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TRACING CIVILIAN SETTLEMENT IN THE SURROUNDINGS OF *NOVAE* (LOWER MOESIA). SOURCES, INVESTIGATIONS, RESULTS

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Abstract: The reconstruction of the civilian settlement in the neighbourhood of *Novae* is a task requiring an integrated scientific approach. Non-destructive investigations carried out in 2012–2014 were one of the steps in the long and laborious process of collecting data concerning this subject. The field survey included geomagnetic prospection, field walking, and mapping metal finds, but also laboratory analyses of archaeobotanical remains or documentation of architectural structure visible in some places. Finally, the results were compared to information provided by epigraphic evidence.

Due to the limited time for the survey, geomagnetic prospection was performed in an area covering 12.67 ha. The results undoubtedly show the existence of anthropogenic underground structures in the eastern annex of *Novae* and in the area of the presumed *vicus* at Ostrite Mogili. In the small lot accessible on the western side of the fortress, the results were better when investigations were done using the electric resistance method. The results were not so clear at other minor sites, although they are rich in archaeological material. The metal finds and pottery used in establishing the chronology helped to create a map of the *canabae* and Late Roman *suburbium*. During field walking, we localised several settlements or other traces of human activity, but also surveyed the exact positions of the mithraeum and shrine of Dionysus / Liber Pater. The research results show that studying the extramural settlement at *Novae* should involve long-term surveys and must be continued in the future.

Keywords: *Novae* , Lower Moesia, *canabae legionis*, civilian and military settlement, non-intrusive surveys.

Novae is one of the most important Roman military sites on the Lower Danube (**fig. 1**). The legionary camp and attached civil settlements developed into a Late Roman fortified town with an extensive annex on its eastern side (**fig. 2**). *Novae* is considered to have been the base of the Eighth Augustan Legion dispatched to Thrace with orders to suppress the uprising in AD 46, though the earliest earth-and-timber architectural remains have been dated to a slightly later date[1]. However, the legionary fortress became a permanent base of the First Italic Legion which arrived in *Novae* at the beginning of the 70s to stay there until the end of Antiquity, as its presence is attested epigraphically through to the 430s at the very least[2].

The legionary camp lay on an extensive sloping plateau on top of a high Danubian escarpment between two small gullies. The stone fortress rearranged during Trajan's reign covered 17.99 ha, sloping downward toward the Danube, from about 70 m a.s.l. at the southern end to just 40 m a.s.l. at the northern one. The western side of the fortress is adjacent to flat terrain, rising slightly upwards to the south, while the terrain on its eastern side is more irregular; with flat land and a deep gully to the north-eastern side, and a high, naturally defensive plateau on the south-eastern side (**fig. 3**). The deep valley of the river called Dermen dere cuts through loess hills to the east of *Novae* before reaching the waters of the Danube.

[1] Genčeva 2002, 10-11; Sarnowski, Kovalevskaja, Tomas 2012, 169.
[2] Sarnowski 2005; Sarnowski, Kovalevskaja, Tomas 2012.

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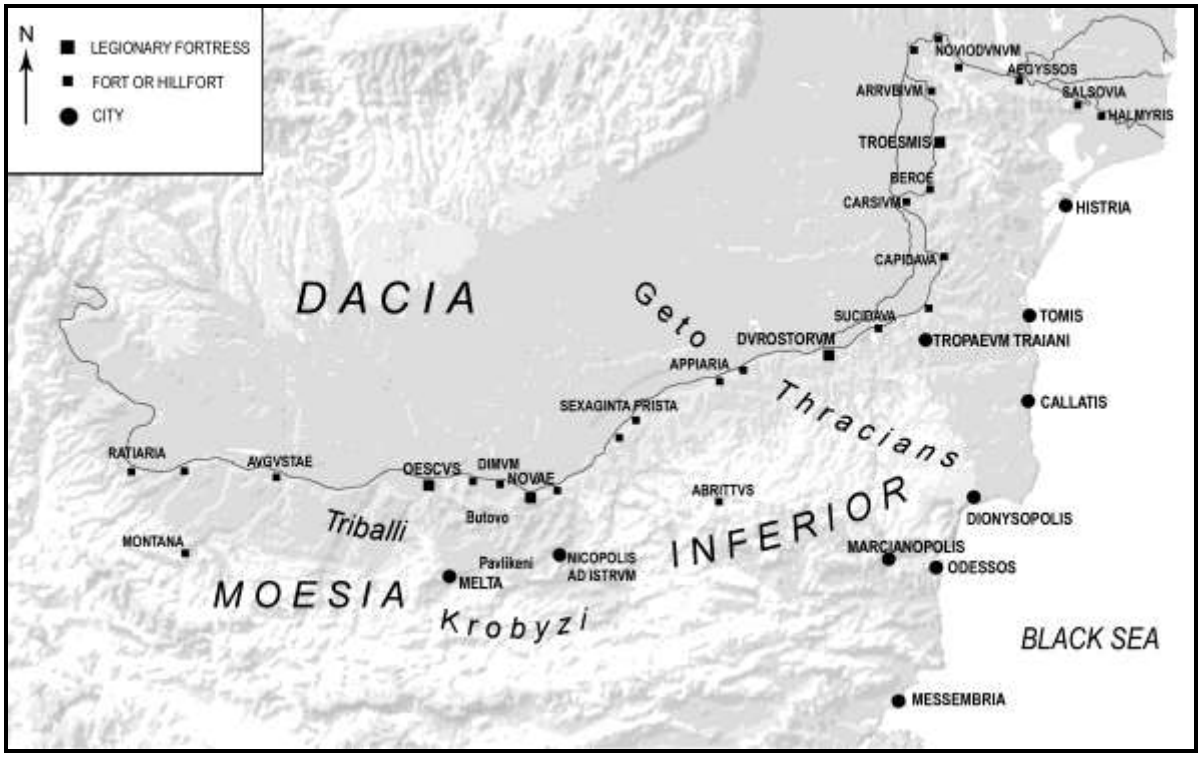

Fig. 1: The location of *Novae* in Lower *Moesia* (A. Tomas).

