

Hypothetical reconstruction of a late ancient residence at Podunajské Biskupice

Milan HORŇÁK, Oddelenie za arheologiju, FF, Univerza v Ljubljani, Slovenia

Erik HRNČIARIK, Katedra klasickej archeológie FF TU, Trnava, Slovakia

Jana MINAROVIECH, STUDIO 727, Bratislava, Slovakia

Abstract: The remains of a late ancient Germanic residence dated to the last third of the fourth century AD, unearthed at the location Križovatka in the cadaster of the village Podunajské Biskupice at the end of 2017 and beginning of 2018, is one of the most unique discoveries in decades. The archaeological excavation unearthed the remains of a Germanic residence, which formed part of a larger settlement. The size of the excavated area was around 48 × 58 m. The residence was enclosed by a wooden fence, which went into the depth of 40 cm from the point where it was recorded. The inner structure of the farmyard was formed by six wooden rectangular buildings, whose foundations have survived in the form of trenches and postholes. Stone was used only to support the columns of the portico in Buildings I and III. The architecture of the residence differs from the standard Germanic settlements, which have buildings with halls or sunken-featured pit-houses. Aristocratic residence in Podunajské Biskupice is built in wood, but its overall layout, the principles of symmetry and axuality predetermining the arrangement of the buildings, and the large square colonnade buildings are architectural features and principles rooted in the tradition of ancient architecture. It seems that both the architect who designed the complex and the builder who raised it came from the Roman world south of the Danube, and not from the native barbarian environment. The hypothetical reconstruction of the Germanic residence is a result of an intensive cooperation between the archaeologists who conducted the excavation and Studio 727 in Bratislava. The purpose of this contribution is to present the process of reconstruction with emphasis on the specifics of fourth-century wooden architecture. Plans were processed in AutoCAD, then 3D building models were modulated in Houdini. The resulting textured images were rendered in V-ray.

Keywords: *Roman period—wooden architecture—hypothetical reconstruction—Roman-Germanic relations*

CHNT Reference: Horňák, Milan; Hrnčiarik, Erik, and Minaroviech, Jana. 2021. Hypothetical reconstruction of a late ancient residence at Podunajské Biskupice. Börner, Wolfgang; Kral-Börner, Christina, and Rohland, Hendrik (eds.), *Monumental Computations: Digital Archaeology of Large Urban and Underground Infrastructures*. Proceedings of the 24th International Conference on Cultural Heritage and New Technologies, held in Vienna, Austria, November 2019. Heidelberg: Propylaeum. doi: [10.11588/propylaeum.747](https://doi.org/10.11588/propylaeum.747).

Introduction

The archaeological excavation at Podunajské Biskupice was instigated by the planned construction of a bypass around Bratislava and its connection to the motorway. In the course of several months, archaeological companies investigated settlements which date back from the Stone Age to the High

Middle Ages. One of the most interesting discoveries was an inhumation cemetery dated to the period of the Avar Khaganate (Horňák, 2018, pp. 2–5).

From December 2017 to the end of April 2018, the remains of La Tène, late Roman and high medieval settlements were excavated in the part of the site that got the working title Podunajské Biskupice – Crossroads. The excavation was carried out by the archaeological private company VIA MAGNA Ltd. and the Department of Classical Archaeology of Trnava University in Trnava.

The first remains of sunken-featured structures were detected on the site as early as the beginning of December, when the archaeologists of VIA MAGNA Ltd. discovered the western edge of a large precinct. Due to unfavourable weather conditions and the size of the unearthed area, the work was suspended for three months. Meanwhile, the archaeologists reached an agreement with the construction company, which allowed them to investigate the entire area of the settlement including the parts situated beyond the planned road. Also Via Magna and the Department of Classical Archaeology agreed on cooperation, and the excavation was financed by both organisations (Hrnčiarik and Horňák, 2018, pp. 130–137).

