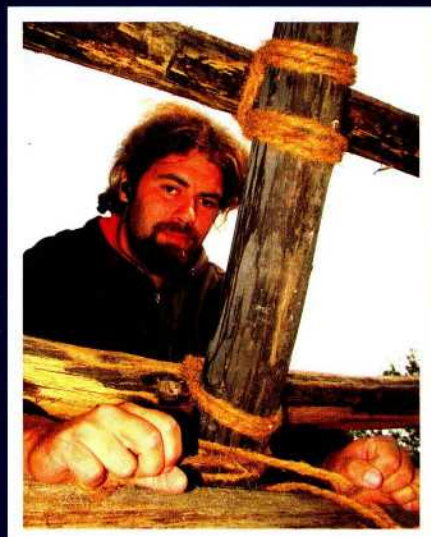
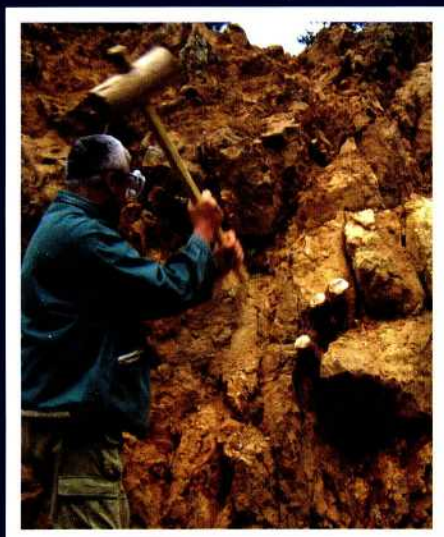


EXPERIMENTELLE ARCHÄOLOGIE

in Europa

BILANZ 2014



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3D Reconstruction and Digital Visualization of the South of the Royal Palace in Great Preslav

Stoycho Bonev, Tsvetanka Boneva, Severina Yorgova, Stoyan Bonev

Zusammenfassung – 3D-Rekonstruktion und digitale Visualisierung des Südens des Zarenschlosses von Veliki Preslav. Dieser Bericht stellt den Film „10. Jahrhundert. Der Süden des Zarenschlosses in Veliki Preslav“ vor. Er besteht aus zwei Teilen – „10. Jahrhundert. Das Zarenschloss in Veliki Preslav. Der Platz mit der Fiale“ und „Die Gemächer des Herrschers“. 3D- und virtuelle Rekonstruktionen des Architekturkomplexes, der während der archäologischen Ausgrabungen im Zarenschloss entdeckt wurde, werden im Film benutzt. Die 3D-Filme erfreuen sich einer zunehmenden Popularität und werden von den Wissenschaftlern sowie von der breiten Öffentlichkeit begrüßt. Ein anerkanntes Reiseziel in Bulgarien ist Veliki Preslav – die Hauptstadt des mittelalterlichen bulgarischen Staates und auch ein wichtiges Kulturzentrum des europäischen Südostens im 9.-10. Jh. Der erste Teil des Films wurde dank der finanziellen Unterstützung der Stiftung „Amerika für Bulgarien“ produziert und der zweite mit Finanzierung vom Fond „Wissenschaftliche Forschungen“ beim Bildungsministerium. Ein Team von fast 20 Mitarbeitern – einschließlich Computerspezialisten, Schauspielern, Dolmetschern und dem Tonstudio „Trima“ – hat am Film gearbeitet. Im ersten Teil des 3D-Films sind Teile des großen Schlosses, der Platz mit der Fiale und die dazugehörigen Gebäude – ein wichtiges Strukturelement im Städtebau der Herrscherresidenz im 10. Jh. – dargestellt. Im zweiten Teil liegt der Schwerpunkt auf dem südwestlichen Teil des Zarenschlosses in Veliki Preslav, wo sich der persönliche Palast und die Kanzlei der Herrscherdynastie befinden. Die virtuelle Rekonstruktion wurde vom Klub „Virtuelle Archäologie“ am Mathematischen Naturwissenschaftlichen Gymnasium „N. Popowitsch“ in Schumen erstellt. Dank der Bemühungen seiner Mitarbeiter ist schon klar, wie der Süden des Zarenschlosses in Veliki Preslav aussah.

Digital technologies introduce new possibilities for presentation and popularization. With the purpose of attracting the interest of the general public, it is necessary to restore the supposed shape and size of the construction or the architectural ensemble. Thus every visitor can get a better notion and more easily perceive their cultural and historical value. These technologies offer us a new type of

restoration – virtual reconstruction. Three-dimensional models are a way to visualize our monuments without any intervention of their authentic appearance and regardless of their actual status. The first European conference on virtual archaeology was held in Italy in 1998 and the reports were published in a special series. Virtual reconstruction provides a possibility to construct and depict variant



Fig. 1: The Preslav water pinnacle being unearthed. – Fiale von Preslav während der Ausgrabungen.



