

# Virtual accessibility of the Macedonian tomb in Ohrid

## *Virtualna dostopnost grobnice makedonskega tipa v Ohridu*

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### *Abstract*

The paper presents activities that were carried out in the framework of the project “Virtual reconstruction and making a model of a Macedonian tomb in Ohrid” with the main aim of promoting and presenting archaeological cultural heritage inaccessible to the broader public. Creating the virtual reconstruction and digital 3D model gave the Macedonian tomb in Ohrid “visual access”. Thus, despite being completely isolated, the tomb is now accessible to everyone for inclusive learning and acquiring new knowledge or simply as a tourist attraction of exceptional regional cultural and historical significance.

*Key words:* Ohrid, Macedonian tomb, virtual reconstruction, 3D Model

### *Izvleček*

V prispevku so predstavljene aktivnosti, ki so bile izvedene v okviru projekta »Virtualna rekonstrukcija in izdelava makete grobnice makedonskega tipa v Ohridu« z glavnim ciljem promocije in predstavitve širši javnosti nedostopne arheološke kulturne dediščine. Ustvarjanje konceptualne virtualne rekonstrukcije in digitalnega 3D modela je makedonski grobnici v Ohridu omogočilo »vizualni dostop«. Tako je grobnica kljub popolni izoliranosti postala dostopna vsakomur za inkluzivno učenje in pridobivanje novih znanj ter preprosto tudi kot lokalna turistična zanimivost posebnega kulturno-zgodovinskega pomena.

*Ključne besede:* Ohrid, grobnica makedonskega tipa, virtualna rekonstrukcija, 3D model

### **Introduction**

Ohrid is a region of outstanding cultural and historical value, dating back to pre-historic times. Classical antiquity was a period when the area was of great importance. Perhaps the main reason for this is the fact that the historic *Candavian* road and the later Roman *Via Egnatia* passed through the territory, connecting the western Adriatic with the eastern Aegean and the southern Balkans (Битракова Грозданова 1988, 37–52; Митревски 2013, 234; Bitrakova Grozdanova 2021). Consequent-

ly, many archaeological sites reflect the status of the place and the importance of the people who lived there during the Macedonian rule and the flourishing of Hellenistic art. The monumental tomb of the Macedonian type in Ohrid is an excellent example of this hypothesis.

The tomb was found on the hill Varosh above the Ohrid Lake, at the site “Karagjulevci” (fig. 1), directly above the ancient theatre. For many years, this tomb was forgotten and inaccessible to the public, probably due to the impossibility of its physical presentation since the structure is located on private property (Битракова Грозданова and Кузман 1999; 2017; Kuzman