The site Podunajské Biskupice – Crossroads is situated in the north-western corner of Žitný Ostrov, on the eastern outskirts of Bratislava (Fig. 1). Its historical development and the richness of settlement were affected not only by an excellent climate, but also by fertile land and sufficient humidity thanks to the nearby Danube. On the other hand, the river also caused floods and often changed its course throughout history, which meant that some of the excavated sites have been destroyed.

The size of the excavated area was around 48 × 58 m. Since the excavation took place in the early spring months, it was necessary to adjust the methodology to these conditions. On some of the surfaces, we had to stop working at a certain hour, and on others we could not start before a certain hour. This meant, paradoxically, that we were able to work on the site all day.

The archaeological excavation unearthed the remains of a Germanic residence, which formed part of a larger settlement. It was enclosed by a wooden fence that extended 40 cm below the point where it was recorded. The residence covered a rhombic area, with the north-eastern fence parallel to the south-western side. The north-eastern side of the fence diverted by about 80 degrees. The fence had probably enclosed the residence on all four sides, but only fragments of it were recorded in the southeast, east and northeast. In front of the northern, eastern and southern sides of the enclosure the authors detected a system of a large number of irregularly arranged pits of various sizes and depths. The pits were relatively shallow, around 15–20 cm from the point where they were recorded. Most of them did not interfere with one another – they formed three parallel rows – but some of them were in superposition. Since both the fence and the pits were rather shallowly sunken in the ground, the authors may assume that they served only to demarcate the area within the settlement, and were not the remains of a fortification system.

Ancient residence at Podunajské Biskupice (Fig. 2)

The inner structure of the residence was formed by six rectangular buildings of wood, whose foundations survived in the form of trenches and postholes. Stone was used only to support the columns. These were arranged along the inner sides of the fence, with a courtyard in the middle. The superposition of buildings II and III, and V and VI, suggests at least two building phases of the residence.

The earlier building phase included buildings I, II and VI, while the second phase included buildings I, III, IV, V and VII. Since the fills of the trenches and postholes yielded minimal finds, an exact dating of the time frame between the two building phases cannot be provided. However, it should not be too broad, as the accompanying finds from the whole area of the settlement are homogeneous and date to a relatively short period at the end of the 4th century (Hrnčiarik and Horňák, 2018, pp. 130–137).

The residence can be dated by coin finds. The majority of them derive from a metal detecting survey conducted on the removed heaps of clay during the excavation. Although they mostly come from the layer above the residence, which means they cannot be associated with any settlement structure, their range gives us a clear idea of the time frame of the settlement. Only one coin was found in the trench filling of Building V. It is a small follis struck for Helena in Trier by emperors Constantine I (306–337) and Constantine II. (337–361), and is dated to the years 337–340 AD. The collection clearly suggests that most of the coins date to the second half of the 4th century AD. The latest of them belongs to Emperor Valens and dates to 364–367 AD.

Roman-style residences in the territory of Slovakia

The architecture of the residence differs from standard Germanic settlements, which have buildings with halls or sunken-featured pit-houses (Varsik 2011, p. 45). The aristocratic residence in Podunajské Biskupice was built in wood, but its overall layout, the principles of symmetry and axuality predetermining the arrangement of the buildings, as well as the large square colonnade buildings, are architectural features and principles rooted in the tradition of ancient architecture. Both the architect, who designed the complex, and the builder who raised it seem to have come from the Roman world south of the Danube, and not from the native barbarian environment.

The phenomenon of Roman-style residences in the territory of Slovakia is known from the turn of the eras (Bratislava-Castle), throughout the Roman period (Bratislava-Dúbravka) to Late Antiquity (Milanovce-Veľký Kýr and in particular Cífer-Pác). The residences in Bratislava-Dúbravka, Veľký Kýr and Cífer-Pác were built in several phases. Their buildings from wooden or earth-and-timber phases bear resemblance to the buildings on the studied site (Hrnčiarik, 2013, pp. 209–216). Unlike the residence in Podunajské Biskupice, however, they were later rebuilt in stone. The Germanic residence in Podunajské Biskupice was inhabited only for a short period of time. Even though its structure resembles that of the residence in Cífer-Pác, it was not rebuilt in stone, and after a while was abandoned by its owner for unknown reasons.

