim grobovima. Sa kupinovske nekropole sačuvano je samo nekoliko posuda, što autor objašnjava time da lokalitet nije sistematski istraživan i da fragmenti keramike nisu pruivukli pažnju sakupljača. Kupinovska keramika može se razvrstati na nekoliko različitih oblika — posude između zdele i lonca, zdele bikoničnog oblika, kantarosi, zdela sa izvučenim obodom i posuda kuglastog oblika sa ravnim dnom, kao moguće nasleđe autohtonih panonskih kultura.

Treće poglavlje u publikaciji nosi naslov *Interpretacija groblja u Kupinovu.* Na stranicama poglavlja autor iznosi utemeljene zaključke o vremenskom pozicioniranju nekropole (zasnovano na tipološko-hronološkoj analizi nalaza), okvirno određujući njeno formiranje u period srednjeg latena.

Pažnja je posvećena i pogrebnom ritualu. Ovaj zadatak je bio zahtevan, jer je nekropola uništena bez evidentiranih podataka o grobnom celinama i obliku grobnih jama, dok se u izveštajima P. Marjanovića i J. Brunšmida samo beleži postojanje grobova sa ostacima spaljenih pokojnika („paljevinski grobovi"). Sa druge strane, na osnovu analogija sa drugim lokalitetima i pojedinim kupinovskim nalazima (ranolatenske narukvice, dvodelni šuplji obruč, savijeni ranolatenski mač...), I. Drnić smatra da u Kupinovu postoje indirektne potvrde biritualnog načina sahranjivanja.

Takođe, autor posebno podcrtava da je na oružju sa kupinovske nekropole uočljiv još jedan pogrebni ritual, koji se često javlja u latenskoj kulturi, mada nije isključivo vezan za nju. Reč je o ritualnom uništavanju pojedinih predmeta. Naime, više od polovine mačeva i veliki broj kopalja oštećen je savijanjem, a na pojedinim nalazima vide se i tragovi sečenja. Autor smatra manje verovatnom pretpostavku da je ovaj ritualni čin predstavljao prevenciju protiv pljačkanja grobova i smatra osnovanijim mišljenje da je reč o religijskoj simbolici koja predstavlja smrt predmeta korišćenih u konstrukciji identiteta preminulog ratnika. Odnosno, uništeno oružje moglo je označavati smrt socijalnog bića ratnika i njegovo isključenje iz zajednice živih.

Početak ritualnog uništavanja oružja okvirno se povezuje sa prelaskom na kremacijski način sahranjivanja, s tim što se javljaju izuzeci, kako u vidu pronalaska neoštećenog oružja u grobovima spaljenih pokojnika, tako i pojedinačnih pojava deformisanog oružja u skeletnim grobovima.

U potpoglavlju pod naslovom *Kulturna pripadnost groblja* autor, na osnovu predstavljenog materijala, zaključuje da se u Kupinovu nalazila relativno velika nekropola latenske kulture. Na nekropoli je svoje mrtve ukopavala zajednica, koja je mogla biti uključena u širu grupaciju poznatu pod nazivom Skordisci. Morfološki se, ipak, izdvajaju

i pojedini nalazi povezani sa autohtonim panonskim stanovništvom, ali i neke karakteristike koje se objašnjavaju geografskim položajem lokaliteta i njegovom povezanošću sa centralnobalkanskim plemenima i središtima mediteranskog kulturnog kruga. Autor, na osnovu analogije sa vremenski i prostorno bliskim nekropolama (Karaburma, Zvonimirovo, Beletov vrt...), odgonetava pitanja vezana za socijalnu strukturu zajednice koja vrši pokopavanje, za šta upravo nalazi sa nekropola pružaju bitne smernice.

Poglavlje sa nekonvencionalnim naslovom *Na kraju...* donosi razmišljanje autora o pitanju da li je već više od stotinu godina trajanja naučnog procesa, oličenog u prikupljanju materijala i terenskog i teorijskog istraživanja, pružilo zadovoljavajući doprinos poznavanju latenskog perioda na prostoru južne Panonije. Odgovor na pitanje je, na žalost, negativan. Autor naglašava da je, i pored brojnih istraživačkih dostignuća vezanih za utvrđena i otvorena naselja iz mlađeg gvozdenog doba, i dalje vidljiv nedostatak podataka o ranolatenskim naseljima i slabim poznavanjem istih iz perioda srednjeg latena, kao i nejasan odnos između pojedinih naselja u kasnom latenu, dok su nedorečena znanja vezana za njihovu infrastrukturu.

Sa druge strane, autor napominje da saznanja o latenskim nekropolama na navedenom prostoru, u poslednjim decenijama zaostaju u odnosu na istraživanja istovremenih naselja i pored istraživanja velikog broja grobalja u tom periodu. Naglašen je i nedostatak literature u kojoj je adekvatna pažnja posvećena pogrebnom kultu. Na sve navedeno nadovezuje se i činjenično stanje da je vremenom uništen veliki broj latenskih nekropola, sa kojih nisu sačuvani ni pokretni nalazi, na šta se nadovezuje i priča o „crnom tržištu" arheoloških predmeta.