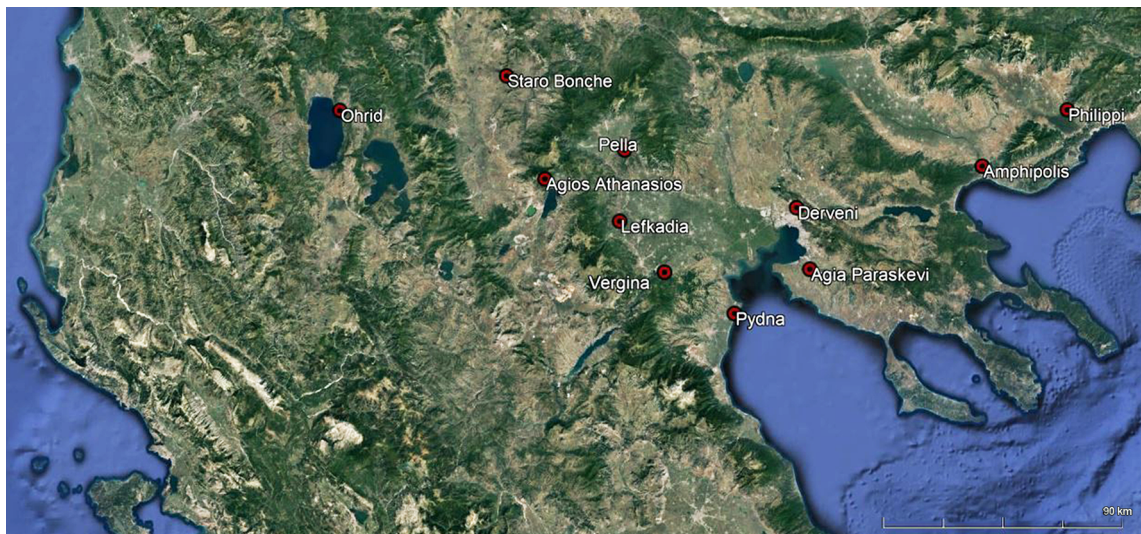


Figure 1. The distribution of the Macedonian tomb sites mentioned in the text (on the basis of Google Earth 2022; elaborated by M. Blečić Kavur).

2009; cf. Guštin and Kuzman 2016). Therefore, a detailed and systematic archaeological investigation of the area is almost impossible under these circumstances. This gave rise to the idea of producing a modern documentation, presentation, and promotion of the Ohrid archaeological monument, which is physically inaccessible to the general public but is crucial for understanding the ancient cultural heritage of this region.

Another Macedonian tomb is located quite far from Ohrid (66 km), in Staro Bonche, in the northern Pelagonian plain (Jakimovski 2011; 2015, 32–41; cf. Guštin and Kuzman 2016). Despite their distance and architectural differences, according to the current state of research, they are the only examples of this type of preserved funerary architecture in Northern Macedonia (fig. 1).

In this study, an introductory overview of the funerary architecture of the Macedonian tombs is presented, as well as a history of research and previous findings interpreting the Macedonian tomb at Ohrid. The architecture, technical description and state of preservation of this building are then discussed. The virtual reconstruction, visual restoration and 3D digital model of the tomb are described in detail. Finally, we emphasize how persons with disabilities and all

types of special needs can make full use of virtual reconstructions and 3D models. Thus, these results support the main goal and perspective of the international project *Accessible and Digitized Cultural Heritage for persons with disabilities* (Lilcikj et al. 2022; cf. Karovska and Minov in this publication), to which this issue of *Studia universitatis hereditati* is dedicated.

#### Macedonian tomb in Ohrid

Macedonian tombs appear in the Late Classical and Hellenistic periods, from the 4<sup>th</sup> to the 2<sup>nd</sup> century BCE as a type of burial, first of kings and then of the upper classes. In the areas that were under Macedonian influence or under Macedonian occupation, numerous tombs are known. The best known are the tombs near the great centres of that time e.g. at Vergina, Lefkadia, Derveni, Amphipolis, or Philippi in northern Greece (fig. 1; Tomlinson 1977; Miller 1982; Andronikos 1993; Tsimbidou-Avlonitou 2005; Borza and Palagia 2007; D'Angelo 2010; Schmidt-Dounas 2016). Most Macedonian tombs were plundered, so that especially the unlooted tombs at Vergina and Derveni are important sources of information on burial customs and social organisation in ancient Macedonia (Sismanidis 1997; Tsimbidou-Avlonitou 2005;



Figure 2. The survey and documentation of the Ohrid tomb (photo I. Malezanov, D. Angjelkovski).

cf. Palagia 2022). The emergence and development of such Hellenistic funerary architecture is associated with the wealth and expansion of the Macedonian kingdom (D'Angelo 2010; Stampouloglou et al. 2019; cf. Palagia 2022). Macedonian tombs were constructed underground and covered by an artificial tumulus. They have the following architectural elements: a rectangular burial chamber and/or one or two antechambers, a *dromos*, a passage leading to the entrance of the main chamber where the funerary rites are performed, and a monumental façade (Miller 1982; Schmidt-Dounas 2016; Stampouloglou et al. 2019; Stampouloglou et al. 2020; Palagia 2022).