Building I was situated in the south-eastern corner of the residence. It had a rectangular construction (outer dimensions 21 × 13.5 m), and the thickness of the foundation trench was in the range 24–47 cm. The perimeter construction was supported by three pillars of about 26 cm on three sides. A portico was situated along the entire perimeter of the building, and the load-bearing pillars in the corners were aligned with the perimeter walls of the main structure. The area between the portico and the main structure is about 130 cm. We assume that it is a residential building with a north-western entrance.

Building II consisted of an inner closed area surrounded by a foundation trench. The postholes were recorded also in the foundation trench of the building but did not protrude from its line. We did not

record any traces of dividing walls inside the building. A portico was situated in the south. Dimensions with the portico: 7.5×6 m; enclosed area: 6×6 m.

Building III (Fig. 2) was the largest of the structures unearthed at Podunajské Biskupice. It consisted of an inner area, which was disturbed in the middle of the southern wall. The trench was completely destroyed in the north-east. The postholes were recorded also in the foundation trench of the building and they partly protruded from its line. The building was surrounded by a portico and was entered through it. From there one continued to a hall, and further on to two rooms of different sizes. The hall was closed in the north and open in the south. Dimensions with the portico: 26×15 m; enclosed area: 21×8 m. As for its function, a building of similar construction was unearthed on the site Oberleiserberg in Austria (Stuppner, 2008, pp. 284–285), where it was interpreted as a gate. In Podunajské Biskupice, however, such interpretation is impossible, since the part of the building, which, according to the Oberleiserberg model, should have an entrance, is closed and does not have the typical features of a gate construction. However, buildings similar to Oberleiserberg were excavated in Cífer-Pác. These were interpreted by T. Kolník and later by V. Varsik as dwellings or farm buildings (Varsik and Kolník, 2016, pp. 257–268).

Building IV with inner dimensions 7.13×5.6 m was situated on the north-western side of the residence and was aligned with the perimeter fence. The mark after a horizontal foundation beam (38 cm thick) and the postholes (diameter 30–32 cm) suggest that it was a smaller building with a simpler construction than buildings I, III and V. A portico with pillars was situated on each of the four sides of the building. The dimensions of the outer construction including the portico were 12.8×13.3 m (Fig. 3).

Building V was situated on the south-western side of the residence and is similar to Building I in construction, just smaller. The rectangular structure with dimensions 7.6×8.9 m is surrounded by pillars on four sides and forms a 2.5 m wide portico. The outer dimensions are 9.2×15.8 m.

Building VI is in superposition with Building V, and the two buildings clearly could not have existed at the same time. It is a smaller rectangular structure (4.3×4.6 m) with an entrance hall built onto its northern side (depth 1.75 m). The door to the entrance hall can be identified on the northern, shorter side of the structure, and we placed a single wooden door here. The small dimensions of the building suggest that it was a farm building, which was later demolished and replaced with the larger Building V.

Building VII was situated in the north of the residence, and its foundations differed from those of the other buildings. They were formed by 9 postholes placed at regular intervals on an area of 3×3 m. The entire structure measured 4×6 m and probably served as a granary. Its floor was likely above the ground to protect it from moisture and rodents. The perimeter wall in the upper section consisted of plaited wickerwork, which ensured that air circulated in the room and the crops stayed dry. The load-bearing construction consisted of wooden beams. A granary is also assumed by V. Varsik in Cífer-Pác (Varsik and Kolník, 2016, pp. 257–268). but there it was situated on the outer side of the residence. Behind Building VII was a pottery kiln. It was 4.24 m long and the inner width of the firing chamber was 0.58 m.

