Short Paper

The Visualisation of Construction Principles of Antique Architecture

An Antique Amphitheatre Visually Explored

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Introduction

At the last CHNT conference we illustrated our method of visualisation of hypotheses as a counter-position of presumed virtual reconstructions of architecture. A visualisation of a hypothesis is profoundly different from a virtual reconstruction. The difference lies in the understanding of what is to be shown in the face of what can be expressed scientifically. Reconstruction claims that it is possible to rebuild a lost building. That may be possible in some cases. In the case of ancient buildings such as this amphitheatre, where the findings are less than sparse, this is quite impossible. This is why we developed our method of visualisation of hypotheses. It emphasises that archaeological knowledge consists of a wide range of uncertainty including contradictions rising from multiple equally valid scientific assumptions. Instead of pure diagrams, we work with subtle indications, mainly through versatile geometric abstraction. Contrary to the literal meaning this does not mean leaving things away but designing new and evident shapes of representation. Abstract shapes are then compensated by virtual architectural photography.

Catalyst

Even this form of visualisation acts as a catalyst, as the three-dimensional synthesis of the most diverse archaeological sources regularly leads to the discovery of missing parts, which turn out to be in the interest of archaeology (Lengyel and Toulouse, 2019). But not only that, the results of virtual photography, perspective projection, the perception from spatial positions that were possible in antiquity are also opening up new research questions. The display of architecture, actually of the architectural design idea, is also always the substance of the visualisations (Lengyel and Schaerer, 2020). It is precisely the abstraction, the absence of clearly antique attributes from people to clothing to weapons, but also of traces of use and missing technical equipment that always allow a comparative view of the visualisation with our own perception of architecture (Deuring, 2016; Lengyel and Toulouse, 2016). The projects shown included works for the German Archaeological Institute (DAI) and several museums e. g. of the State Museums of Berlin and have always accompanied and

enriched archaeological research: The metropolis of Pergamon around 200 AD, the Imperial Palatine Palaces in Rome in the third century AD (Märtin and Wulf-Rheidt, 2012), the royal city of Naga in today's Sudan in the first century AD, Cologne Cathedral and its predecessor building from Roman times until today (Lengyel and Toulouse, 2013), a tenth-century agricultural garden of the Umayyad dynasty in the Caliphate of Cordoba, a sixteenth century counter reformation parish church building program by the Würzburg prince bishop Julius Echter von Mespelbrunn (Schock-Werner, 2017; Lengyel and Toulouse, 2017), the colonnades at the Neues Palais in Potsdam.

Architectural Principles

With this paper we are going to present a project that goes beyond this. Funded by the Gerda Henkel Foundation for the Humanities, it answers questions on the amphitheatre of Durrës that have arisen during the last decades of archaeological research by Prof. Dr. Henner von Hesberg and Dr. Heinz-Jörg Beste. Durrës is situated in today's Albania (Follain, 2009), a harbour city on the road between Rome and Constantinople. The particular peculiarity is that the construction of the amphitheater the construction confuses the otherwise familiar alignment with the topography. The axes of the amphitheatre are actually turned in relation to those of the slope.