The first detailed analysis of the Macedonian tomb at Ohrid was conducted in 1996 and subsequently published by Vera Bitrakova Grozdanova and Pasko Kuzman (Битракова Грозданова and Кузман 1999; 2017; Kuzman 2009). They presented the history of the research and its use during World War I, when it was a hiding place for Bulgarian soldiers. The first research was carried out in the 1950s by Vasil Lahtov, who reopened the tomb and installed an iron gate in the *dromos* for protection. In 1984 Vlado Malenko started an excavation in the antechamber. No small finds of material culture were found, so it is assumed that the tomb was plundered in the past. Based on its characteristic architectural elements and solid construction, it has been dated to

the late 4<sup>th</sup> or early 3<sup>rd</sup> century BCE (Битракова Грозданова and Кузман 1999; Kuzman 2009; Bitrakova Grozdanova 2022). As far as the architectural and decorative elements are concerned, the tomb at Pydna is the most similar (Sismanidis 1997; Stampouloglou et al. 2019; Stampouloglou et al. 2020), which has already been presented and argued in the interpretation of the Ohrid tomb (Битракова Грозданова and Кузман 1999; 2017).

### Architecture and state of preservation

In 2021, a group of young archaeologists, students, civil engineers and expert archaeologists conducted the project entitled “Virtual reconstruction and model of a Macedonian tomb in Ohrid” (fig. 2). The project promoter was the *Association for the Protection and Sustainable Development of the Environment Regional Green Centre Ohrid*, in cooperation with the *NI Institute for the Protection of Cultural Monuments and Museum Ohrid* with the support of the Ministry of Culture of the Republic of Northern Macedonia. It was divided into three phases – field documentation, analysis and digitization of technical documentation, and virtual reconstruction, restoration and modelling of the tomb.

During the first activity, the tomb was technically recorded and digitally photographed with modern technology (fig. 2). A total station could not be used for the technical documenta-

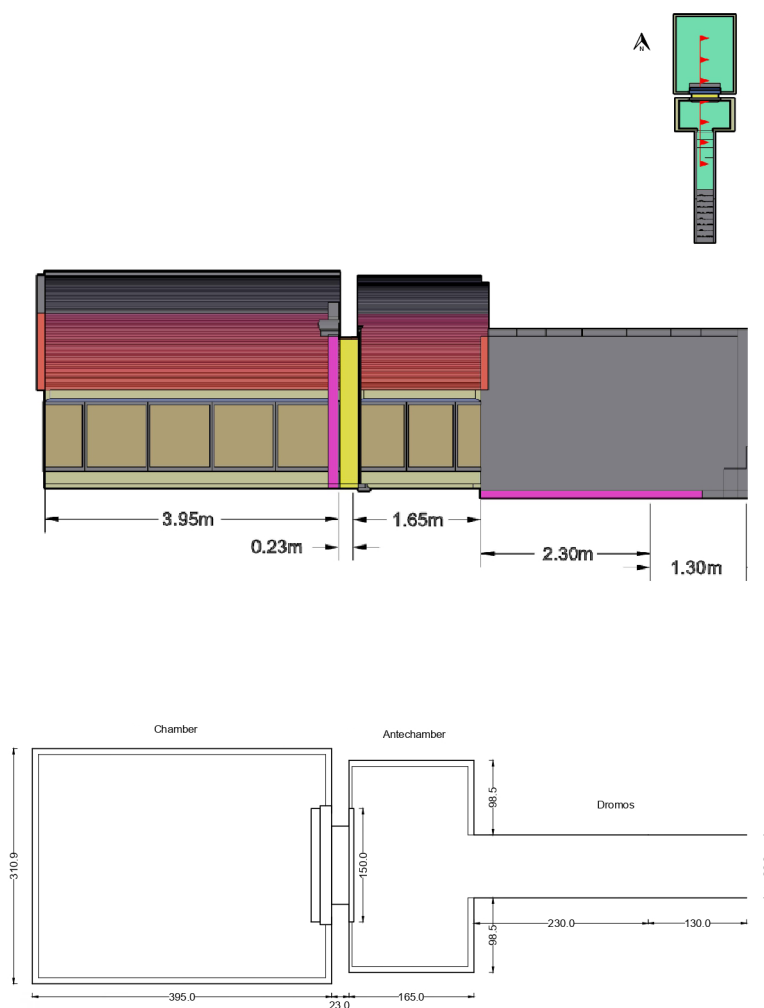


Figure 3. Ground plan and cross-section of the Macedonian tomb in Ohrid (produced by A. Boyadzieva and K. Denkovski, elaborated by M. Blečić Kavur).

tion due to time constraints and the difficult terrain. Therefore, a laser distance measurer was employed to determine the dimensions of the tomb. In addition, numerous photographs were taken with a DSLR camera, which were necessary for the creation of 2D drawings and 3D models of detailed geometric documentation.

