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THE WATER SUPPLY OF SARMIZEGETUSA REGIA’S PRECINCT

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Rezumat. Cercetările arheologice de până acum au demonstrat că la Sarmizegetusa Regia au existat cel puțin două captări de apă: una în așezarea civilă și alta în zona sacră, ambele situate sub nivelul incintei militare. Se admite în general că incinta nu a beneficiat de o sursă permanentă de apă, deși unii specialiști au încercat localizarea unei a treia captări în interiorul ei. Unele rapoarte de săpătură austriece, datând de la începutul secolului al XIX-lea, în mare măsură necunoscute sau nevalorificate astăzi, consemnează prezența unei conducte în interiorul fortificației, certificând astfel existența celei de-a treia surse, fapt confirmat și de săpăturile recente. Articolul de față își propune să valorifice aceste informații, cu scopul de a contribui la o mai bună cunoaștere a problemei alimentării cu apă la Sarmizegetusa Regia.

Cuvinte cheie: cetăți dacice, Sarmizegetusa Regia, alimentare cu apă, conducte ceramic, săpăturile fiscului austriac, istoriografie.

It has been widely considered until now that the precinct of Sarmizegetusa Regia (Grădiștea de Munte/Grădiștea Muncelului) has never enjoyed a permanent water supply, as the two water sources identified by archaeologists – the one from the western civilian settlement and the one from the sacred area – are situated outside and below it. Still, in time, fragments of a ceramic pipeline have been uncovered inside the enclosure or in its close vicinity but such information remained unused so far.

The first mention of some clay pipelines in the ruins of Grădiștea Muncelului date as far back as the reports of the Austrian tax authority who carried on

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1 Today it is generally accepted that first there was a Dacian precinct that included only the terraces I-III (Glodariu et alii, 1996b, p. 134). The last phase enclosed the terraces I-V and is regarded almost unanimously as a Roman fort, built in part on the path of the former Dacian wall (Fig. 1). Isolated voices claim that never existed a Dacian phase of the fortification, but only a Roman one (Opreanu, 1999-2000), without taking in account the strong evidence for an earlier Dacian stage (see Daicoviciu et alii, 1983, p. 232 for the remains of the old eastern wall unearthed near the gate in 1980).

diggings in the area in 1803 and 1804\(^3\); they also appear on the plan drawn up by the cartographer András Szőts, who had been sent there in the autumn of 1804 by the authorities\(^4\).

The excavations inside the precinct revealed the layout of a pipeline – most likely in 1803, but we lack some reports for that year's campaign, so the discovery is not registered first-hand\(^5\). Fortunately the summary report written by the mining engineer Anton Bögözi, who had supervised the diggings, dated 25\(^{th}\) of April 1805, marks down this find while also giving a lot of details\(^6\). Thus, we learn about a well-burned clay pipeline found in the ground next to the wall, at the depth of 4-5 feet (1.20-1.50 m) and boarded by 10-12 inches (0.25-0.30 m) planks. The tubes are 3 feet in length (0.90 m), the thickness of the wall is of 1 ½ inches (3.81 cm) and the inner diameter is 15 inches (0.38 m). The total length of the pipe found undamaged is of 11 fathoms (20.79 m)\(^7\). The text does not mention the side of the enclosure where the digging took place. The information is extremely valuable and remained unexploited so far by archaeologists although it was published more than once\(^8\).

Szőts marked on his plan two places where pipelines were unearthed inside the precinct (unless it is the two ends of a single pipeline). Unfortunately, the original drawing is lost (or has yet to be searched out in the archives) and we have only a copy\(^9\) that lacks some details, including the placement of these pipelines (Fig.

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\(^3\) In 1802 and 1803 the villagers from the neighborhood have found some coin hoards near the ruins and this has determined the authorities to organize official excavations. There were two campaigns, one in 1803 and another in 1804, totaling almost 9 months. Reports were written while the diggings took place, but they were published only in 1970’s by Sigismund Jakó (Jakó, 1968; Jakó, 1971; Jakó, 1972; Jakó, 1973), and were not used until now. See Pețan, 2012, p. 81-82.