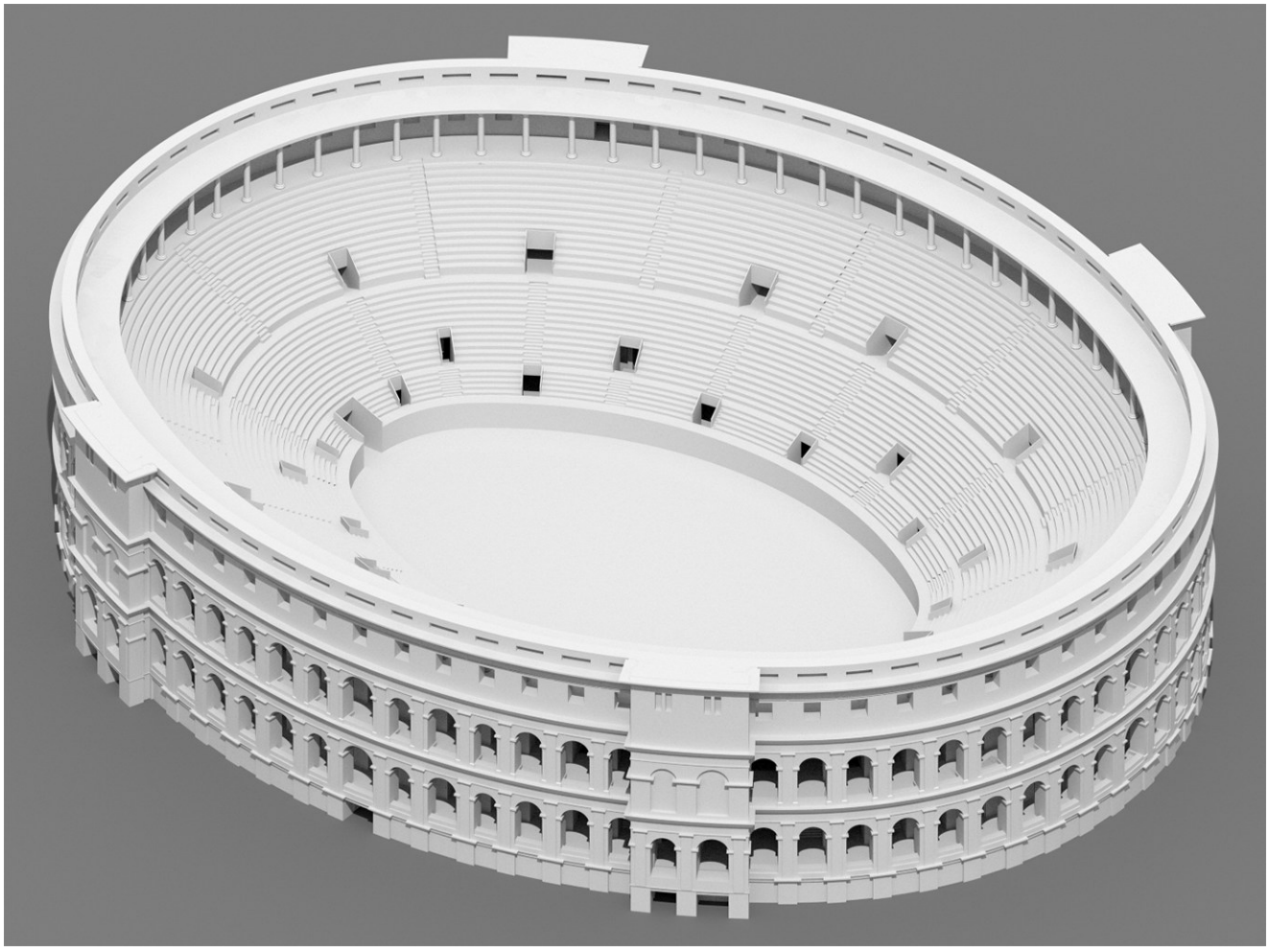

Fig. 1. The ideal behind the amphitheatre of Pula. (© Lengyel and Toulouse).

Antique amphitheaters generally follow common principles in order to provide a common external appearance (Golvin, 1988; Graefe, 1979). Durrës followed this regarding the principal external views

but deviated in its construction and access system from the common way and required new solutions for both, construction and access.

The amphitheatre that was built shortly before in Pula, which has very similar dimensions, was used as a reference, as a starting point, in the assumption that it must also have served as a reference for the builders and architects of Durrës at that time. Pula, however, has a specific yet symmetrical embedding in the topography, but also unusual features such as exterior staircases, for which there is no evidence in Durrës. Consequently, while Pula forms the historical reference, its idealised version, i.e., the hypothetical principal disposition of Pula, forms the starting point for Durrës (Figure 1).