The last analysis in 2021 documented that the ground plan of the tomb consisted of a *dromos* (2.3×0.83 m), an antechamber (1.65×2.8 m) and a chamber (3.95×3.11 m) (fig. 3). The antechamber and the main chamber are covered by a continuous barrel-vaulted roof. In the cham-

ber there are traces of two burial beds (*klinai*) on which the deceased were placed. The tomb was built from massive hewn limestone blocks, and no binding material was used in its construction. The limestone blocks are arranged in four rows in the *opus quadratum* technique, while the fifth row of stone slabs is slightly inclined towards the *dromos* to support the roof beams (fig. 3–6). Between the antechamber and the chamber there is a trapezoidal door with typically made stone jambs rising diagonally and supporting a lintel that overhangs them (fig. 5, 6; Битракова Грозданова and Кузман 1999). The floor of the

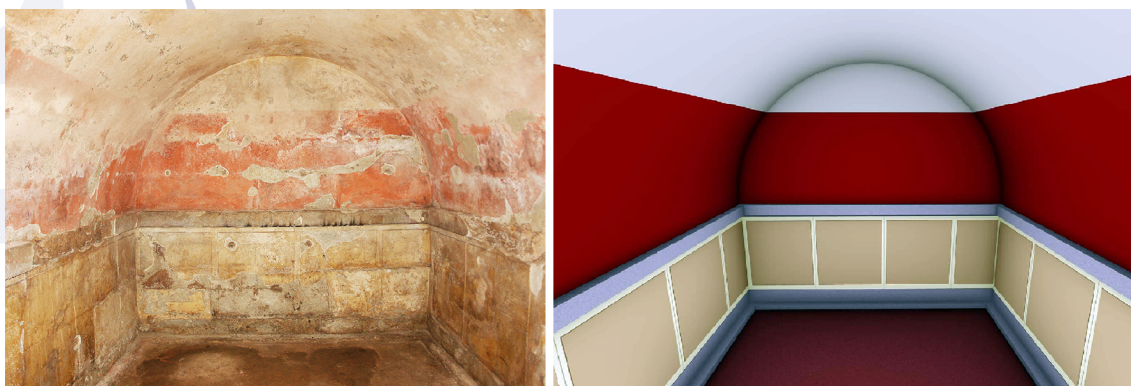


Figure 4. View of the northwestern wall of the chamber (photo by I. Malezanov; virtual reconstruction produced by K. Denkovski).