\(^4\) There were two plates drawn by A. Szőts: one containing the map of the ruins and another with the most important artifacts found there. For this map see Pețan, 2013.

\(^5\) Two reports are missing covering four weeks of digging; see Pețan, 2012, p. 82, n. 4.

\(^6\) Jáko, 1973, p. 629 sqq.

\(^7\) "In diesem Raume, dicht an der Ringmauer hat man eine aus gut gebrannten Thone gemachte Röhre gefunden, die rund herum mit 10 bis 12 Zoll wohlbearbeiteten Latten verstaucht war; oben lag 4 bis 5 Schuh hohe Dammerde. Jede Röhre ist 3 Schuh lang und 1 ½ Zoll dick, die innere Lichte hat 15 Zoll; man hat 11 Klafter davon ziemlich unbeschädigt aufgedeckt". (Jáko, 1973, p. 630. 1 Austrian fat hom (Klafter) = 1.89 m; 1 foot (Schuh) = 0.30 m, 1 inch (Zoll) = 2.54 cm).

\(^8\) Besides Jakó, see Finály, 1916, p. 16 and Daicoviciu-Ferenczi, 1951, p. 91.

\(^9\) There were at least two contemporary copies of the plates of Szőts. One of them was made by a certain captain Kulyan, of both plates (Jakó, 1973, p. 636), and is now located in the Österreichisches Staatsarchiv in Wien, in the war archive collection (Kriegsarchiv, Kartenabteilung KVIIk 403 I/2). A microfilmed copy of these plates can be found in Bucharest, at the National Archives of Romania, obtained from the archives of Wien in the 1980 (Austria Collection, roll 198). They were poorly reproduced by Jakó as annexes to his article from 1973. The second copy was made by Friedrich Wagner, a scribe of the Chamber, and is kept in The National Archive of Romania – Cluj-Napoca Department, in the collection
2) although they are mentioned in the caption. The text of the caption informs us that the digging took place inside the enclosure, where interconnected ceramic tubes were found in the points marked as m and n\textsuperscript{10}. The second plate presents, among other findings, a ceramic tube in a longitudinal and transversal section, whose dimensions are closed to that reported by Bögözi, and therefore might be from this pipeline (Fig. 3).

It is difficult to identify in the field the path of the conduit. We do not know the side of the precinct where it was dug out from, but we have some clues. The plans of the fortress drawn up before 1981 show on terrace IV an old ditch about 25 meters long, parallel to the eastern side of the precinct, at a distance of about 10 m from it (closer to the wall at the northern end and deflecting away from it westward), cutting what is now the path in front of the eastern gate and which was filled after the maintenance works of 1980 (Fig. 1)\textsuperscript{11}. His length and his position against the wall suggest that it could be that Austrian ditch with pipes inside.

The placement of the “Austrian” pipeline is unexpectedly confirmed by a recent excavation. In 2011, a surface excavated on terrace IV “not far from the eastern gate”, in order to establish the direction of the paved road, crossed with his south-eastern corner an older excavation, named by the archaeologists “the Austrian pit”, where “fragments from tubes made from burnt clay from a pipeline of large size” were uncovered. It is quite possible that the team led by Gelu Florea had found the remains of the conduit reported at the beginning of the 19\textsuperscript{th} century. The report does not mention the depth of the pieces, which had been disturbed anyway by the Austrians and by later works, but it remains to establish the chronological link between the pipeline and the paved road, as they crosses each other\textsuperscript{12}.

Earlier in 1988 they had sectioned a pipe “de dimensions beaucoup plus grandes, semblables à ceux qui utilisaient les Romans”, south of the fortification, next to the building taken as Roman bath\textsuperscript{13}, which is likely to be the same as the “Austrian” one. It is not certain why this pipe resembles the Roman ones given that the only clue is the diameter, irrelevant in establishing the manufacturer\textsuperscript{14}. Eugen

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\textsuperscript{10} “In diesem eingeschlossenen Raum in m und n örter sind die in der Reihe noch gut zusammen verbundenen Wasserröhre ausgegraben worden”. (Österreichisches Staatsarchiv, Kriegsarchiv, Kartenabteilung KVIIk 403 I/2).