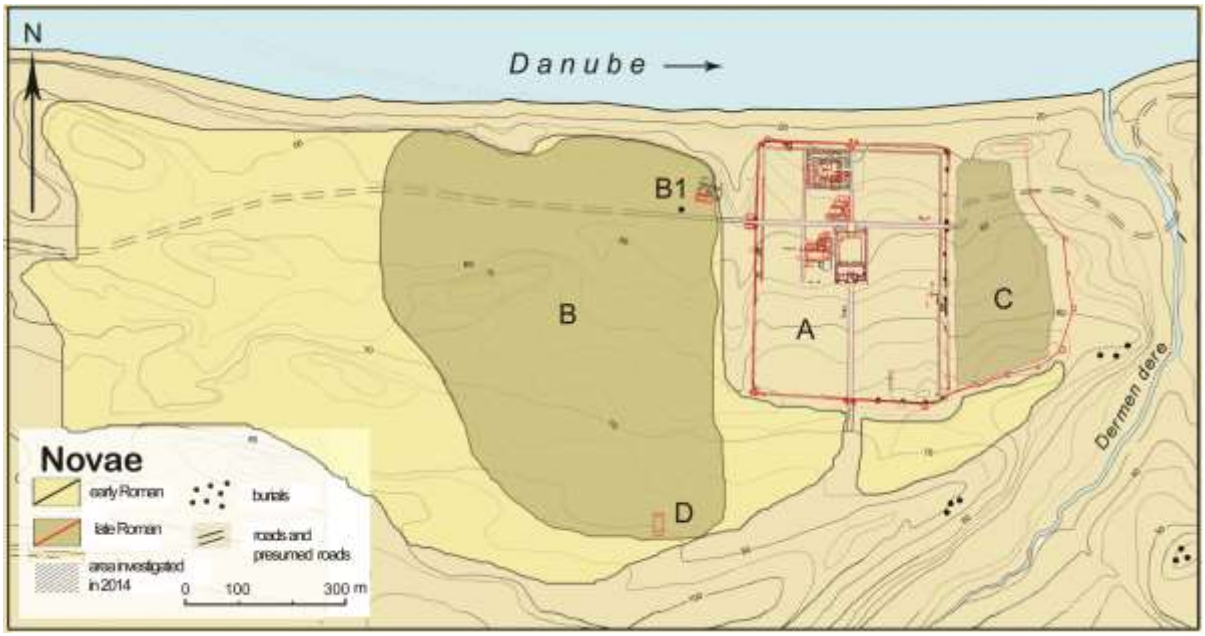

Fig. 2: *Novae*. The camp, *canabae* and Late Roman town. A – *castra*; B – western part of the *canabae*; B1 – extramural residence and Late Roman basilica; C – eastern part of the *canabae* transformed into the annex; D – mithraeum (by A. Tomas).

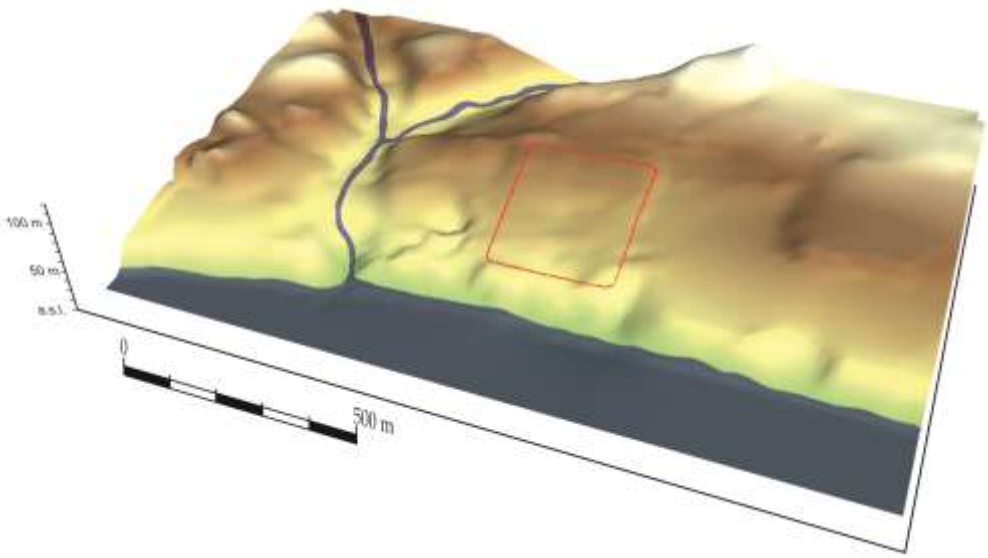

Fig. 3: *Novae* and the valley of the river Dermen dere. A three-dimensional model of the terrain with a superimposed outline of the camp (by P. Zakrzewski).

Similarly as in other legionary bases, civil settlements in the form of a more permanent settlement developed in connection with the longer presence of its mother unit; one (*canabae*) directly neighbouring the military base, and another (*vicus*) at a certain distance from the fortress. In *Novae*, the second settlement is located 2.5 km east of the military base, in a place called Ostrite Mogili (**fig. 4**).