Hypothetical Adaptation as Research Method

Durrës deviated from the usual path and did not position the amphitheatre in the terrain in such a way that a symmetrical construction was possible, instead orienting it to the urban street grid. Why this was done is not documented, but it required new solutions for construction and access. The findings are too rare to build a certain reconstruction upon. Still, the findings suggest that there must have been a special and individual solution, principles that pursue the single goal of providing an appearance and a functionality as similar as possible to the other amphitheatres (Figure 2).

The development of a consistent spatial hypothesis could only be done in virtual space, as a digital three-dimensional model clearly reveals voids and contradictions. Therefore, the first challenge was to coordinate the existing planimetric hypotheses with each other on the basis of the measurements. However, the measurements were limited to georeferenced drawings. Due to the generous covering of the finds with a concrete layer from the middle of the 20th century, three-dimensional scans would only have been possible in the few preserved vaults; their overall extent would not have justified the effort. Moreover, the details that could have been gained through this were not relevant to addressing the question of this research project.

While further coordination and clarification were already necessary here, it was above all the missing parts that became apparent, which had not yet been dealt with in the previous investigations. It became apparent that the architectural claim was to actually spatially complete a building design – which here stands, analogously, for the development of an architectural hypothesis. Even such elements of an architectural development as the composition of the façade, which was initially not in focus from an archaeological point of view, had to be clarified in principle, at least in the sense of a first hypothetical approach. Scientificity as a guarantee against a random or even merely artistic freedom in the architectural composition was always at the centre of attention. It was by no means a question of developing an ideal of an amphitheatre that corresponds to our present-day tastes, but rather of developing such an ideal whose components are covered by scientifically founded hypotheses. Thus, the task was essentially to combine three different types of foundations of a scientific nature. In addition to the finds on site, even these not incontrovertible, since they too are to be dated and thus the result of scientific interpretation, there were concrete reference buildings, analogies, here above all the amphitheatres of Pula and Salona, which are close in time and space, as well as the known and preserved compositional principles of other preserved amphitheatres up to and including the Colosseum. In some difficult cases resulting from the findings, overlaps of vaults in the development system were taken into account in order to anchor also these solutions scientifically. Throughout, an attempt was made to answer all open questions by analogies with better preserved

buildings. Thus, the starting point of the investigation, namely the unique deviation of the alignment from the topography, is also based on analogies with other amphitheatres.

Here, too, it became particularly clear how easy it is to describe precisely uncertain information linguistically without the spatial difficulties becoming apparent. In some cases, the verbal description of intersecting vaults, for example, promised an obvious solution, while only the concrete arrangement in the space revealed which architectural challenges were posed in detail. Once again, the translation of language into geometry turned out to actually increase knowledge.