\textsuperscript{11} The ditch can be seen on the plan of 1950 (Daicoviciu-Ferenczi, 1951, Fig. 21) and on the one of 1979 (Călinescu, 1982, p. 14, pl. I), but do not appear on the plan of 1981 drawn up following the land leveling works of the previous year (Călinescu, 1982, p. 15, pl. II).

\textsuperscript{12} Florea et alii, 2012, p. 63. Curiously, Daicoviciu et alii, 1983, p. 232 placed the paved road inside the enclosure at 2-2.30 m below the level of the eastern gate, whilst Florea’s team found its slabs few meters away at only -0,8 m underground.

\textsuperscript{13} Iaroslavschi, 1995, p. 139. As described, it does not seem to be an archaeological excavation.

\textsuperscript{14} Glodariu, 1983, p. 39 claims that most of Dacian pipelines in the Orăştie Mountains have diameters of 15-18 cm. The Roman pipelines can be of many dimensions, including
Iaroslavschi tried then to prove the Roman origin of the pipe based on the place of its uncovering – next to the thermal edifice – and on the fact that it was oriented towards it\textsuperscript{15}. Unfortunately the information is very laconic and does not allow placing the mentioned spot on the plan\textsuperscript{16}. Yet it is known the diameter of the pipes revealed in the building considered to be a Roman bath: a report from 1803 mentions that there parts of a pipeline with a diameter of 4-5 inches (0.10-0.12 m)\textsuperscript{17}, much less than the conduit unearthed by Austrians and probably sectioned in 1988. For sure this building was supplied by a branch coming out from the large pipe that maybe goes further southward to supply other terraces. Therefore dating the pipeline dug out by Austrians is related to dating this building. But although the problem seems to be easy as the building is taken as Roman one, I am still not convinced about the Roman origin of the pipe, because I still have not found any valid arguments in favor of interpreting the edifice as Roman baths\textsuperscript{18}. Moreover, the diameters identical to those of the Dacians (Frontinus, \textit{De Aquaeductu Urbis Romae}, 39-63, counts 25 standard dimensions); yet there are Dacian pipelines with large diameters (Glodariu \textit{et alii}, 1996a). There were other information from the 19\textsuperscript{th} century regarding pipelines with large diameters in the ruins of Grădiștea Muncelului, all out of the enclosure. Mihály Péchy noticed in 1805 a pipeline with a diameter of 14 inches (0.35 m) with the ends cemented one into another, that he claims was seated on stone blocks roundly carved on the inside (Jakó, 1973, p. 634), suggesting rather a Roman pipeline situated on terrace X. Neigebaur, 1851, p. 102, no. 22 also mentions a pipeline east of the eastern gate, with a diameter of 1 foot and 5 inches (0.42 m). László Ferenczé refers to a pipeline with a diameter of 1 foot and 6 inches (0.46 m), without locating it (Finály, 1916, p. 19).

\textsuperscript{15} Both known catchments are below the level of the building: the spring “Tâu” at 982 m, the one from the sacred area at 985 m, the “Roman bath” at 988 m (and the highest point of the fortress at 1034 m) – data taken with a Garmin Montana 650 GPS. Still, Ioan Glodariu says that the Roman bath was supplied with water from Tâu (Glodariu \textit{et alii}, 1996b, p. 137), and Simon Ștefan believes that this was connected to a pipeline transporting water from the sacred area spring (Ștefan, 2005, p. 77). Even Constantin Daicoviciu believed that the water source from Tâu was directed towards the fortification (Daicoviciu \textit{et alii}, 1951, p. 121), in spite of the negative difference of level.