The exact localization and identification of *Novae* 's *canabae* and *vicus* was a debated subject[3]. Topographical observations, repeated field walkings and the surveys carried out recently have indicated that the principal part of the *canabae* lay to the west of the army camp, but its exact area was unknown, while the position of some architectural remains remained unidentified for a long time. In Late Antiquity, the extramural area transformed into the town's suburbs. One of the districts, lying on the south-eastern side, was placed on an elevated area which in some places overlooked the *retentura dextra*. This special position could have been of particular importance as it received an additional circuit of defences, built most probably at the end of the 3rd century AD[4]. The exact area, chronology, and the role of the *vicus* at Ostrite Mogili was another debated issue[5], as was the municipal status of *Novae*, i.e. which settlement was granted this privilege and when[6]. The subject of the civil settlement remained an open question, even though some architectural remains in the *canabae* — the residential building, the Liber Pater sanctuary, and the mithraeum — were excavated[7]. In addition, the vicinity of *Novae* and its settlements were surveyed by T. Sarnowski in 1977[8], P. Donevski in 1990[9], and P. Dyczek together with A. Tomas in 2000[10], as well as by the Bulgarian-German expedition at the same time[11]. The collected archaeological materials were awaiting elaboration, and the broad area of the fortress' surroundings needed new modern investigations and reassessment.

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3 Gerov 1977; Sarnowski 1976, 62; 1990, 239; Mrozewicz 1981; Parnicki-Pudełko 1981.
4 Press, Sarnowski 1990, 240.
5 Gerov 1977; Conrad 2006; Tomas 2004 (2006).
6 Kolendo 1970; Sarnowski 1976, 62; Gerov 1977, 300; Tomas 2004 (2006); 2007, 42; 2011, 159-161.
7 Čičikova 1997; Vladkova 2006; Džonova 1961; Najdenova 1994.
8 Sarnowski 1979.
9 Donevski 1991.
10 Tomas 2004 (2006).
11 Conrad, Stančev 2002, 676-677.

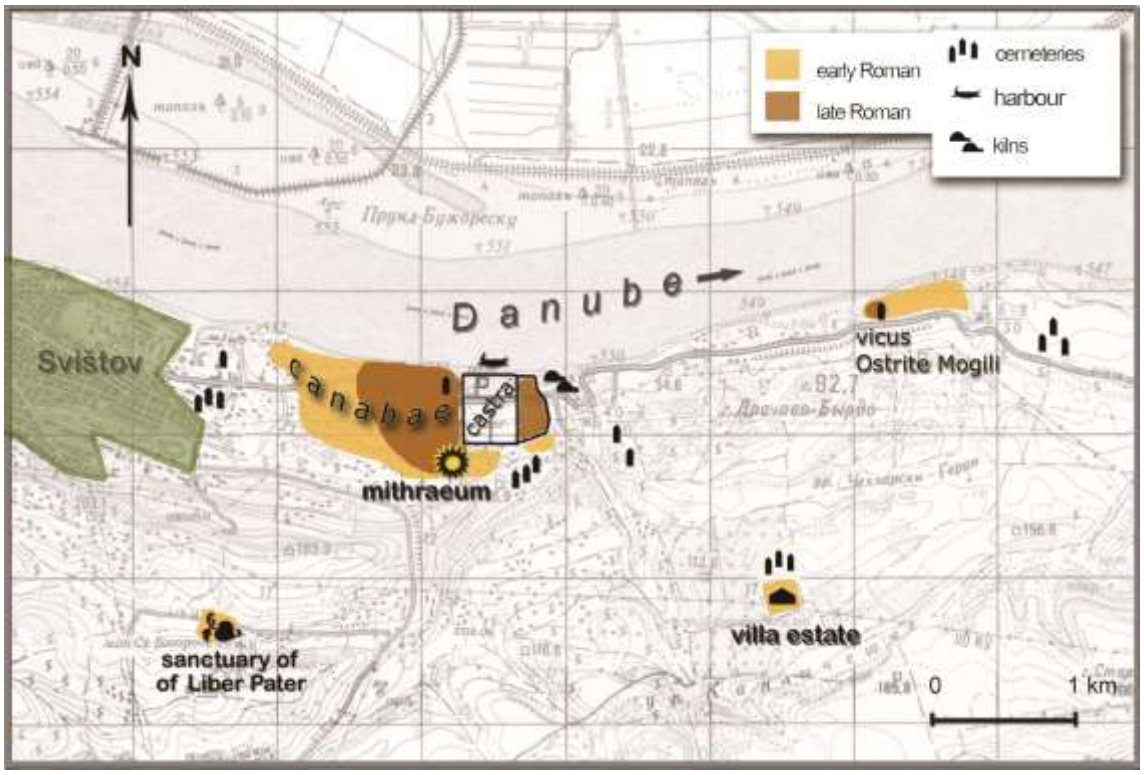

Fig. 4: *Novae* and its surroundings (A. Tomas).

A grant from the National Science Centre opened the way to the exploration of the civil settlement at *Novae*[12]. A three-year project involving non-intrusive surveys was carried out in three spring seasons from 2012 to 2014, while a series of tests, including aerial photographs and geophysical prospection, preceding the start of the programme were done in August 2011[13]. In addition, archive studies were carried out in the local Historical Museum and in the National Archaeological Museum in Sofia within the KWERENDA programme supported by the Foundation for Polish Science[14].

Choosing the methods

The extensive and complex settlement units in the surroundings of army camps along with their infrastructure require more comprehensive and interdisciplinary methods than traditional broad-scale excavations. Testing and regular excavations usually give some idea of the individual buildings, without providing any information about general site topography, the landscape, hydrological network, the street grid, etc. Moreover, in the case of multi-phase settlements like *Novae*, the choice of research methodology requires extensive preparatory studies, collecting large amounts of data and using the GIS database. One also has to add the issue of increasingly active looting around the site,

[12] National Science Centre (Narodowe Centrum Nauki), decision no. DEC-2011/01/D/HS3/02187. The team includes J. Balcerzak and M. Pisz, students of IA UW, who are responsible for aerial photography. Geomagnetic prospection and electrical resistivity surveys were carried out by M. Jaworski, P. Wroniecki and K. Misiewicz, W. Małkowski (IA UW, IAiE PAN). Intensive field surveys with the aid of metal detectors were conducted under the supervision of P. Jaworski (IA UW). T. Sarnowski is the project adviser.