Sa stručne strane, formiranje kompletne slike o sahranjivanju u mlađem gvozdenom dobu otežava i gotovo potpun nedostatak osteoloških analiza ostataka pokojnika. Naravno, ovaj tip analiza u startu je jako otežan činjenicom da su latenske kulture, na ovom podneblja, u najvećoj meri praktikovale spaljivanje pokojnika, što dosta

otežava mogućnost dobijanja podataka iz osteološkog materijala. Takođe, u dosadašnjoj literaturi izostavljene su i analize životinjskih i biljnih ostataka, u kontekstu grobih priloga u hrani koji bi mogli pružiti značajne informacije, poput društvenog statusa pokojnika, rodne diferencijacije, ali i godišnjeg doba kada je izvršen pogrebni ritual.

Autor izražava optimizam u pogledu mogućnosti dobijanja novih saznanja, pouzdajući se i u „istraživačku sreću" arheologa vezanu za mogućnosti novih proučavanja, kako u smislu registrovanja novih lokaliteta, ali i mogućnosti da poznata nalazišta ponovo postanu polja istaživanja. Do tada, ukazuje se na brojnu građu pohranjenu u muzejskim depoima i arhivama koja i dalje čeka na stručnu i naučnu obradu i interpretaciju.

Prvi deo publikacije završava se kratkim poglavljem *Zahvala...*, gde autor, uz konstataciju sa arheologija nije „individualan sport", izražava svoju zahvalnost brojnim ustanovama i pojedincima, koji su predstavljali podršku prilikom realizacije ovog poduhvata.

Kataloški deo knjige otpočinje listom nalazišta sa kojih potiču nalazi korišćeni kao analogije za kupinovski materijal. Pojedinačno su navedeni lokalitetii za svaku vrstu nalaza, raspoređeni po državama.

Poglavlje *Kupinovo ─ katalog predmeta* sadrži 223 kataloške jedinice nalaza sa nekropole. Nalazi su razvrstani u sledeće grupe: mačevi i korice (48 kataloških jedinica), koplja (43 k. j.), petice (3 k. j.), okovi drške (3 k. j.), delovi štitova (20 k. j.), pojasne garniture (14 k. j.), noževi (22 k. j.), fibule (17 k. j.), obručasti nakit (11 k. j.), ženski pojasevi (10 k. j.), stakleni predmeti (1 k. j.), toaletni pribor (1 k. j.), oruđe (3 k. j.), delovi kola i konjske opreme (1 k. j.), keramičke posude (7 k. j.) i predmeti iz Muzeja u Beču (19 k. j.). Svaka kataloška jedinica predstavljena je preciznim opisom, dimenzijama, datacijom, vrstom materijala i literaturom.

Iscrpan spisak literature sadrži 406 bibliografskih jedinica. Crteži nalaza predstavljeni su na 46 tabli.

Publikacija Ivana Drnića predstavlja odličan primer obrade, analize, pronalaženja analogija i prezentacije nalaza koji su dugi vremenski period čekali da budu predstavljeni stručnoj, ali i široj zainteresovanoj javnosti. Knjiga, pored toga što predstavlja smernicu za pravac budućeg publikovanja arheoloških nalaza, nameće još dva zadatka za istraživače — neophodnost i značaj „iskopavanja u muzejskim depoima" koji kriju mnoge zanimljivosti i potrebu za izradom sveobuhvatne monografije ili zbornika radova posvećenog arheološkim lokalitetima u Kupinovu, kao mestu gde su gotovo sve epohe prošlosti ostavile neizbrisiv trag.

Ljubiša VASILJEVIĆ

RUBINA RAJA, ANETTE HØJEN SØRENSEN, HARALD INGHOLT & PALMYRA, Museum of Ancient Art at Aarhus University, Aarhus Denmark 2015. Publikacija sadrži 68 stranica na engleskom jeziku (prevedenih sa originala na danskom jeziku), 83 ilustracije, tri terenska crteža i dve mape.

Publikacija je pratila izložbu, otvorenu 2015. godine u Muzeju drevnih umetnosti na Orhus (Aarhus) univerzitetu u Danskoj. Izložba je zasnovana na rezultatima dobijenim u okviru projekta istraživanje porteta iz Palmire, koji je predstavljao zajednički poduhvat Karlsberg Fondacije i Orhus univerziteta. Značajno je napomenuti da se, izvan Sirije, najveća kolekcije pogrebne skulpture iz Palmire čuvaju u Novoj Karlsberg gliptoteci (Ny Carlsberg Glyptotek) u Kopenhagenu, što predstavlja rezultat aktivnosti navedenog projekta.