Interpretation and hypothetical reconstruction

The hypothetical reconstruction of the Germanic residence is a result of an intensive cooperation between the archaeologists who conducted the excavation and an architect from STUDIO 727 in Bratislava. The authors will present the reconstruction process with emphasis on the specifics of fourth-century wooden architecture.

As the authors have already said, the only surviving parts of the residence in Podunajské Biskupice were the postholes and the foundation trenches. In the reconstruction, drew the authors on the knowledge of an analogous site in Cífer-Pác, which was investigated by Titus Kolník in 1969–1980 (Varsik, 2014, pp. 141). The three buildings there had similar ground plans as the structures in Podunajské Biskupice. They had a portico in front with a pillar on each side. The largest building had a portico only on the two longer sides of the building.

Walls

In Podunajské Biskupice, the authors assume a structure of Fachwerk type, with vertical pillars mortised into a wooden horizontal construction. Between the pillars was plaited wickerwork, which was coated with clay plaster blended with chaff. Sometimes a thin wooden wall was used instead of wickerwork, and it was covered with reed, which is a good base material for clay plaster (Chybík, 2009, pp. 162).

Load-bearing constructions of wood and clay have a long tradition. The combination of these materials was frequently used in all ancient cultures, whether it was Ancient Egypt, Minoan Crete or Ancient Greece. Houses with wooden post-construction were built in the territory of present-day Slovakia, Moravia and Bohemia as early as the La Tène period. In the 1st to 2nd centuries AD, earth-and-timber construction system was also used by Romans to build military camps. In this territory, such a camp is situated at Iža-Leányvár (Minaroviech, 2007, p. 95). The Romans continued to build these types of earth-and-timber structures in this region also in the late ancient period from the 1st to 4th centuries AD. Such structures have survived in the Roman civilian town at Carnuntum (Humer, 2009, p. 58). In his book *La Construction Romain* (Adam, 2005, pp. 104–105), J. P. Adam gives numerous examples of the use of woodworking joints in ancient Greece and Rome. One of them is the so-called Jupiter's joint, which derives from the shape of god Jupiter's lightning.

Roof and roof covering

The authors assume that the material used for roof covering was reed, as there were no finds of ceramic roof tiles or nails (used on shingled roofs), and reed was likely available in the vicinity of the site. Roof pitch for this type of covering ranges from 42 to 45 degrees, in places with strong wind it is 50 degrees (Oláh et al., 2002). The right pitch and thickness (30–35 cm) ensures the durability of roof covering (50–100 years). A lower pitch is used on the parapets of gable roofs, but this means that rain water does not drain properly and may damage the roof. Therefore, roof covering should be changed more often on these portions of the roof than on others. Reed covering has various advantages, for instance it is a good thermal and acoustic insulator (Vlček, 2008, p. 43). A large number of natural sites rich in reed can be found in the south of Slovakia. Another analogy, that the authors used in the reconstruction were the buildings presented at the Freilichtmuseum Elsass in Austria (www.freilichtmuseum-elsarn.at).

Doors and windows

The exact locations of the building entrances have not been identified, but they are assumed on the longer sides of the structures towards the centre of the residence. The authors located them in places where the vertical wall construction is missing. They designed the entrance door from wooden boards on a wooden turntable. The windows were probably smaller to prevent heat leakage. Their position is only hypothetical. The window opening may have been covered with a wooden grille or animal skins. On the outside, the windows probably had wooden shutters for better insulation. Finer, glazed windows are not assumed in these buildings. In Roman military camps, window glass was used in the buildings of commanders and tribunes (Minaroviech, 2007, p. 99).

Exterior of the buildings

We assume that the buildings were plastered with clay plaster of earthy colour. The main load-bearing constructions of wood were exposed. The buildings were surrounded with trenches, which drained rainwater from the roofs and prevented the buildings and pillars from soaking. However, these trenches were not recorded and are only assumed.

The postholes for the pillars supporting the portico are round and their cross-sections range from 37 cm (Building IV) to 90 cm (Building III). In comparison, the postholes in Cífer-Pác were square. Despite this difference we assume that on both sites the pillars were of circular diameter.