[13] Sarnowski, Kovalevskaja, Tomas, 2012, 194.

[14] Tomas 2015a. - The research on the subject of the present article was possible thanks to the generosity of the De Brzezie Lanckoroński Foundation which supported the library studies of the author in the Library of the Institute of Classical Studies in London in 2015.

which brings damage to archaeological remains and discourages researchers from investigations. The surveys were intended to elicit information concerning the landscape and human activity in a broader area. Landscape archaeology often uses both settlement studies and non-intrusive methods, which can cover large areas. Non-destructive surveys have been done at other analogical sites related to the Roman army, such as *Carnuntum* or *Isca*[15]. The methods implemented in *Novae*, which is a very complex and difficult site to survey, needed to engage all possible tools of prospection.

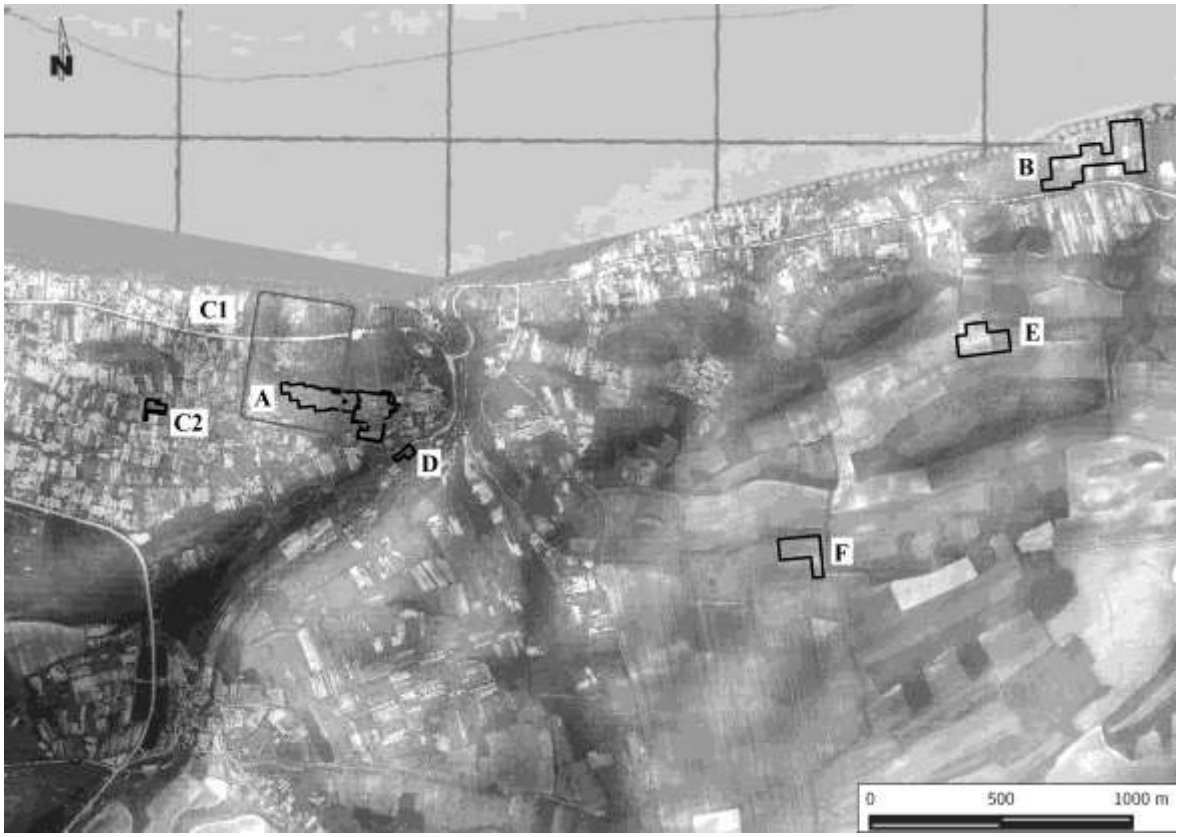

Fig. 5: The surroundings of *Novae*. A–F — places where geophysical prospection was carried out in 2012–2014 (A. Tomas, P. Wroniecki)

A magnetic survey was carried out in the annex and *retentura dextra* using the Bartington Grad 601-Dual fluxgate gradiometer, and next with the Geometrics G-858CaesiumVapour Magnetometer, which was integrated with real-time RTK GPS positioning. For the earth resistance survey, a Polish Elmes ADA-05 earth resistance meter was used. The collected data were processed using Surfer 10 and Geoplot 3 software. The visualisation of the measurements was prepared in several colour scales. The areas where geophysical prospection was done were extensively surveyed with metal detectors. For this purpose, 25 m long and 2 or 2.5 m wide strips were marked out, and on each strip two people recorded all the metal finds, regardless of their chronology. Such a method allows for the assessment of the degree to which the site is saturated with archaeological finds, but also with present-day garbage. As a result, we hope that it should be possible to identify the degree of erosion of the site, possible places which have experienced destruction, and contemporary metal pollution. A number of flights over the site using, among others, a helium balloon and AeroSurveyor2 drone with an attached high resolution camera enabled taking several thousand photographs. The vertical images were calibrated with a high-resolution (0.41 m) orthorectified image from the WorldView-2 satellite. All

[15] Guest, Luke, Pudney 2012; Doneus, Gugl, Doneus 2013.

acquired data and results of recent investigations were put into the Quantum GIS software database where the satellite imagery was used as a background image. This was necessary to fill in the blank spaces where vertical photos could not be taken due to the unavailability of the land. The satellite image enabled analysing and achieving a better understanding of the chosen methods and results of our investigations, the obstacles we had to deal with, as well as providing a means of showing the research results in publications. Additionally, geodetic measurements were made in some places, e.g. along the Late Roman defensive walls of the annex. To sum up, the database contains a georeferenced satellite image, plans, ortophoto maps produced as a result of summer and winter prospection flights, the results of geophysical prospections and field surveys carried out in six places (**fig. 5/A–F**), and also the maps of metal finds.