Rimska posmrtna skulptura iz antičke Palmire predstavlja najmonumentalnije predstave ljudskog tela i portreta nastale izvan samog Rima. Samo ta činjenica je dovoljna da označi izuzetnu vrednost pomenutih nalaza, s tim što se oni mogu istraživati i u okviru proučavanja identiteta rimskih provincija, ali i sveobuhvatne studije o antičkoj skulpturalnoj umetnosti. Svi navedeni aspekti izučavani su od strane istraživača u okviru projekta proučavanja rimskih portreta iz Palmire.

Palmirska skulptura može da se podeli u dve grupe, veoma različite po brojnosti. Prvu grupu predstavljaju portreti javnih ličnosti (malo je sačuvanih), dok drugu čine posmrtne predstave. Javne skulpture podizane su u čast pripadnike lokalne elite, a postavljane su na karakterističnim lokacijama u različitim delovima grada. Na ovim skulpturama muškarci su predstavljeni odeveni u toge dok su na pogrebnim portretima prikazani odeveni u grčke hitone ili persijsku odeću. Raznolikost se uočava i u načinu predstavljanja žena. Na javnim skulpturama žene su prikazivane sa odećom koja im je u potpunosti prekrivala tela i sa malo nakita, što je bilo uobičajeno u rimskom svetu. Sa druge strane, predstave žena iz grobnih celina odlikuje ukrašavanje ekstravagantnim ko-

madima nakita, dok je odeća (uključujući i razna pokrivala za glavu) pokazivala raznolikost kakva se retko sretala u rimskom svetu.

Nakon određivanja osnovnih grupa palmirske skulpture, autorke ponovo skreću pažnju na značaj kolekcije pohranjene u Karlsberg gliptoteci i njenu povezanost sa istraživačem Haraldom Ingholtom. Pored skulptura, u ovoj gliptoteci čuva se i obimna arhivska građa vezana za Ingholtova istraživanja. Upravo je spoj jedinstvenih nalaza i bogate arhivske građe pohranjenih u fondovima kopenhagenske ustanove, omogućilo da na ovom mestu otpočne projekat detaljnog pročavanja palmirske skulpture.

Premda su palmirske skulpture privlačile pažnju istraživača tokom perioda dužeg od jednog veka, sve studije ostale su nedorečene do pojave Ingholtovog disertacije, iz 1928. godine, pod nazivom Studije palmirske skulpture (Studier over Palmyrensk Skulptur). Disertacija zasnovana na karlsberškoj zbirci, pružila je osnovu za buduća proučavanja datovanja palmirske skulpture, ali i osvrte na pitanja razumevanja karakteristika ove vrste spomenika, kako u kontekstu čitavog Rimskog Carstva, tako i u okviru lokalne zajednice.

Izrada novog kataloga palmirske zbirke u gliptoteci sačekala je 1993. godinu, kada su se ovim poslom pozabavili Gunhild Ploug i Ove Hidberg-Hansen. Prilikom realizacije ovog zadatka autori su koristili Ingholtovu arhivu, koja sadrži uvid u osnovne hronološke odrednice skulptura i više od 800 ilustracija.

U skladu sa zahtevima i standardima trećeg milenijuma, pred realizatorima projekta istraživanja palmirske skulpture nametnula se potreba digitalizacije pomenute arhivske građe i omogućavanje njene potpune dostupnosti svim zainte-

resovanim istraživačima. Autorke su istakle da je planirano da tokom trajanja procesa digitalizacije bude obrađeno, dokumentovano i predstavljeno više od 2600 portreta iz palmirske zbirke. Konačan cilj procesa je predstavljanje sveobuhvatnosti korpusa, koji će sadržati sve poznate portrete iz sfere interesovanja, bez obzira u čijem se vlasništvu nalaze.

Neželjeni ali veliki dodatak aktuelnosti projekta pružili su nemili događaji vezani za ratna dešavanja u Siriji, prilikom kojih je veliki boj portreta ilegalno izmešten iz Palmire. Prateći efekat ovih događaja predstavljao je veliki porast izrade falsifikata palmirskih umetničkih dela. Kako su se saznanja o postojanju i aktivnostima projekta širila, ostvaren je kontakt sa velikim brojem kolekcija širom sveta koje su želele konsultacije i stručno mišljenje vezano za autentičnost portreta do kojih su dolazile.

Autorke su predočile i činjenicu da su palmirske skulpture retko predstavljane u publikacijama izdatim u zemljama engleskog govornog područja. Potom su naglasile da su najznačajnije studije o ovoj temi publikovane na francuskom i nemačkom jeziku gde su, po mišljenju autorki, imale pogrešan fokus na „provincijski“ karakter portreta. Dalje se navodi da slično stanovište postoji i u literaturi na engleskom jeziku, gde se ponekad palmirske skulpture tumače kao rimski provincijski portreti koji slede imperijalne stilove i modne trendove. Autorke decidno naglašavaju da se palmirska umetnička dela ne mogu okarakterisati na taj način i da imaju sopstvene karakteristike i izvornost.