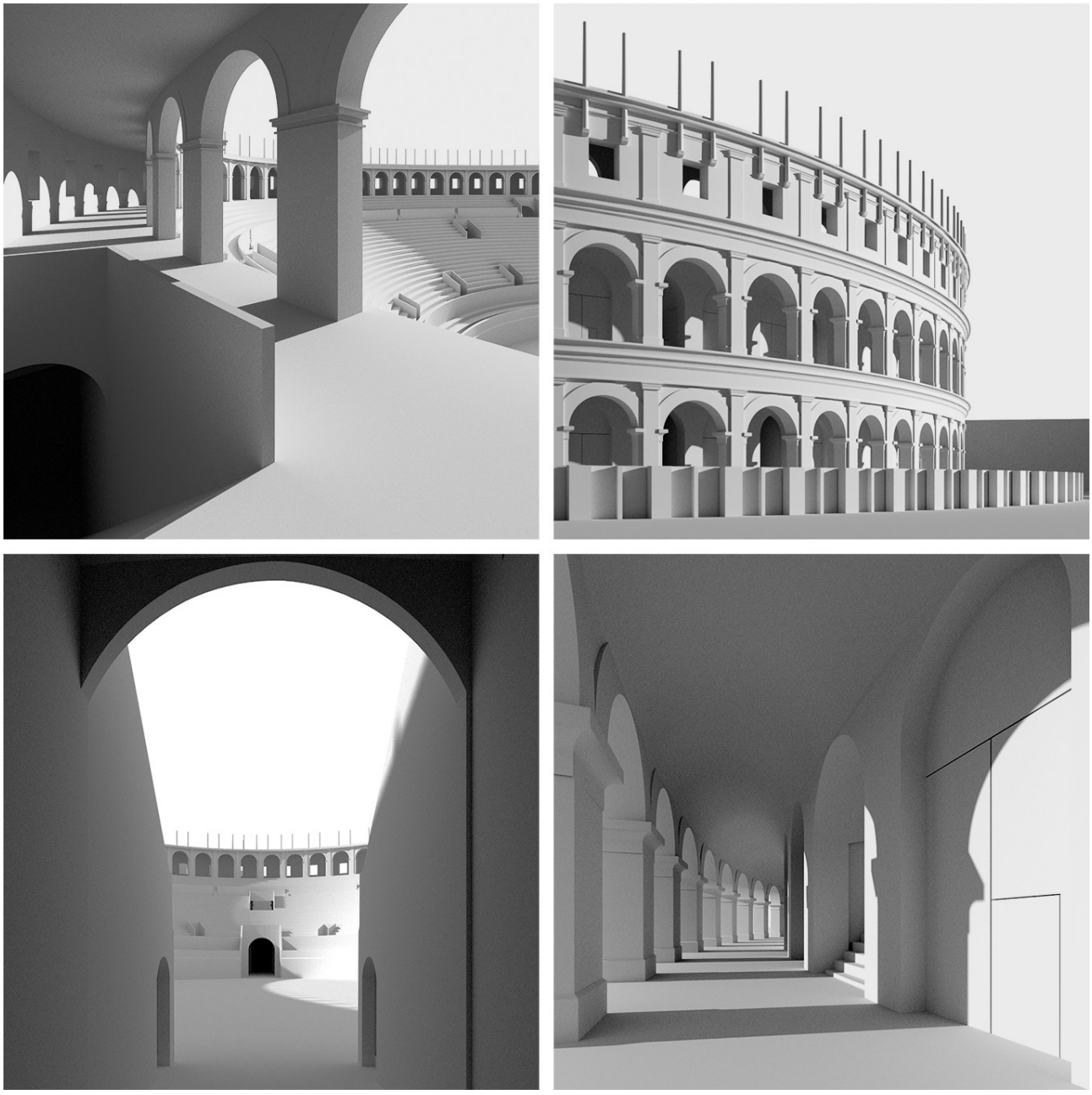

Fig. 2. The regular outer appearance of the hypothetical amphitheatre of Durrës. (© Lengyel and Toulouse).

All geometric elements from this translation are, above all to emphasise the hypothetical character, only detailed to the extent necessary for the spatial assemblage of the elements with each other. For vaults in particular, this means that only the diameters of the aisles in rectangular cross-section with the actual vaults running above them in circular cross-section are reproduced in their essentially straight form. The breakdown of the structure into individual stone blocks or wall structures, which is

irrelevant for solving the spatial compositional challenges of development and construction as a whole, is excluded here. Not only because it is not relevant, but also because the few finds would have meant a broadly speculative formulation that could have almost obscured the relatively high scientific quality of the statement about the spatial disposition. It is another level of hypothesis, but without repercussion on the central scientific question of the spatial disposition. Also, in order to visually emphasise this, subordinate levels of detail have been omitted. Even further, obvious small-scale irregularities that could not be attributed to any traceable intention were equalised.

The visualisation, which may resemble a design concept, is supplemented by diagrams that do not illustrate the geometry of the building in an abstracted way, but completely exclude the building as an object in order to refer entirely to the circulation of paths or the stability of the building. In this way, the changes to the terrain are explained as a diagram.

The result is a hypothetical structure for an amphitheatre that could serve as a design idea, a blueprint. It is not a reconstruction in the usual sense. Much, not only the specific construction of the masonry, is left out; it is also not a comprehensive presentation of all possibilities that would explain the open and vague finding situation. On the contrary, it is a first offer, a single one of the infinite number of possible solutions, a basis for further research that will have to face the questions of further findings that may come to light in future excavations.