Putting together old jigsaw puzzles

Collecting data from old surveys and excavations is similar to solving a jigsaw puzzle. This statement is particularly well suited to the situation in *Novae*, since excavations have been carried out there since 1960 by both Polish and Bulgarian archaeologists, who now work in four independent archaeological expeditions. Over the years, some finds and architectural remains were excavated outside the defensive walls, but some of those found within the fortress were moved there - *e.g.* from cemeteries - in Antiquity.

Among the excavated buildings, there is a large residence and late antique basilica with burial grounds located about 150 m west of the camp (**fig. 2/B1**)[16]. Establishing the precise position of the complex enabled seeing that its axis is oblique to the line of the western defensive walls of the military camp. Earth resistance surveys carried out in the area adjacent to the residence (**fig. 5/C1**) show regular anomalies that may originate from solid walls, presumably part of another building, on the other side of the ancient street. Fragments of solid walls - perhaps of another large residence - were also documented near the Danubian bank to the west of the fortress (**fig. 5/C1**)[17]. In 2014, the preserved structure measured 2 m in its E–W axis and 4.90 m in its N–S axis[18]. The prospection in the western part of the *canabae*is very limited due to the existence of modern private lots and on-going human activities – both in terms of construction work and cultivation. Still, during field walkings done in one of the lots we found a marble piece bearing a fragmentarily preserved letter of an inscription[19]. One of the fields was large enough to conduct geophysical and earth resistance investigations (**fig. 5/C2**). The total surface covered with geophysical surveys in the western part of the *canabae* was 25.6 ares. Surprisingly, within the entire investigated area, not only considerable numbers of point dipole anomalies were recorded, but also a number of linear anomalies in three zones of increased resistivity, definitely originating from architectural structures[20]. Pottery and glassware gathered during field walkings have been dated to the 2nd–3rd centuries AD.

The eastern part of the *canabae*, later transformed into the said annex (**fig. 2/C**), has never been regularly excavated. Only the fortifications were unearthed, while in some places the archaeologists explored the layers preceding the Late Roman defensive structures. Finds from the Bronze and Early Iron Age, as well as Early Roman remains were recorded there, including burials and remains of a paved street[21]. The results, although signalling some important findings, have not contributed substantially to our knowledge of the potential architecture in this area. In contrast to the western part of the *canabae*, where excavated buildings are rather of a residential nature, here we are dealing with

[16] Čičikova 1997; Vladkova 2003.
[17] cf. Vladkova 2015.
[18] Tomas 2014 (2015), fig. 5.
[19] Tomas 2014 (2015), fig. 3i.
[20] Tomas 2013 (2014), fig. 3.
[21] Čičikova 1980, 62; Dimitrov *et alii* 1967, 139-140; Čičikova 2013; cf. Tomas 2013 (2014)b.

remains of a different character - burials from the Bronze Age and the Early Roman period, some architectural remains, streets, traces of metal processing, and elements of Late Roman armour[22]. The southern part of the annex was chosen for detailed non-intrusive investigations, including geomagnetic and earth resistance prospection and mapping metal finds. The results compared with the image obtained from an analogous prospection done in the adjacent *retentura dextra* (**fig. 5/A**) show that the axis of the buildings in the annex was oblique to the eastern defensive walls (**fig. 6**). Although the magnetometry survey results are not sufficiently readable, in some places linear anomalies seem to belong to buildings. Some illegal trenches, dug quite densely in the annex, show remains of solid walls[23]. Such remnants were documented and included into the GIS database, together with the results of geophysical investigations, as other elements of the 'puzzle' we hope to use for further investigations there.