Fig. 2: The church on the square with the pinnacle. Situation after the excavations. – Die Kirche am Platz mit der Fiale nach den Ausgrabungen.

decisions for historical monuments, without threatening their authenticity. The advantages include the option for preparation and presentation of a considerable larger number of variant solutions for the visualization of the whole three-dimensional object and modeling of the skyline with a maximum amount of details, precision and completeness, which are normally unachievable in a hand-drawn graphic that is always dependent on the actual scale. Furthermore, virtual models can be displayed not only on the PC monitor, but also on video walls, which could project the image closer to the real-life perceptions of the observer. 3D modeling of monuments has an important role for the preservation of the cultural and historical heritage. With the assistance of this technology, objects can be restored from what was only present in the plans and explanations of the archaeologists. It cannot replace the "real picture", but it is a magnificent alternative. By means of computer restoration, archaeological monuments are displayed in a three-dimensional version. The virtual reconstruction is a precise recreation of the appearance of a given sight based on preserved remains and usage of the available archaeological information, as well as of the surrounding or the historical epoch in which the monument existed. Applying this method of representation of cultural and historical monuments is a question of economical availability. This is also a means of popularizing our historical sites through the Internet. The virtual restoration helps the imagination of the visitor with the perception of the monument. Strong impact is achieved with the combination of images of the model with photographs of the current state of the archaeological remains from the same point of view (Fig. 1-2).

By means of 3D models and digital visualization, each monument can be

turned into a virtual visit. The process of computer visualization can be divided into a number of stages.

The first stage is collecting information about the sight, which includes sketches, photographs, analysis of the current state of the monuments and the environment in which they existed, construction technology and the materials used for them. This stage is particularly important for the 3D visualization in view of the fact that it defines the quality of the reconstruction that will be carried out.

The second stage is defining the general notion and concept of the reconstruction, its scale, and the way of visualization and the sphere of distribution. At this stage, the technical and program basis of the virtual reconstruction is formed. It requires determining the objective and type of visualization in advance.

The options here are several:

- Single images of the three-dimensional sight
- Animation
- Virtual interactive tour inside the building.

The third stage could include the process of executing the virtual restoration and its finalization as a documentary.

By making documentaries, better possibilities for perceiving the monuments are revealed. Through motion in the interior and around the virtually restored monument, the visitor could get a complete idea of its proportions, size and impact. Appropriate shorter or longer films can be shown on displays, installed in the area of the archaeological site or on larger screens in a museum. They can be broadcasted as an advertisement of the sight on TV or in the Internet or distributed as digital storage media for popularization of the sight, offered to the visitors. Making animations requires time and resources and it is usually the result of the efforts of large teams of specialists. It is necessary

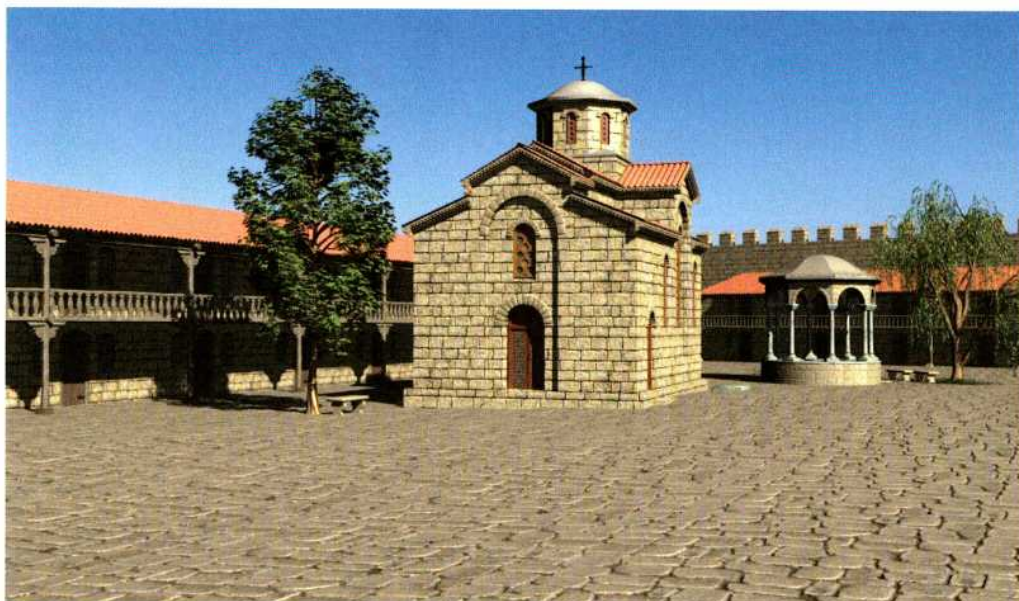


Fig. 3: The square with the pinnacle. 3D reconstruction. – Der Platz mit der Fiale. 3D-Rekonstruktion.

to work out preliminary scripts, to have detailed description of the effects and the motions that will be realized.