\textsuperscript{16} Ștefan, 2005, p. 77, n. 287 and p. 340, Fig. 176 erroneously places a pipeline segment east of the Roman bath. He had wrongly interpreted the digging report of 1979 (Daicoviciu \textit{et alii}, 1980, p. 161-163), where parts of pipeline were dug out on the south side of the large limestone temple. Ștefan believes it is the south side of the precinct, places it there and even imagines the pipe inserted in the filling of the wall although on the plan he places it south of the wall.

\textsuperscript{17} Jakó, 1968, p. 442.

\textsuperscript{18} This edifice was the main objective of the Austrians and has been dug out for several months during the two campaigns, without finishing the investigation. Diggings also were undertaken there later in the century by some enthusiasts who uncovered more buildings, but their writings, some of them in manuscripts, remained almost totally unknown today. After a hundred years C. Daicoviciu made only some check on the edifice unearthed by Austrians. It was regarded as a Roman bath by M. Péchy (Jakó, 1973, p. 634), as a theatre by J. F. Neigebaur (Finály, 1916, p. 27), as a temple by Gábor Finály (Finály, 1916, p. 38), as a palace by Alexandru Ferenczi (Daicoviciu \textit{et alii}, 1989, Fig. 18), and again as a Roman bath.
Romans used to cement with mortar the ends of the pipes, information that could not miss form the detailed description of the Austrian report\(^\text{19}\).

Based on this information, Iaroslavschi believes that there was a water source inside the precinct, on the terrace IV, where aquatic vegetation, proving the existence of water in the ground, existed nearby the eastern gate\(^\text{20}\). This hypothesis was not verified however.

Yet two other recent finds could lead to a different location of the water source. In 2002 an area in the northern sector of terrace III was excavated and among the mentioned materials there are “fragments of a water pipeline”\(^\text{21}\). In the next year they opened up a trench on the same terrace, south of the digging of 2002 and on the same line, and they found again “a fragmentary water pipeline”\(^\text{22}\). The two archaeological reports do not prove that the pipe remains (whose dimensions are not specified) or other artifacts from those excavations originated in another place, possibly in a levelment. It is not excluded that the pieces originate from elsewhere, given that the terrace was set out by Romans, but the two spots where they were unearthed are well aligned with the path of the Austrian ditch and these are the only places on the terrace (and the only terrace inside the enclosure, besides the terrace IV) where remains of a pipe have been reported, although they carried out excavations in many parts of it\(^\text{23}\).

The alignment of these four sections in which they found pieces of a pipe could hardly be a coincidence. Thus we could place the water source further up than Iaroslavschi believed, namely in the northernmost part of the terrace III, close to the wall. This sector of the terrace remained uninvestigated until now, at least according to the published archaeological reports. The spring could not be located on the upper terrace, as this was fully excavated and there came out no clue in this direction\(^\text{24}\). Because the precinct occupies the highest point in the area, we also cannot place the water source outside of it. Theoretically, there is the possibility that they used a spring situated at a distance, in a higher place, but the Dacians did not know how to reduce the pressure created on the pipelines on high slopes\(^\text{25}\).

\(^{19}\) But is mentioned in 1805 for another pipeline, outside enclosure, see above n. 14.

\(^{20}\) Iaroslavschi, 1995, p. 139.


\(^{22}\) Glodariu et alii, 2005.

\(^{23}\) Daicoviciu et alii, 1951, p. 106; Glodariu et alii, 2004; Glodariu et alii, 2005; Florea et alii, 2010, p. 69; Florea et alii, 2011, p. 47-48. On the other side, among the 10 known excavations on the terrace III, there are another two that could have cross the pipe debris, but the report for one of them is extremely sketchy and for the other is inexistent.


\(^{25}\) Iaroslavschi, 1995, p. 142.
It is possible that another pipe provided water from the same source for the cistern of terrace IV, next to the western side of the fortification\footnote{Investigated in the excavations campaigns of 1994 and 1995 (probably even before this, but there are no published reports), see Glodariu \textit{et alii}, 1995, Glodariu \textit{et alii}, 1996a, Iaroslavschi, 1995, p. 139. The excavation reports do not mention how the cistern was supplied. Iaroslavschi claims that it was supplied with rainwater and underground springs.}, unless there were two springs inside the precinct.