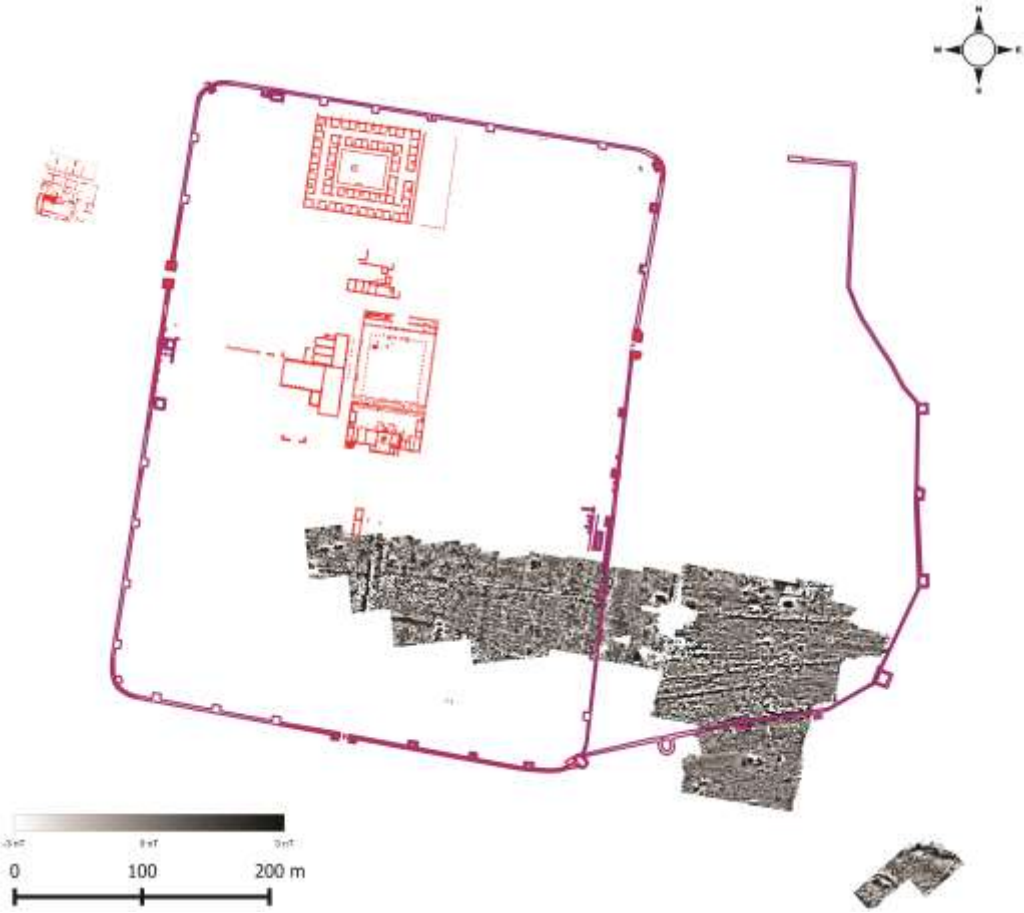

Fig. 6: Eastern annex in *Novae*. Greyscale visualization of geophysical data and interpretation of the results (by M. Jaworski, M. Pisz, P. Wroniecki).

One of the purposes of making geodetic measurements was in order to verify the course of the masonry wall of the eastern annex of *Novae*. Remains of towers were found in the field, and their location was measured with GPS devices. Their exact positions combined with previously published partial plans of the towers were integrated into the GIS database system, where relevant points were georeferenced. As a result, the course of the annex's fortifications was verified and the plan of *Novae* modified, especially in its eastern and northern parts (**fig. 2**).

[22] Čičikova 1980; 2013; Tomas 2012 (2013), 160.
[23] Tomas 2016, fig. 4.

The investigated area covered 2.07 ha, on a wide plateau adjacent to the south-eastern corner of the camp and by its foot (**fig. 2/C** and **6**). The linear anomalies seem to show, among others, a building measuring 11×17 m in its SE corner. Some other anomalies in the form of elongated structures but of poor visibility suggest that the features lie more than 1 m under the ground or their thickness is relatively small. At the foot of the plateau, linear magnetic anomalies were also recorded on the E–W and N–S axes. The remains were interpreted as ancient streets and a building measuring 12×20 m. The same area was surveyed with metal detectors, within regular 30×2.5m strips. Among the 77 metal finds, 33 were coins dated to between the 1st and 6th centuries AD, with the latest of Maurice from AD 587/588. The other finds include lead seals, fragments of lead mirrors, military equipment elements, fibulae, and building nails. A prospection was also conducted in two small fields located to the east of the annex (**fig. 5/D**), where pottery sherds were visible on the surface.

Apart from the extramural area, surveys were conducted at the Ostrite Mogilisite (**fig. 5/B**). The site is well known, and the first archaeological prospection was carried out there in 1948 by Stefan Stefanov, the Director of the Historical Museum in Svištov[24]. The size and location of the site attracted the attention of the Bulgarian historian B. Gerov, who suggested that this may have been a small settlement (*vicus*), similar to the nearby numerous analogous legionary bases. Its municipal status was suggested by some scholars[25]. The site was subjected to field surveys in 1961, 1977, 1999 and 2000[26], while salvage excavations were carried out there in 1990[27].

At present, the site is an area of arable fields, between the present-day road from Svištov to Vardim as the southern edge, and a steep scarp of the Danube, covered with bushes and trees as the northern one. In the west, the site is surrounded by several hills resembling barrows which provided the name for the site (Bulgarian *ostrite mogili* – steep barrows), and the eastern part is divided by a gully (**fig. 7**).