Za razliku od rimskih, porteti iz Palmire nemaju individualizovane nego idealizovane karakteristike, često sa naglašenim generičkim oblicima lica. Takođe, kroz predstave odeće, nakita i pokreta izrazito se potencira palmirski identitet koji čini mešavina grčko-rimskih, parćanskih i lokalnih elemenata.

Nakon predstavljanja projekta i osnovnih karakteristika palmirskih skulptura, pružen je osvrt na istoriju Palmire. Prošlost Palmire opisana je preko dvadeset i jedne takstativno navedene odrednice. Opisan vremenski raspon proseže se

od osamnaestog veka pre nove ere, odnosno najstarijeg poznatog pomena imena grada zabeleženog u zapisu iz antičkog Marija, sve do 1132. godine nove ere, kada je Belov hram pretvoren u otomansku tvrđavu.

Sledeći taksativno navedeni istorijat odnosi se na povezanost danskih istraživača sa nasleđem Palmire. Predočeni vremenski period proteže se od 1678. godine, kada grupa engleskih trgovaca „ponovo otkriva“ Palmiru, sve od 2012. godine u kojoj Rubina Raja pokreće projekat pruoučavanja palmirskih portreta. Razumljivo, najveći broj odrednica posvećen je istraživačkoj delatnosti Haralda Ingholta.

Naredno poglavlje u publikaciji opisuje geografski položaj Palmire (današnji lokalni naziv je Tadmor) i pruža osnovne podatke o lokalitetu. Pisane podatke o izuzetnoj lokaciji i značaju antičkog grada, smeštenom u srcu sirijske pustinje, zabeležio je 77. godine nove ere rimski pisac Plinije Stariji. Antički autor posebno naglašava značaj geografskog položaja, plodnog zemljišta i postojanja izvora u neposrdnom okruženju. Najveće vodeni resurs u okruženju predstavlja izvor Ekfva, vrelo tople sumporne vode sa karakterističnim mirisom.

Antički grad nalazio se na relativno ravnom terenu, okruženom padinama obližnjih brda. Na pomenutim padinama nalazili su se kamenolomi koji su eksploatisani tokom antičkog perioda. Autorke se potom osvrću na izgled i najznačajnije građevine nekadašnjeg raskošnog naselja.

Naredna tri poglavlja posvećena su istraživačkoj delatnosti Harolda Ingholta (1896−1985), filologa za semitske jezike, teologa i arheologa. Tokom svoje dugogodišnje karijere Ingholt je obavljao zaduženja u više međunarodnih institucija. Svoju bogatu karijeru okončao je kao profesor na Univerzitetu Jejl u Nju Hejvenu. Nakon penzionisanja, ostao je u Sjedinjenim Američkim Državama sve do svoje smrti. Precizno su navedeni svi koraci u bogatoj Ingholtovoj karijeri.

Harald Ingholt je bio pionir danskih arheoloških istraživanja na Bliskom Istoku. U periodu

između 1924. i 1938. godine rukovodio je iskopavanjima u Siriji, prvo u Palmiri, a potom na lokalitetu Hama. Gotovo dve decenije kasnije, od 1957. godine, predvodio je istraživanja nalazišta Tel Šimšara u Iraku.

Tokom tri kampanje istraživanja koje je Ingholt sproveo u Palmiri tokom treće decenije dvadesetog veka, istražen je veliki broj grobnica. Grobni prilozi sadržali su skulpture i druge nalaze, poput predmeta od stakla i keramike. Akcenat svojih interesovanja Ingholt je položio na proučavanje skulptura i natpisa. Sa druge strane, o čemu svedoče njegovi dnevnici, nije se ustručavao ni od otkupljivanja predmeta koji bi ga zainteresovali. Najzanimljiviji nalazi, na kraju svog puta, dospeli su u gliptoteku u Kopenhagenu.

Poseban naglasak u publikaciji posvećen je prvoj Ingholtovoj kampanji u Palmiri, sprovedenoj 1924. godine. Budući da se Sirija tada nalazila pod francuskom dominacijom, Ingholt je, tokom prvih istraživanja, sarađivao sa Morisom Dunanom, direktorom Francuske arheološke misije u Libanu. Međutim, kampanja je finansirana od strane danske Rask-Orsted fondacije.

Tokom dvomesečnog iskopavanja, većinom sprovedenih u okviru jugozapadne nekropole, istraženo je tridesetak podzemnih grobnica sa razvijenom arhitektonskom konstrukcijom u obliku obrnutog slova T. Na vratima većine grobnica nalazili su se natpisi koji su svedočili o vremenu izgradnje i sahranjenima u njoj. Kao vrstan filolog Ingholt je zabeležio približno stotinu natpisa, pretežno ispisanih na palmirskom dijalektu aramejskog jezika, mada su zabeleženi i dvojezični, na grčkom i aramejskom.