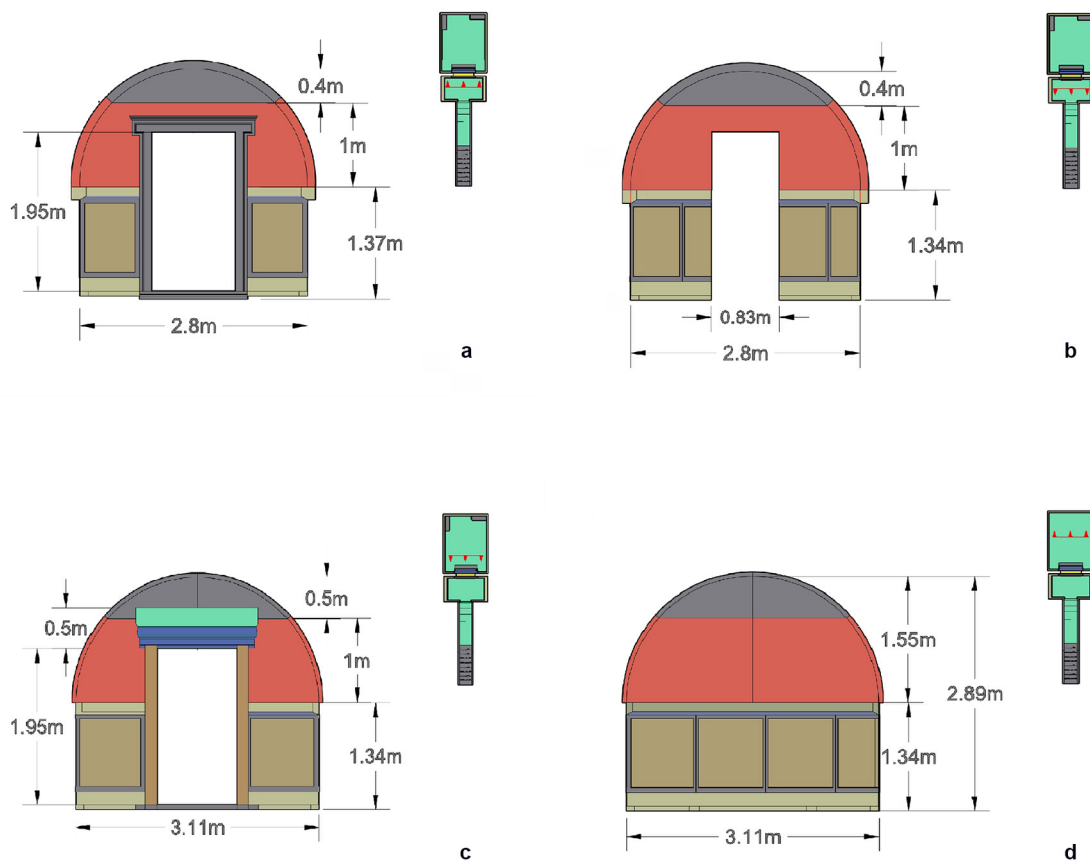


Figure 5. View of a) the entrance from the antechamber to the chamber, b) the exit from the antechamber to the *dromos*, c) the exit from the chamber, and d) the northeastern wall of the chamber (produced by K. Denkovski, elaborated M. Blečić Kavur).

tomb is made of hydraulic mortar, which is still preserved in the chamber. In the antechamber, unfortunately, the floor has not been preserved due to the contemporary use of the tomb or due to earlier research. The wall decoration in the antechamber and in the chamber consists of stucco and mortar painted different colours, of which the *Pompeian-red* predominates (fig. 4–6).

On the 2.89 m high northwest wall of the chamber are a 10 cm high plinth and a 1.24 m high stucco orthostat imitating marble slabs. The area above the 1 m high orthostat is painted red (fig. 5). In previous researches, the highest part of the wall was depicted with blue paint (Битракова Грозданова and Кузман 1999, 13; 2017), which was not confirmed during the field documentation, as the last 55 cm do not have any painted surface.

The exit wall of the chamber has the same dimensions. The door is 80 cm wide and the stone structure on which the door was installed has an interesting detail on the side of the chamber, which tells us that one of the stone blocks broke during installation, so it was fixed with iron, that is, a kind of clamp. On the other hand, the entrance from the antechamber to the chamber has a 1.27 m high orthostat, identical to the one in the chamber. The red paint covered the same height, while the unpainted part is only 40 cm high. Finally, the exit wall from the antechamber to the dromos, similar to the northwestern wall, has a 10 cm high base, an orthostat of 1.24 m, a 1 m band paint red and an unpainted part of 40 cm (fig. 5).

On the southwest side of the chamber, the floor and wall show traces of destruction, probably by illegal excavators. At the entrance itself, above the antechamber, the roof is also badly destroyed. This probably happened during the First World War, as evidenced by the inscriptions on the southwestern wall of the chamber.

It is interesting to note that during this activity the temperature inside the tomb was measured regularly and indicated a constant temperature of 14°C. However, in the presence of three people, the temperature inside the tomb

increased by 4°C, which means that it reached 18°C in only 10 minutes. Since the temperature inside the tomb fluctuates, daily visits would affect the humidity and damage the wall paintings. This is another reason why the tomb should be conserved and presented in a virtual edition, such as a 3D model based on visualizations.

### Virtual reconstruction and 3D model

The next phase was the creation of a virtual reconstruction of the tomb, i.e. the analysis and digitization of the technical geometric documentation. Besides digital documentation, virtual reconstruction is very important because it is the only way to visualize the tomb under the currently available conditions. The aim of this activity was to present the documented tomb to a wider public. Thus, an information board with a short description of the tomb and a QR code to access the virtual reconstruction was placed near the site.