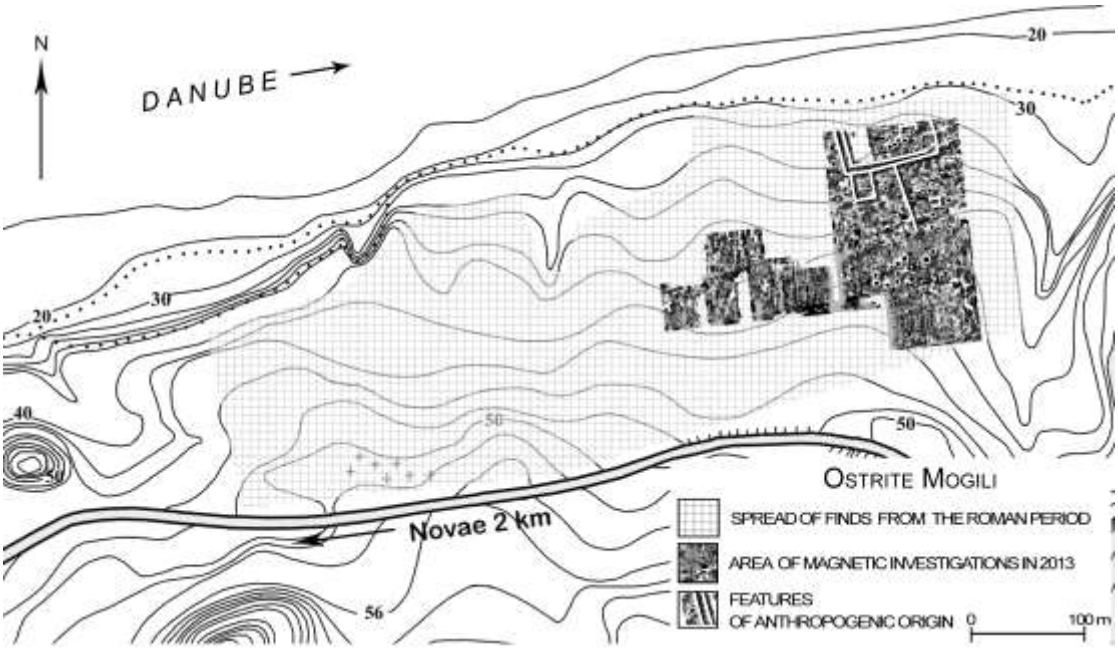

Fig. 7: Ostrite Mogili. Plan of the site and the results of geophysical prospection (P. Wroniecki, M. Jaworski).

[24] Stefanov 1958, 351.

[25] Gerov 1964; 1977, 300, note 4; Mrozewicz 1981; Poulter 1983, 84; Mrozewicz 1984; Tomas 2004 (2006), 127-128.

[26] Dymaczewski, Hilczerówna, Wiślański 1965, 207-210; Conrad, Stančev 2002, 675, figs. 2, 3; Conrad 2006, 322-324, fig. 12; Tomas 2004 (2006), 115-128.

[27] Donevski 1990.

One of essential issues was to identify conclusively the extent of the Roman settlement as it was marked in different ways in various publications[28]. A field walking survey was carried out in the eastern part of the site, on both sides of the gully and to the south of the asphalt road. Spots that yielded no archaeological material were marked with hand-held GPS devices. It was established that to the east of the gully there were almost exclusively fragments of Slavic vessels and Palaeolithic stone tools, and only a few fragments of Roman amphorae and bricks. However, these fragments may have come from the cemetery excavated there in the early 1960s[29]. To the south of the aforementioned road, no pottery was found; thus, the total surface of the settlement dated to the Roman period can be assessed as measuring a maximum of 15 ha[30].

The next important issue was establishing the character and chronology of the site. The excavations conducted in 1990 yielded wood and earth structures, quern stones, metal artefacts, numerous animal bones, pottery, building materials, as well as a fragment of a south Gaulish *terra sigillata* dated to the Flavian period[31]. During the following field surveys, some tableware and other small finds were documented. It is a multi-phase site, where Palaeolithic stone tools were discovered[32], as well as Hellenistic coins and Republican *denarii*, and medieval coins[33]. The unearthed burials were dated to the mid-3rd century AD at the latest[34]. These finds demonstrate the close links between the settlement and the camp, while also showing that human activity there lasted until Late Antiquity[35].

Geophysical investigations were carried out in places where the greatest concentration of archaeological material was found in previous years and where vegetation was not an obstacle. The total investigated surface amounted to 4.5 ha. Some linear anomalies can be related to balks and paths, but others make up an outline of architectural features. Numerous point dipole anomalies, some of them very compact, may have resulted from operations involving high temperatures (ovens, hearths or kilns), and others, visible as a series of strong point dipole anomalies seen within the entire investigated area, may suggest looting activities within this part of the site. A few larger robbery trenches were identified on the scarp, in a forest. In one of them, we have found remains of a masonry wall, which contained two fragments of an inscription dated to AD 196 and a fragment of a cornice[36].

Investigations using metal detectors have shown that at Ostrite Mogili the share of metal finds is more diversified. Among the more interesting finds, one has to mention a *denarius* of Geta and a collective find of Medieval coins, as well as numerous arrowheads, bronze applications, and a lead seal in the form of a human face.

In 1984, remains of walls were discovered on private property not far from the south-western corner of the legionary fortress. Rescue excavations carried out there yielded the remains of a small sanctuary interpreted by its discoverers as a mithraeum entirely rebuilt and rearranged in the 270s as a temple of Sol[37]. However, the few available publications on the sanctuary did not present any plan of the building, the pottery or the small finds. The rediscovery of the site allowed us to document the plan of the sanctuary and to establish its exact position with respect to the legionary camp (**fig. 2/D**).

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28 Conrad 2006, fig. 12; cf. Tomas 2004 (2006), fig. 1.

29 Vălov 1965.

30 Tomas 2004 (2006), 119 and fig. 1; Tomas 2013 (2014), 202.

31 Dimitrova-Milčeva 2000, no. 162, Taf. 10.

32 Tomas 2004 (2006), 119; Kowal, Kozłowski 2011, 7-13.

33 Dimitrov 2013, 712-766, esp. 713 and 731ff.; Dymaczewski, Hilczerówna, Wiślański 1965, 281-284; Ivanov 2002, 123; Tomas 2004 (2006), 120.

34 Vălov 1965, 27-34.

35 Ivanov 1997, 600; Conrad, Stančev 2002, 675; Ivanov 2002, 123; Tomas 2004 (2006), 120.

36 Tomas 2013 (2014)b.

37 Najdenova 1994.

The reassessment of old and new discoveries enables putting forward the conclusion that the sanctuary was a mithraeum, at least from the viewpoint of its architectural layout, and most probably it was not rebuilt but constructed later than suggested by the discoverers[38].

Another sanctuary examined with salvage excavations lies some 2.2-2.5 km to the south of Novae (**fig. 4**). The only publication did not present any plan, and only a few small finds were presented on some very poor photographs[39]. Although we managed to find the place, the site seems to have been damaged by illegal trenches. Liber Pater / Dionysus was a deity of some importance at Novae, worshipped both inside and outside the fortress[40]. The said sanctuary deserves re-examination in the future.