Naredne stranice opisuju Ingholtova dostignuća vezana za istraživanja i interpretacije rezultata dobijenih prilikom narednih kampanja arheoloških iskopavanja, fokusiranih na proučavanje grobnica i stambene arhitekture. Za rekonstrukciju istraživanja neizmerni značaj imaju sačuvani terenski dnevnici, u kojima je Ingholt precizno beležio sve detalje i aspekte iskopavanja. Ingholtovi dnevnici osim zapisa sadrže i vrlo vredne mape na kojima su detaljno prikazani položaj i orijentacija grobnica.

Na osnovu brižljivog proučavanja jugozapadne nekropole tokom narednog dvomesečnog istraživanja 1925. godine u saradnji sa arhitektom Albertom Gabrijelom, Ingholtove mape su obogaćene novim detaljima. Izvršena je tipizacija grobnica i ustanovljeno je da postoje tri tipa nekropola-*loculi* ili police u nišama, gde je pokojnik položen; grobnice kule i grobnice kuće/hramovi. Iako su skoro sve grobnice imale sličan generalni plan, ipak, ni jedna nije bila ista.

Uključujući grobnice iz jugozapadne nekropole Ingholt je identifikovao ukupno pedeset i jednu grobnicu. Od ovog broja samo su dvadeset četiri grobnice bile pristupačne za ulazak i dalje proučavanje. Istraživanje je znatno obogaćeno novim saznanjima kada se ustanovilo da je jedna od najstarijih grobnica, *grobnica Atenatana*, koja potiče iz 98. godine, prohodna za ulazak.

Osim dodatnog broja grobnih mesta otkrivenih tokom druge etape istraživanja, pronađeni su i neki zapisi ispisani grčkim dijalektom, što je bila novina u odnosu na zapise iz prethodnih istraživanja kada je ustanovljeno da su svi zapisi pisani palmirsko-aramejskim dijalektom.

Iako je ovog puta pronađeno manje zapisa, jedan je pobudio pažnju istraživača po svojoj neobičnosti. Uobičajena praksa je bila da glava kuće, odnosno muškarac, obezbedi grobna mesta za članove svoje porodice, o čemu svedoče i zapisi na grobnicama. Međutim, ovaj neobični zapis o prodaji pogrebne niše ženi nazanoj *Julia Aurelia Amtha,* svedoči u prilog činjenici da su i imućnije žene isto tako imale mogućnost da plate pogrebno mesto i izradu zapisa.

Poseban segment teksta autorke su posvetile muralima i štuko ukrasima koji su pronađeni kako u privatnim kućama tako i u grobnicama Palmire. Tragovi nekada živopisnih boja mogli su se pronaći i na skulpturama a replike nekih murala u tehnici vodenim bojama je 1928. uradio danski arhitekta Čarls Kristensen, koji je sarađivao sa Ingholtom prilikom treće faze istraživanja. Pomenute replike rađene su po uzoru na murale koje je

Ingholt pronašao u samo tri grobnice 1924. godine tokom prve faze istraživanja.

Likovno najbogatija od tri grobnice u kojima su sačuvani murali je *grobnica Hairana* koja potiče iz 106-07. godine. Ona je oslikana predstavom Hairana i njegove žene, koji su okruženi vinovom lozicom, medaljonom sa portretom dečaka i orlom sa raširenim krilima koji je naslikan preko svoda iznad ulaza u grobnicu. Veruje se da su murali nastali 149-50. godine.

Tokom 1932. Ingholt je objavio nekoliko crteža iz pomenute grobnice kao i iz *grobnice Dionisusa* ali bez plana same grobnice pa tako i nije poznato gde su se crteži tačno nalazili. Treća grobnica u kojoj su pronađeni crteži obojeni žutom, zelenom, braon, crvenom i crnom bojom je *grobnica Makai*. Međutim, detalji o pozicijama crteža takođe nisu poznati. Kasnije su otkriveni i zidni crteži na stubovima u *grobnici tri brata* koja se nalazila u jugozapadnom delu nekropole.

Nije moguće sa sigurnošću utvrditi da su ove zidne slike imale religiozno značenje jer, kako autorke dalje navode, ima jako malo materijalnih, arheoloških i pisanih izvora o religijskom životu u Palmiri tokom rimskog perioda. Autorke dalje upućuju na knjigu Teda Kaizera *Religiozni život u Palmiri* iz 2002. godine u okviru koje nailazimo na podatke o socijalnoj strukturi ovog antičkog grada, a navedena struktura je najverovatnije nasleđe upravo rimske ere.