The third activity, also aimed at the public presentation of the tomb, was the creation of an ideal reconstruction, virtual restoration and model of the tomb, for which the textured 3D models are necessary. Three-dimensional digitization has become an integral part of cultural heritage documentation and brings significant benefits to studies of reconstruction and restoration of architectural structures, archaeological sites, and historical monuments (Stampouloglou et al. 2019). Thus, a model of the Ohrid Tomb was produced using a 3D printer and later artistically painted (fig. 7). In this way, researchers and visitors can now better understand the original appearance of the monument, even though safety reasons prohibit actual physical restoration of the tomb. With the 3D model, we also wanted to show how the tomb looked in three dimensions so that people with different types of disabilities could see and touch it. We can now touch and feel the tomb in detail, especially its construction and the architecture. This result allowed equal participation in the broader cultural activities of Ohrid. It therefore provides an excellent opportunity to involve different audiences (chil-

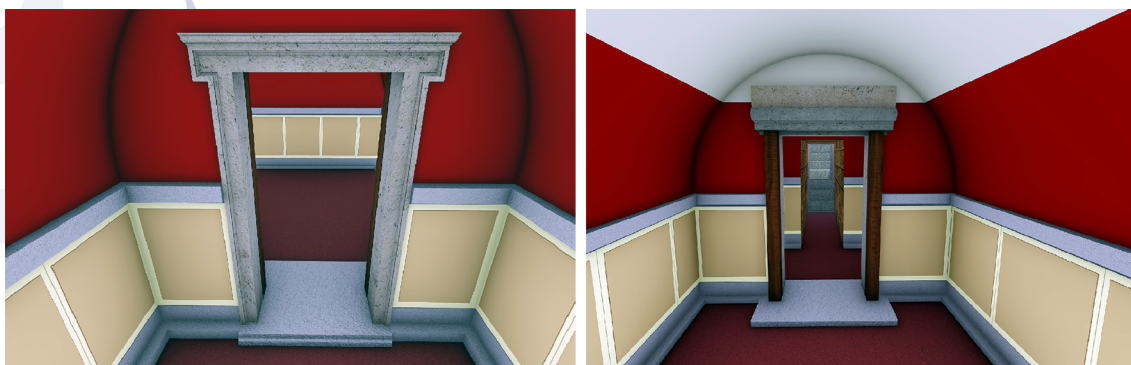


Figure 6. Ideal virtual reconstruction and visual restoration of the entrance from antechamber to the chamber and the exit from the chamber (produced by K. Denkovski).

dren, persons with disabilities, seniors...) in the promotion of the common quality of life associated with our social and cultural values.



Figure 7. 3D model of the Macedonian tomb in Ohrid (produced by I. Malezanov).

## Conclusion

Macedonian tombs were luxurious funerary monuments for the Macedonian elite and aristocracy. In addition to ancient Macedonia, these tombs have been found in Thrace, Thessaly, Asia Minor, and Euboea (Miller 1993; D'Angelo 2010; Schmidt-Dounas 2016; Palagia 2022). In contrast to the magnificent Macedonian tombs with attractive facades, such as those at Vergina, Pella, Agia Paraskevi, Agios Athanasios, etc. (Andronikos 1993; Sismanidis 1997; Tsimbidou-Avlonitou 2005; Stampoulouglou et al. 2020; cf.

Palagia 2022), the tomb of Ohrid has a simple facade. Nevertheless, due to its solid construction, the techniques of interior decoration and the use of colours and stucco, it undoubtedly belongs to the Macedonian tombs with the nearest example, the tomb of Рудна (Битракова Грозданова and Кузман 1999; cf. Stampoulouglou et al. 2020). Consequently, an exceptional dignitary and his wife were most likely buried in it (Кузман 2010, 58–59). Therefore, the interpretation that it is the burial of a historical figure *Aeropos*, depicted in ancient written sources as the ruler of Lychnidos in the 3<sup>rd</sup> century BCE, has also been offered (Битракова Грозданова and Кузман 1999; Блажевска 2013, 677; Bitrakova Grozdanova 2021, 426). However, the so-called provinciality of the building, the reduction of the architectural and decorative elements as well as the simplicity of the facade speak for a dating of the tomb into the 3<sup>rd</sup> century BCE, which could be confirmed at least hypothetically by the assumption of lavish burial of *Aeropos* at this place.