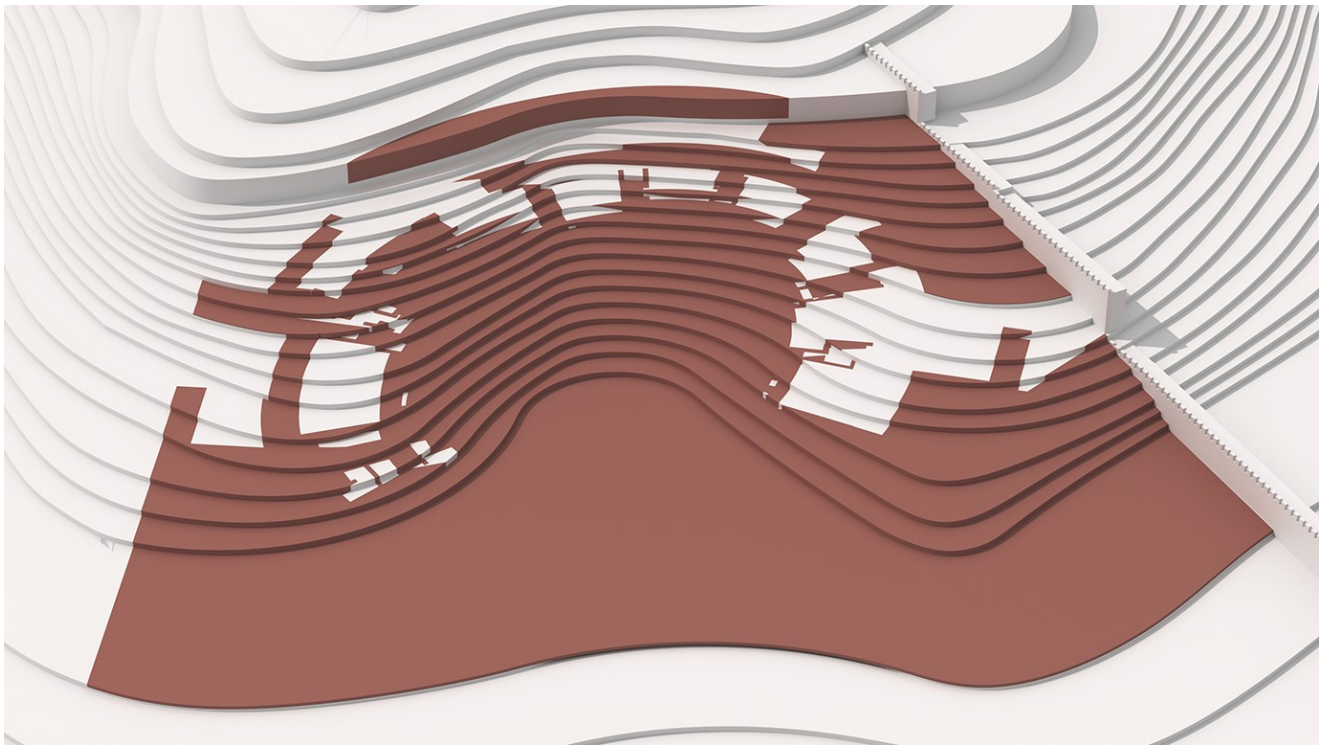

Fig. 3. The terrain excavation needed for the amphitheatre. (© Lengyel and Toulouse).

Conclusion

Based on scientifically based hypotheses created to an important extent during the common research project and their mutual consideration, the project demonstrates how a complex geometrical system has been analysed and synthesised and is being mediated visually by a set of complementary visualisations of different pictorial methods and architectural segmentation. As the project is a joint research project between architecture and archaeology, the team promised deep insights and

an important outcome not only for the scientific community in archaeology but also for the community of visualisation in scientific cooperations. In the end, the participation of architects provides a result that also meets the expectations in terms of spatial and visual design.

Acknowledgement

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