In the summer of 1978, at a certain distance from the legionary camp, in a place called Kălna češma, two funerary stelae were discovered during field works[41]. The discovery prompted interest in the site, and the following year T. Sarnowski conducted field surveys, that included the mapping of archaeological materials[42]. The site, which is located 2.5 km south-east of the fortress, is now an arable field with a few scattered pottery sherds and pieces of building materials (**fig. 5/F**). Geophysical investigations did not bring any substantial discoveries. In addition, some T-shaped linear anomalies may belong to buildings, although the content of one of the inscriptions suggests that it could have been a villa[43].

In recent years, traces of settlement have also been discovered farther to the south of *Novae*[44], and in the nearby town of Svištov, a little over 3 km to the west of the fortress[45]. The field walkings and geophysical prospection carried out to the south of Ostrite Mogili allowed us to identify a new site localised some 800 m to the south of Ostrite Mogili (**fig. 5/E**). Numerous fragments of local Thracian, Roman, and Medieval pottery and building materials, as well as a bracelet made of bronze dated to the Roman period, were visible on the surface there, but geophysical prospection did not provide any conclusive results[46].

M. Biernacka-Lubańska (1997) investigated the *Novae* water-supply system extensively. The scholar documented the main conduits and water reservoirs, many of them irretrievably damaged now, though a few are still visible in some places. One such feature that belongs to the western line of an aqueduct and could have served as a water distribution tank (so-called *castellum aquae*), documented in the early 1960s by M. Biernacka-Lubańska, was identified recently[47]. During our surveys, we managed to find a well in the southern part of the *canabae*; however, it was already being explored by looters who did not allow us to document their discovery. The issue of the water supply for the *canabae* remains open[48]. Field walking surveys also encompassed an area situated to the south-east and the south of *Novae*, within a distance not exceeding 2.5-4 km from the defensive walls of the fortress. We did not record any archaeological material in an area of vast arable fields to the south of the fortress. Possibly, these fields were used for cultivation or were forested in antiquity. Field walkings done south and east of *Novae* let us identify places where potential roads may have existed. The location of the *Novae* cemeteries is fairly certain[49]. Regrettably, most of them are situated on private properties or within the modern town of Svištov, which is an obstacle for archaeological investigations.

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38 Tomas, Lemke 2015.
39 Džonova 1961.
40 Tomas 2015b.
41 IGL*Novae* 82, IGL*Novae* 112.
42 Sarnowski 1979.
43 Sarnowski 1979, 207-210.
44 Conrad, Stančev 2002, 676-677.
45 Stefanov 1958, 341ff.
46 Tomas 2016.
47 Biernacka-Lubańska 1962, 99-104, especially fig. 84 and cf. Vladkova 2015, 189, fig. 3.
48 Tomas 2011.
49 Kołkówna 1961; Vălov 1965.

Processing the obtained data

A digital elevation model is still in progress, generated based on extensive ground measurements, enabling a visualization of army camp topography and its *canabae*, as well as of the progressive erosion of the river escarpment in the north.

The vicinity of the legionary base at *Novae* was extensively investigated in 2000 by Bulgarian and German archaeologists, who estimated the size of the settlement adjacent to the fortress (*canabae*) at 70–80 ha[50]. The field walkings using hand-held GPS devices enabled establishing the maximum extent of the surface material, which indeed covers such an area. This, however, does not mean that the settlement itself was so large, since pottery sherds and building materials may lie on the ground in places where cemeteries are located.

A number of flights over the site using a helium balloon with an attached high-resolution camera enabled taking several thousand photographs. The vertical images were calibrated with a high-resolution (0.41 m) orthorectified image from the WorldView-2 satellite, encompassing the entire area of the camp, *canabae* and surrounding territory. A series of vertical aerial photos were also taken over the site of Ostrite Mogili. An orthophoto map based on these photos shows the results and can be used for spatial analyses, but the weather conditions and the character of the cultivation there signify that the photographs cannot serve as a tool for detecting features visible from the air.

Using satellite imagery as a basis, Quantum GIS software was used to put together georeferenced archival maps and plans, ortophoto maps produced during prospection flights and using the results of geophysical prospection and maps of finds made during metal detector prospection.

For the purpose of the reconstruction of the landscape in the past, complementary to the above-mentioned investigations, a set of laboratory analyses were carried out. Two sets of soil samples from stratified context were taken during summer excavations, on which archaeobotanical and anthracological analyses were conducted. Preliminary results show that the vegetation was very similar to that at present[51]. These results compared with the published animal bone remains of wild species shall provide information concerning the local environment in past periods. Further landscape analyses were conducted on a broader area of legionary hinterland. For this purpose, the Thiessen (or Voronoi) polygon method was applied with the aim of defining the areas around the settlements. Additionally, analyses of visibility from chosen places have been made.

The project was executed over a period of six weeks of field works carried out in spring (March-April). Geophysical investigations covered a total area of 12.67 ha. Field walkings done within a radius of 2.5-4 km around the fortress enabled detecting a number of ancient features and measuring their exact position. The GIS database containing old and newly acquired archaeological data is a perfect tool for present and future investigations at *Novae* and its surroundings.

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50 Conrad, Stančev 2002, 673-681.

51 Laboratory analyses were conducted by Dr. H. Winter from the Institute of Geology Polish Academy of Sciences (palynological remains), as well as Dr. M. Moskal-del Hoyo and Dr. R. Stachowicz-Rybka from the Institute of Botany Polish Academy of Sciences in Cracow (anthracological and macrobothanical remains). The results have not yet been published.

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