For many years this Macedonian tomb in Ohrid was forgotten or neglected because it was not accessible to the public. With the production of the virtual reconstruction, a visual restoration and the 3D model of the tomb, we wanted to present to a wider public why this tomb is so important for the whole Ohrid region. The fact is the elite of Lychnidos were buried in the Macedonian way in the 3<sup>rd</sup> century BCE, adopting

the innovations of Hellenistic monumental funerary architecture.

Archaeological heritage belongs to all, and access to it should be guaranteed to all. The European Commission (2003) sees accessibility and inclusion as key to sustainable development and believes that it enhances the quality of life and makes the environment more liveable (Kajda, Michalik and Kobiałka 2015). Therefore, it is necessary to provide people with disabilities with various opportunities to participate in economic, social and cultural life (UNESCO 2020). Not only people with disabilities, but also the entire population is affected by accessibility: Parents of young children, the elderly, people with temporary mobility limitations, etc. The lack of accessibility prevents them from experiencing and understanding their own heritage. With the aim of increasing accessibility and making changes in this regard, we have succeeded in presenting the significant archaeological heritage of Ohrid to a wide audience and tourists through virtual reconstruction and visual restoration. We believe that such an approach is our future standard, both in the profession and in the promotion of the (in)accessible heritage.

### Summary

The Macedonian tomb in Ohrid symbolises one of the most important architectural representations of the tomb buildings from the Hellenistic period in the territory of Northern Macedonia. Architecturally, the tomb consists of a *dromos*, an antechamber and a chamber. The entire tomb is made of stone blocks without binding material and is decorated with stucco decoration and mortar. The largest area is covered by Pompeian red paint, which was found in the middle zone of the tomb's walls. The tomb is dated to the 3<sup>rd</sup> century BCE and was probably commissioned by a resident of Lychnidos who belonged to the aristocracy or rulers of the city at that time. Traces of two *klinai* were found inside, which means that two people were buried in the chamber.

For many years this Macedonian tomb in Ohrid was forgotten and/or neglected because it was not accessible to the public. With the realization of the virtual recon-

struction, a visual restoration and the 3D model of the tomb, we wanted to present to a wider public, especially to persons with different types of disabilities, why this tomb is so historically important for the whole Ohrid region. The tomb is now accessible to everyone for inclusive learning and acquiring new knowledge about archaeology, or simply as a tourist attraction of cultural and historical significance.

### Povzetek

Makedonska grobnica na Ohridu je eden najpomembnejših arhitekturnih predstavnikov grobnih stavb iz helenističnega obdobja na ozemlju Severne Makedonije. Arhitekturno je sestavljena iz dromosa (hodnika), predverja in komore. Celotna grobnica je izdelana iz kamnitih blokov brez veziva in je okrašena s štukaturnim okrasjem in ometom. Največjo površino pokriva pompejanska rdeča barva, ki je bila najdena v srednjem pasu sten grobnice. Datirana je v 3. stoletje pr. n. št. in jo je verjetno naročil prebivalec Lihnida, ki je pripadal takratni aristokraciji ali vladarjem mesta. V notranjosti so bili najdeni sledovi dveh klinai, kar pomeni, da sta bili v grobni komori pokopani dve osebi.

Dolga leta je bila ta ohridska grobnica pozabljena in/ali zanemarjena, saj ni bila dostopna javnosti. Z izvedbo virtualne rekonstrukcije, vizualne obnove in 3D-modela smo želeli širši javnosti, zlasti osebam z različnimi vrstami invalidnosti, predstaviti, zakaj je ta grobnica tako zgodovinsko pomembna za celotno ohridsko regijo. Grobnica je zdaj dostopna vsem za vključujoče učenje in pridobivanje novih znanj ali preprosto kot turistična znamenitost kulturnega in zgodovinskega pomena.

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