Fence

The entire area of the residence was enclosed with a fence. The authors assume that in the first phase, the enclosure was formed of a wooden fence embedded into the ground, made of posts which carried horizontal wooden planks. In the second phase, the fence was extended to the east. In the west, the old fence was kept, but in the east it was rebuilt using a new technique. It was extended with posts that were irregularly sunken into the ground, and likely wrapped with wickerwork.

3D model of the residence (Fig. 3, 4)

The basic analytic tool used for the documentation of terrain indicators or archaeological features was photogrammetric documentation. This was done by a combination of vertical and oblique drone images from the height of about 20 m. The obtained photogrammetric model (produced in the AGISOFT software) was georeferenced into the coordinate system SJTS-SK. This allowed the authors to create precise DEM and comprehensive plans of the residence. The plans were processed in AutoCAD, and 3D building models were subsequently modulated in Houdini software. A simplified model was created, which was then approved by the authors of the excavation. After incorporating the authors' comments, they clarified the constructional details of the building. When the model of the structure was approved, the authors conducted texture mapping. The authors looked for analogous examples of textures used on other archaeological structures. The textures were adjusted in the Photoshop programme, and then applied on the materials of the different parts of the model (wood, clay plaster and reed).

The surrounding terrain was modelled with the help of a model provided by archaeologists. The entire model was joined with the terrain to form a whole and was subsequently rendered in the

Redshift software. The rendered images were adjusted in Photoshop, and background was added. The most suitable images were selected for publication.

Conclusion

The Germanic residence in Podunajské Biskupice is a good illustration of the spread of Roman inspired architecture to the Germanic environment. The reconstruction drew on authors' knowledge of the way wooden buildings were constructed in the Roman Empire, but also in Barbaricum. It was a unique architecture, one of the aims of the presented article was to approach the methodology of its reconstruction, which may help in similar constructions in the future. The practical knowledge of the architect in collaboration with an archaeologist was used to create the model. We clearly benefited from the fact that a similar, almost identical Germanic residence had been investigated in Cífer-Pác, not far from the studied site. The reconstruction of both sites was conducted by the co-author of this contribution, and the coordination of the work helped the authors complete missing information on each site. In this way, the author managed to provide a more reliable reconstruction of both residences. The researched objects are important in the development of architecture not only in Slovakia, but also in Europe. The 3D model created in this way made it possible to get a more realistic view of this unique Germanic residence. The model will be used in the monograph, which summarizes the results of archaeological excavation. At the same time, it will serve as a basis for the preparation of educational videos, which will be part of the upcoming exhibition on the Germanic nobility in Slovakia. The model will also be freely available on the website. Their visitor will not only be able to see the residence virtually, but also to learn about the life of the Germans. The 3D model will be used, among other things, in the teaching process at secondary schools and universities with a focus on history and archaeology.