Ono što je poznato je da je ovaj antički grad bio podeljen na velike porodice koje su imale i svoje hramove od kojih je najveći bio hram posvećen Balu. Balov hram je služio kao svetilište i ostalih bogova a osim velikog svetilišta sastojao se i od dvorane koja je mogla da primi preko stotinu ljudi, nekoliko velikih oltara kao i od podzemnih tunela kojima su dovođene žrtvene životinje.

U okolini ostataka ovog hrama pronađene su mnogobrojne pločice od terakote – *tesareje,* koje su služile kao svojevrsni tokeni za ulazak na religiozne bankete. One su bile sličnih dimenzija ali je oblik znatno varirao. Na osnovu identifikacije preko hiljadu tesareja utvrđeno je da je jedna stra-

na ovih pločica sledila skoro doslednu ikonografiju dok su sa druge strane detalji varirali od slučaja do slučaja.

Posebno poglavlje posvećeno fotografijama odabranih tesareja naglašava njihov značaj u religioznom životu naroda koji je živeo na tlu Palmire. Sa jedne strane, usko su povezane sa obredima koji su se održavali u hramu, a sa druge, one predstavljaju najbogatiji i najpouzdaniji izvor koji je u vezi sa religijskim verovanjima žitelja ovog antičkog grada. Predstave na tesarejama obiluju mnoštvom tema a pretežno su prikazivana različita muška i ženska božanstva. Veliki deo tokena je ukrašen natpisima sveštenika koji je održavao religijski banket, a na nekima je bila ispisana i količina hrane i piće neophodna da bi se dobio jedan token za ulazak na svečanost. Često su ove pločice od terakote odbacivane nakon svečanosti jer više nisu imale vrednost. Izrada posebnih tesareja za svaku svečanost i činjenica da je bilo moguće prisustvovati samo po pozivu, nam omogućava zaključak da su ove religiozne svečanosti bile od velikog značaja za stanovnike Palmire.

U narednom tekstu autorke opisuju Ingholtov povratak na iskopavanja u Palmiri 1928. godine nakon što je uspešno odbranio svoju doktorsku disertaciju. Osim pomenutog arhitekte Kristensena, trećem iskopavanju prisustvovao je i danski arhitekta Johanes Muler, koji je pomagao Kristensenu u izradi arhitektonskih skica grobnica. Paralelno sa iskopavanjem Ingholt je kupio i brojne artefakte sa iskopavanja, uključujući i tesareje.

Tokom zime 1928. iskopavanja su uglavnom bila usmerena ka severozapadnom uglu jugozapadnog dela nekropole, posebno ka *grobnici Atenatana* u kojoj se nalazila i zanimljiva velika apsida nazvana po natpisu koji se na noj nalazio – *Makai apsida.* Grobnica je isklesana 98. godine a 229. je proširena dodatnom apsidom koja je urađena za čoveka nazvanog *Julius Aurelius Maqqai.* Iz natpisa saznajemo da je on lično platio za izradu ove niše koju je namenio za svoje sinove i njihove sinove. Apsida je imala oslikan svod a značajna je pre svega zbog tri sarkofaga od kojih

su dva imala skulptoralne dekoracije, koje svedoče o funeralnim običajima u Palmiri tokom trećeg veka. Sarkofazi su izrađeni od kamenog krečnjaka verovatno uzetog iz lokalnog kamenoloma a veruje se da je na njima prikazan Makai sa svojom porodicom i slugama. Tragovi boja, crvene i plave, pronađeni su na dva sarkofaga, što je Ignholt i zabeležio u svojim skicama. Figure na sarkofazima nose odeću karakterističnu za to vreme, dugačke toge i ogrtače, a tragovi boje ukazuju da su ivice odeće bile ukrašene upravo ovim bojama. Iskopavanja *grobnice Atenatana* su vršena tokom sve tri ekspedicije, 1924, 1925 i 1928. godine.

U tom periodu, u zapadnom delu nekropole iskopana je i grobnica nazvana *Beli zamak*, datovana u kasni drugi vek. Iako postoje debate kom tipu grobnica ona pripada, Ingholt je smatrao da predstavlja tipičan primer kućne grobnice. U njoj je pronađeno devet fragmenata, malih i velikih ali i izuzetno očuvana bista žene sa vidljivim tragovima boje. Ovu bistu, nazvanu *Lepotica Palmire* Ingholt u svom dnevniku opisuje kao „najlepšu žensku bistu koju je do tada video". Po dobijanju sredstava od Rask-Orsted fondacije, Ingholt je otkupio ovu bistu i poslao je Karlsberg gliptoteci u Kopenhagen. Autorke naglašavaju značaj ovog otkrića, za koje se nije znalo sve dok nije počeo rad na prevođenju i publikovanju Inghgnoltovih dnevnika. Ističu da nema sumnje da će njegovi dnevnici pružiti značajne informacije o toku samog iskopavanja kao i o kulturnom nasleđu Palmire što je moguće upravo samo putem komparativne analize ovih dnevnika i kolekcije u gliptoteci.