The large diameter of the pipeline, mentioned by the Austrians and the excavations from 1988 and 2011, are arguments for a source with a strong flow. Today this is not visible on the surface. The depth of the pipe is much below the freezing level, either because of the source depth or because they needed to obtain a constant slope or for other constructive reasons. The alignment of the sections containing pipe debris suggests that the pipeline was directed southwards. Nevertheless we cannot say anything more about the direction or the total length of the pipeline, only excavations or geophysical prospection could bring further data.

I cannot exclude for certain the possibility that the clay pipelines found inside the enclosure indeed belonged to the Romans or were built by Roman craftsman sometime near the conquest, but yet we do not have enough arguments to claim this. Even if we are dealing with a Roman pipeline, what is important is that it proves the existence of a water source there. It is highly improbable that the Dacians did not know about this spring and that it was revealed and used only by the Romans who stayed there after 106. Furthermore we can claim that the place for building the Dacian fortress was chosen based on the existence of this spring. However, the question of the chronology and of the relationship between the pipeline and the stages of the enclosure still remain unsolved until further data will come to light.

Not knowing the information about the pipeline inside the precinct led to the hypotheses about the vulnerability of the fortress against sieges. As a consequence, the dramatic scene CXX-CXXI from Trajan’s Column (Fig. 4) was interpreted in this manner and it might represent, according to some researchers, the sharing of the last water supplies\footnote{Daicoviciu-Daicoviciu, 1966, p. 34; Vulpe, 2002, p. 97.}. In the future we should reconsider such interpretations\footnote{The oldest interpretation is that of a collective suicide by poisoning; see e.g. Bartoli \textit{et alii}, 1673, pl. 292.}.

To conclude, there was a permanent source of water inside the precinct, with a strong flow, used by the Dacians and probably also by the Roman garrison stationed there after the conquest. Future archaeological research will have to identify the water catchment, the path of the aqueduct and its branches, and to determine when it was built. Therefore, the manner in which the issue of Sarmizegetusa Regia’s water supply was initially considered has to be discussed from a different point of view, as well the implications it has in the economy and in the defensive strategy of the fortress.

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\footnotetext[26]{Investigated in the excavations campaigns of 1994 and 1995 (probably even before this, but there are no published reports), see Glodariu \textit{et alii}, 1995, Glodariu \textit{et alii}, 1996a, Iaroslavschi, 1995, p. 139. The excavation reports do not mention how the cistern was supplied. Iaroslavschi claims that it was supplied with rainwater and underground springs.}
\footnotetext[27]{Daicoviciu-Daicoviciu, 1966, p. 34; Vulpe, 2002, p. 97.}
\footnotetext[28]{The oldest interpretation is that of a collective suicide by poisoning; see e.g. Bartoli \textit{et alii}, 1673, pl. 292.}
Fig. 1. The plan of Sarmizegetusa Regia’s enclosure with the placement of the excavations where clay tubes of a pipeline were uncovered. Based on Glodariu et alii, 1996b, p. 135, fig. 24 and Glodariu et alii, 2004, pl. 1.
Fig. 2. Detail from the map of 1804 with the fortress of Grădiștea Muncelului. Image source: Österreichisches Staatsarchiv, Kriegsarchiv, Kartenabteilung KVIIk 403 l/2.

Fig. 3. Detail from the plate with the artifacts found at Grădiștea Muncelului in the campaigns of 1803-1804 representing a clay tube from a pipeline. Image source: Österreichisches Staatsarchiv, Kriegsarchiv, Kartenabteilung KVIIk 403 l/2.
Fig. 4. Detail from scene CXX of Trajan’s Column. Photograph taken by Aurora Pețan on the copy in National Museum of Romanian History.
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