Figures

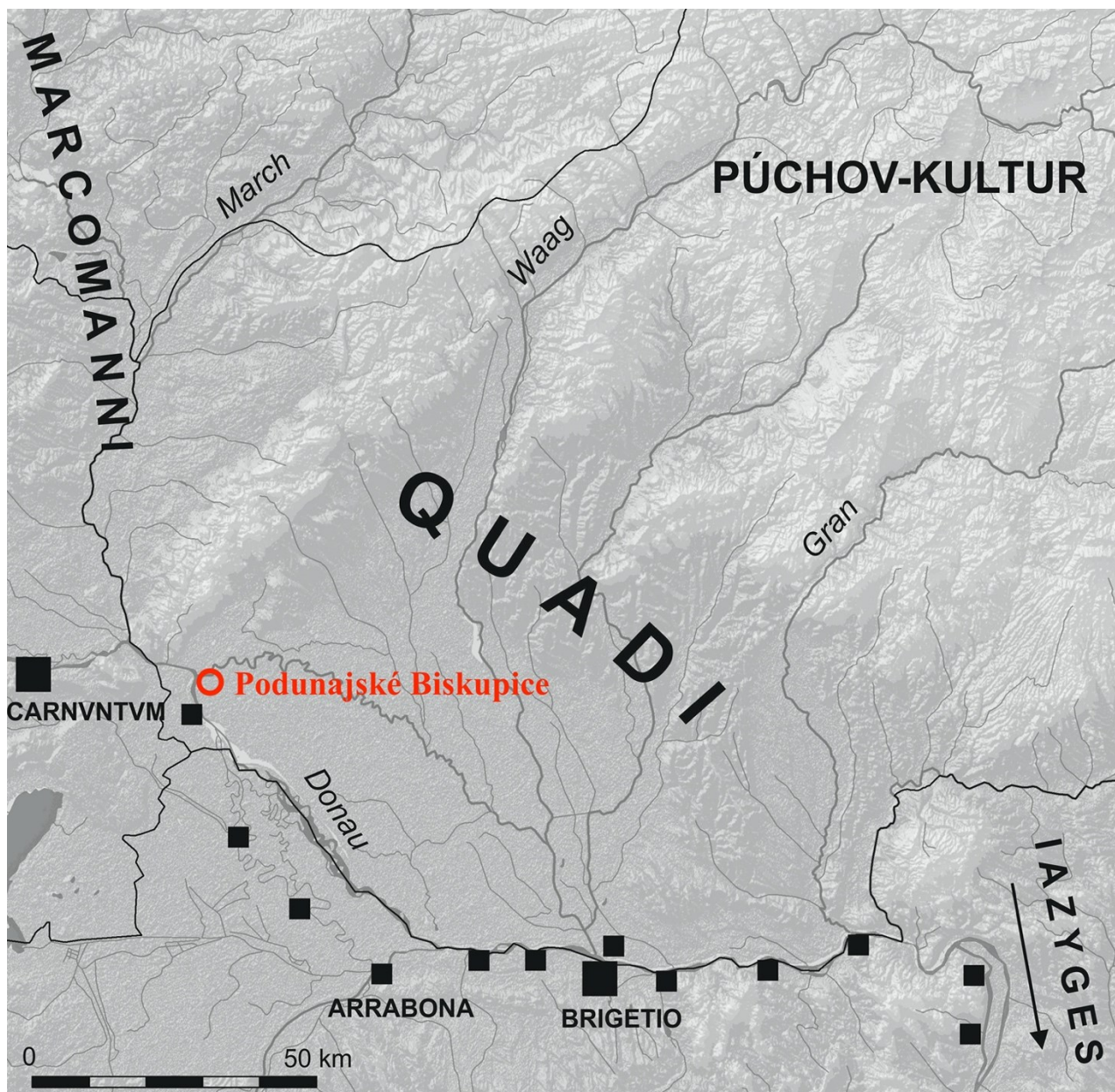


Fig. 1. The Roman frontier in north Pannonia and Germanic residence at Podunajské Biskupice
(© Hrnčiarik).



Fig. 2. Germanic residence at Podunajské Biskupice (© Horňák-Hrnčiarik).

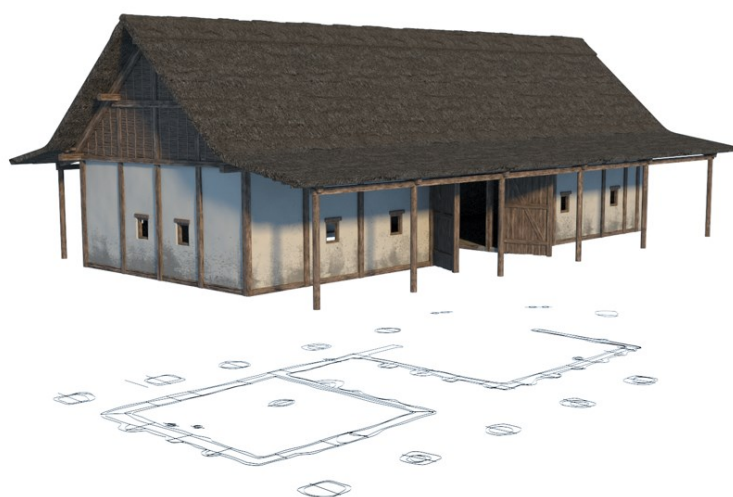


Fig. 3. Ground plan of Building III (© Horňák-Hrnčiarik) and hypothetical reconstruction of the Building (© Horňák-Hrnčiarik-Minaroviech).