U poglavlju nazvanom: *„Nezavršena posla: grobnica Malku"* navodi se podatak da se Ingholt ponovo vratio u Palmiru u dva navrata 1935. i 1937. prevashodno da bi dodatno ispitao *grobnicu Malku*, u jugozapadnom delu nekropole, u koju nije ranije mogao ući jer je bila zatrpana. Na osnovu četrnaest različitih zapisa otkrio je da je 116. godine ovu grobnicu izradio doktor Malkuza sebe, svoje sinove i njihove sinove. U njoj se kako saznajemo, sahranjivalo sve do 267. godine. Pronađeno

je nekoliko dobro očuvanih bisti i jedan sarkofag ukrašen figurama koji se danas nalazi u Nacionalnom muzeju u Damasku a zapisi su deo kolekcije u gliptoteci. *Grobnica Malku* i artefakti koji su tu pronađeni su nabolje opisan segment od svih Ingholtovih istraživačkih poduhvata u Palmiri.

U daljem tekstu sažeto je objašnjeno da su grobnice izrađivali pojedinci, za sebe i svoju familiju. Glavni natpis se nalazio na ulazu u grobnicu i sadržao je podatke o tome ko je platio izradu grobnice. Ponekada su ovi natpisi sadržali i tekst o kratkom istorijatu porodice a često su na njima bila ispisana upozorenja ili pretnje kletvom, onima koji planiraju da opljačkaju grobno mesto. Osim natpisa naloženih od strane vlasnika grobnice na ulazu ili u unutrašnjosti grobnice su se mogli naći i različiti oficijelni zapisi sa setom pravila o tome šta vlasnik sme da dozida ili zazida i slično tome.

Posebno važno poglavlje ilustruje nastanak gliptotečke kolekcije koja zapravo počinje kupovinom artefakata koje je Karl Jakobsen namenio za svoju kolekciju. Ova kolekcija predstavlja reprezentativnu selekciju različitih tipova portretne skulpture uključujući individualne i dvojne portrete, jednu mumiju, kao i reljefe koji potiču iz perioda od prvog veka pre nove ere pa do kasnog trećeg veka. Artefakti su prevashodno bili smešteni u Jakobsenovoj vili u Kopenhagenu, koja je danas Akademija Karlsberg. Nešto kasnije u centru grada izgrađena je Karlsberg gliptoteka da bi se 1886. godine ovde prebacili svi dragoceni predmeti. Tokom 1889. godine kolekciju je katalogizovao glavni rabin Kopenhagena profesor David Simonsen.

O radu Haralda Ingholta u gliptoteci i brojnim kupovinama predmeta iz Palmire saznajemo u narednom poglavlju. Autorke hronološki predstavljaju njegovo angažovanje, navodeći da je već od 1925. godine bio angažovan na različitim poslovima ovde, od strane sina Karla Jakobsena, koji je i osnovao gliptoteku. U periodu od 1927-1930. godine bio je kustos i sekretar ove fondacije i tada je značajno obogatio ovu kolekciju dodajući joj predmete nabavljene kupovinom od građana Palmire ili sa iskopina. U kolekciji se danas nalaze

skulpture, predmeti od stakla, tokeni od terakote i slični njima. Iako nakon 1930. godine više nije radio za fondaciju sarađivao je sa njima dugi niz godina, a u decembru 1981. godine im je ponudio svoju veliku kolekciju fotografija i printova koja se danas nalazi u muzejskoj biblioteci. Naredni, dopunjen katalog artefakata iz Palmire sačinili su 1983. godine Gunhild Ploug i Fin Ove Hidberg-Hansen. Deo Ingholtove arhive, uglavnom onaj koji se tiče iskopavanja *grobnice Malku*, zajedno sa nekim isečcima iz novina i izveštajima, nalazi se na Jejl univerzitetu gde je Ingholt radio kao profesor sve do penzionisanja. Jedan segment arhive sa Jejla danas se nalazi na Orhus univerzitetu. Treba istaći da je Ingholt bio aktivan istraživač sve do smrti 1985. u svojoj 89. godini.

Sledeće poglavlje ovog izveštaja bliže nas uvodi u nastanak i razvoj projekta *Portreti iz Palmire*. Ovaj projekat je zaživeo 2012. godine kada je počelo prikupljanje podataka o portretima iz Palmire za posebno oformljenu bazu podataka. Tokom 2015. godine u bazi je bilo 2600 unosa. Prethodne studije su obradile oko 900 portreta a Ingholt je doprineo sa podacima nastalim tokom iskopavanja sa pronađenih 527 skulptura. Tim istraživača koji radi na projektu planira da obradi i publikuje Ingholtove neobjavljene skice i zapise kao i planove nekih grobnica.