One of the remarkable archaeological sites in Bulgaria is Great Preslav, which was the administrative capital of the mediaeval Bulgarian state and was also a significant cultural and spiritual center of the European Southeast in 9th-10th centuries. Archaeological investigations depict Great Preslav as one of the most important town centers in Europe close to Constantinople. The Royal Palace in Great Preslav is an architectural ensemble copying the town-planning structure of the large emperor's palace in Constantinople, (on a small scale - 0.600 sq. km.), which was constructed before the enthronement of King Simeon. The palatine center was the residence of the Bulgarian rulers in the 10th century with monumental edifices, squares with a significant role in the court life, churches, monasteries, hygiene and decorative facilities, and covered passages. As a result of the long-term investigations, it became evident that Preslav was a center

of spiritual life, applied arts and crafts. Of particular interest are the painted ceramics, the works of which include icon painting, decorative and table vessels with rich ornamentation, tiles, and floorings.

In 2011 a project was initiated and a grant was disbursed by America for Bulgaria Foundation. Thus the work on visualization of the historical monuments in Veliki Preslav was started. The opportunities of 3D projecting were used to assist archaeology. The product that was used is 3DsMax 2011. This program has large graphic capabilities and with its help, it is possible to model, texturize (to place materials on the surface of the objects), to simulate physical processes (rain, water, motions evoked by the wind, water, gravity), to animate cameras, sights, materials and simulations. This product was bought for the virtual archaeology club. The archaeological monuments unearthed so far and the modern technologies helped create a computer restoration of architecture, town-planning and town development and present in



Fig. 4: The south of the Royal Palace. – Der Süden des Zarenschlosses.

detail the way the southern part of the Royal Palace in Veliki Preslav looked like. The film is named “The South of the Royal Palace in Great Preslav. The Square with the Pinnacle”. In 2012, with the support of Bulgarian National Science Fund at the Ministry of Education, Youth and Science, work on the second part of the film began – “The Ruler’s Lodgings”.

In the complete 3D animation, parts of the Palace, the square with the water pinnacle and the buildings attached to this square are shown – a significant compositional element of the town planning of Preslav royal palace in the 10th century. The architecture, the town planning and the town-development are an outstanding expression of the urban thought and practice of Mediaeval Europe. This area has been a subject of special attention in its construction – the builders have accomplished impressive plan composition, strongly influenced by the Byzantine architectural tradition (Fig. 3).

The massive fortress wall, together with the gate forms the borders and has an effect both over the situation and the planning of the construction works. In this

space, several monumental buildings tower above their surroundings. Amongst them are representative edifices, an exquisite cross-domed church, the magnificent and one of a kind water pinnacle, the residence of the Preslav royal dynasty with the office and the personal palace of the ruler’s family.

The information from the archaeological research, conducted by Dr. Stoycho Bonev, associate professor, and the evidence of Byzantine authors on similar monuments in Constantinople are used for the 3D models of the buildings (Fig. 4). The reproduction of graphic reconstructions requires a careful study of the sources and deep knowledge about the discovered buildings. They helped to appraise what was inside the Court complex, especially their size and position.

The curtain walls and turrets are presented on a scale so that the real dimensions can be assumed and the tourists could easily perceive their size when looking at the computer restoration. The visualization shows massive fortification works such as the walls, which



Fig. 5: The southern wall of the Royal Palace. – Die südliche Festungsmauer des Zarenschlusses.

reached a height of 15 m. A special program is used for the calculation of the height based on the width of the foundations. This is a new, but very effective method (*Fig. 5*).

The work on the virtual reconstruction was done by Virtual Archaeology club at the Mathematical School, Shumen, headed by Svilen Rusev who made the 3-dimensional images of the unearthed architectural sights. The 3D modeling is a process related to a very fast and precise algorithm for geometric calculations based on silhouetted delineations and depends on the development of the software. Thus the restoration and presentation of historical and cultural monuments is a complex commission and a huge challenge. The creation of 3D models and putting them in a virtual or real environment provides a different interdisciplinary approach to the work. Nevertheless how the models were created – by CAD programs, laser-scans or photogrammetry – it is always necessary to have a close cooperation between archaeologists, hi-

storians, architects, designers and computer specialists.

Due to the efforts of its members, it is now clear how the south of the Royal Palace in Veliki Preslav looked like. The archaeological researches clarify the plan of the buildings at a ground level or negligible fragments of the above-ground construction. Such remains are of great use to the archaeologists and scholars, but are hardly comprehensible for the general public and this is balanced by the documentary that was produced. The use of modern means for popularizing historical and cultural heritage shows the possibilities for contemporary interference in preservation of the real monuments without changing the cultural landscape. Part of the film will be available on the website of the museum. Thus the result of the project covering long years of archaeological research will be easily accessible through the Internet and will popularize Veliki Preslav National Historical and Archaeological Reserve.

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Picture credits

Fig. 1: BONEV 1998, 93, fig. 45

Fig. 2: BONEV 1998, 84, fig. 38

Fig. 3+5: S. Rusev, "The South of the Royal Palace in Great Preslav. The Square with the Pinnacle"

Fig. 4: S. Rusev, "The Ruler's Lodgings"

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