Fig. 4. Hypothetical reconstruction of the Building V (© Horňák-Hrnčiarik-Minaroviech).

Acknowledgements

This contribution has been written with the support of research grants VEGA No. 1/0358/18 and 1/0243/17.

References

- Adam, J. P. (2005). La construction romaine. Picard Paris, pp. 91–105.
- Chybík, J. (2009). Přírodní stavební materiály. Grada Publishing, Praha, pp. 162–164.
- Hrnčiarik, E. and Horňák, M. (2018). 'Neskoroantický dvorec v Podunajských Biskupiciach', in: Šenkirk, R., Gembešová, L., Bakaljarová, H., Škrovina, M. (Eds.), Dunajský Limes a odkaz rímskej antiky na ľavom brehu Dunaja. Bratislava, pp. 130–137.
- Hrnčiarik, E. (2013). Römisches Kulturgut in der Slowakei: Herstellung, Funktion und Export römischer Manufaktur-erzeugnisse aus den Provinzen in der Slowakei, Universitätsforschungen zur prähistorischen Archäologie 222, Bonn: Dr. Rudolf Habelt GmbH.
- Horňák, M. (2018). Pohrebisko z obdobia Avarského kaganátu v Bratislave-Podunajských Biskupiciach. in. Pamiatky a Múzeá 1, pp. 2–5.
- Humer, F. (2009). Ein römisches Wohnhaus der Spätantike in Carnuntum. Kulturabteilung des Landes Niederösterreich und Archäologische Kulturpark Niederösterreich Betriebsges., St. Pölten, pp. 57–66.
- Minaroviech J. (2007). Hypothetical 3D reconstruction of the Roman earth-and-timber fort in Iža. In: Forschungen und Methoden vom Mittelmeerraum bis zum Mitteleuropa. ANODOS – Supplementum 4. Trnava, pp. 91–102.
- Oláh, J. et al. (2002). Šikmé strechy. Jaga group, Bratislava, p. 224.
- Stuppner, A. (2008). Il sito di Oberleiserberg (Austria), in: Roma e i Barbari: Ausstellungskatalog Palazzo Grassi, Venezia, Roma: L'ERMA di BRETSCHNEIDER, pp. 284–285.
- Varsik V. (2011). 'Slovensko na hraniciach Rímskej ríše. Kvádske sídlisko – vnútorná štruktúra a chronologický vývoj', Trnava : Filozofická fakulta Trnavskej univerzity v Trnave.

- Varsik V. and Kolník, T. (2016). 'Römisch versus germanisch: zum Bauwesen des quadischen Herrensitzes in Cífer-Pác (SW-Slowakei)', *Anodos* 12/2012, (2016), pp. 257–268.
- Varsik, V. (2014). 'Neskoroantické panské sídlo v Cíferi-Páci. Rímske a germánske elementy v architektúre sídla', in Tyszler, L. and Droberjar, E. (Eds.) *Barbari superiores at Inferiores, Achaeology of the Barbarians*, Lódź/Wieluń, pp. 139–152.
- Viček, M. (2008). Hlína, konopí a rákos – znovuobjevené materiály pro zdravé bydlení. Clay, hemp and reed – rediscovered materials for healthy living, in: *Zdravé domy – Healthy houses 2008*, Brno, pp. 41–48.
- <http://www.freilichtmuseum-elsarn.at> (Accessed: 27 June 2019).