U sklopu završnog poglavlja autorke se ponovo osvrću na stanje u Siriji tokom 2011. godine. U osvit rata na tom prostoru povećao se broj nelegalno prodatih i kupljenih originalnih artefakata a zapažena je i povećana izrada kopija koje su prodavane kao originali pod navodima da pripadaju starim libijskim kolekcijama. Zabeležen je i pokušaj prodaje jedne figurine venere sa vrlo karakterističnim obeležjima. Ovaj predmet je jordanska policija zaplenila 2014. godine, a značajan je zbog činjenice da odražava nastojanje infiltracije uticaja određenih etničkih grupacija na antičko nasleđe u regionu Sirije. Postolje pomenute figurine je urađeno kao menora, tipično judaistički simbol, što govori u prilog tome da su radionice koje su se bavile proizvodnjom ovih i sličnih predmeta, nastojale da

posvedoče prisustvo Jevreja na ovom području. Ipak, mnogobrojni pronađeni artefakti nakon mnogo godina istraživanja pobijaju ovu konotaciju.

Iako je publikacija izdata 2015. godine, projekat *Portreti iz Palmire* još uvek traje. Treba istaći da je temelje istraživanjima portreta postavio upravo Ingholt sa hronologijom i tipologijom koju je postavio u svojoj doktorskoj disertaciji, a njegovi doprinosi ostaju fundamentalni u izučavanju funerarne skulpture iz Palmire. Više o projektu može se videti na web stranici: www.projects.au.dk/palmyraportrait.

Ljubisa VASILJEVIĆ
Ivana ĆIRIĆ

UREĐIVAČKA POLITIKA ČASOPISA ARHEOLOGIJA I PRIRODNE NAUKE

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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.

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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).

OTVORENI PRISTUP

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.

SAMOARHIVIRANJE

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;
- • pravo na štampanje probnih primeraka, reprint i specijalnih izdanja rukopisa;
- • pravo da rukopis prevede na druge jezike;
- • pravo da rukopis reprodukuje koristeći fotomehanička ili slična sredstva, uključujući, ali ne ograničavajući se na fotokopiranje, i pravo da distribuira ove kopije;
- • pravo da rukopis reprodukuje i distribuira elektronski ili optički koristeći sve nosioce podataka ili medija za pohranjivanje, a naročito u mašinski čitljivoj/digitalizovanoj formi na nosačima podataka kao što su hard disk, CD-ROM, DVD, Blu-ray Disc (BD), mini disk, trake sa podacima, i pravo da reprodukuje i distribuira rukopis sa tih prenosnika podataka;
- • pravo da sačuva rukopis u bazama podataka, uključujući i onlajn baze podataka, kao i pravo prenosa rukopisa u svim tehničkim sistemima i režimima;
- • 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.

ODRICANJE ODGOVORNOSTI

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 PRIRODNE 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).

11. Sastavni delovi bibliografskih jedinica (autorska imena, naslov rada, izvor itd.) navode se u skladu sa usvojenom formom navođenja. Redakcija časopisa ***Arheologija i prirodne nauke*** prihvatila je preporuku Ministarstva za nauku i tehnološki razvoj i odlučila da autori treba dosledno da primenjuju pravila citiranja i navođenja literature prema uzoru na sistem koji navodimo u daljem delu teksta.

U primerima koji slede navedene su najčeće citirane vrste refererenci:

I KNJIGE (MONOGRAFIJE)

1. Autorizovane knjige
a. jedan autor
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.

b. dva ili tri autora
Između imena prvog i drugog autora, ili drugog i trećeg u bibliografskoj jedinici na srpskom jeziku treba da stoji veznik **i (**ćiriličnim pismom, ako je bibliografska jedinica na ćirilici, a latiničnim **i,** ako je na latinici). Ako je rad naveden u literaturi na engleskom ili nekom drugom stranom jeziku, treba da stoji (bez obzira na korišćeni jezik) engleski veznik and.
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
Za knjige štampane ćirilicom koje imaju četiri i više autora, u osnovnom tekstu navodi se samo ime prvog autora i dodaje se u nastavku **i dr.** Za knjige štampane latinicom koristi se u nastavku skraćenica *et al.* Skraćenica *etc.* koristi se u slučajevima kada ima više od tri suizdavača ili mesta izdanja.

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.
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Hurst, H. and Owen. S.(eds) 2005
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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

a. pisanih različitim pismom
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.
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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. Крунић, Београд: Музеј града, 85-117.
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Samson, C. 1970
Problems of information studies in history, in: *Humanities information research*, S. Stone, ed., Sheffield: CRUS, 44-68.

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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)
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Fishman, R. 2005
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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.

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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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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.

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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.

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

SUBMITTING PAPERS

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

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, reviewer'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.

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