

# A new contribution for the reconstructive study of the theatre of Taormina

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**Abstract** – This paper presents the results achieved for the reconstructive study of the Greek-Roman theatre of Taormina, aimed at the realization of a Computer Graphic (CG) film presented at the G7 summit (26-27 May 2017). The reconstruction is now exposed to visitors within one of the two basilicas at the entrance of the theater. The work was commissioned by the Archaeological Superintendence - Park of Naxos-Taormina and proposes the ancient structure in its original aspect in two distinct phases. The first phase dating back to the first quarter of the II century A.D.. When, following a first imposed renovation, the complex expanded the receptive capacity of audience with the construction of an external ambulatory and the re-construction of the entire *scaenae frons*. The second part dating back to III century A.D. instead, it involves changes to the stage building and the orchestra with its transformation into the arena that change the use of the building. In particular the theatre representations were substituted with gladiatorial games. Our reconstruction uses fast 3D surveys based on drone photogrammetry and close range photogrammetry, together with the potential offered by the 3D modelling environment for interpretation and study. This approach has led to some unpublished solutions. The main goal of this work, is to understand the architectural and details of the monument, in an overall vision of the original context that allows the visitors to value its element of originality.



Fig. 2: The theatre's 3D Model from Photo (by concession of Italian Firefighters).

## I. INTRODUCTION

The role of the virtual archaeology specialist is closely connected to the dialectic relationship between the classical studies and the possibilities offered by these tools for 3D modeling and simulation. Only through constant checks in 3D of technical and constructive, dimensional and spatial aspects is it possible to validate the hypotheses derived from the philological study of the sources, the archaeological data, and contemporary analogous situations. Many original results achieved by mixed teams of archeologist and specialists in virtual archaeology have made possible the study of the monuments in a 3D space. In particular, only a minimal part of the proposed reconstruction has revealed to be plausible and compatible with the functional logic, constructive and stylistic principles used by a particular civilization, in a precise historical period. Then we



Fig. 1: Photos from the drone of the current theatre from S (A) and N (B).

outline some methodological approaches to the reconstruction of ancient buildings, always trying to respect scientific transparency principles, which should make recognizable the whole process of study that led to the reconstruction.



Fig. 3: Example of 3D transformation of a painting.

## II. THE ARCHITECTURAL FEATURES OF THE THEATRE

The archaeological data on the Hellenistic phase of the theatre of Taormina are very few: It had to have a *cavea* with convergent *analèmmata*, with nine wedges smaller than the current one. This is due to the presence of the remains of a Hellenistic sanctuary at the top of the *cavea*, subsequently occupied by the outer *ambulacrum* added to the theatre in the reconstruction of the imperial age. The *cavea* was built using the rocky outcrop to carve the steps, and in part using the local stone blocks to get the steps where the rock was missing: with this regard, there are some rock seats, with paleographic characters of III sec. B.C. The theatre of Taormina can be considered one of the oldest of the Magna Grecia and Sicilian theatres with curved *cavea*, not trapezoidal as in the older ones also dating back to the III sec. A.D.

According to the history of the studies, the currently visible building is considered to be the result of a grandiose reconstruction of the imperial age, occurred in the Trajan-Adrian age.

After this complete reconstruction, another major step was the renovation of the *scaenae* and the *orchestra* and their transformation into *arena*. These changes, in addition to a great change of the inner *ambulacrum* connected to the *porticus in summa cavea*, are attributed to the Severian age. The architectural elements of this phase dating back to the beginning of the III century are some capitals and part of the trabeation created for the *scaenae frons* during the transformation of the *orchestra* in *arena*. The dating is also supported by the tradition of the III century, well documented in Asia Minor, to adapt theatres to gladiatorial games and *venationes* with the typical characteristics of amphitheatres: a signal of a popular interest in games rather than for the cultural

representations. The Trajan-Adrian reconstruction had led to a spectacular use of white marbles and colored stones for the columns and coatings of *scaenae frons* and *orchestra* and a great enlargement of the *cavea* that covered the small Hellenistic temple (the ruins are still visible) on the top of the mountain. The new *cavea*, which could contain between 8.900 and 11.150 observers, held roughly the horseshoe shape of Hellenistic tradition, to which was added a double *ambulacrum* of crowning: the outer one with 47 arches framed by pillars on the facade, the inner one made up of a *porticus* that housed the steps of the *summa cavea* (maybe in wood because of its lack of traces on the northern wall to which they had to bend) supported by a crypt underneath. Towards the *praecinctio* the crypt had a wall high 2,60 m which also formed the podium on which colonnade used to lay on the upper *porticus*.

The *cavea*, divided into nine wedges and three *maeniani*, with *tribunales* above the *paradoi* outlets, reached a maximum diameter of 107 m, and the *orchestra* of 28.94 m (translatable with a slight approximation of 360 and 100 feet). Two large *basilicae* or *versurae* connected directly to the *parascaenia* flanked the building of the *scaenae*, which had the *porticus post scaenam* on the back. The *basilicae* (the western one of 12 x 16.5 m and the eastern one of 10.5 x 16 m) had internal walls articulated in niches and formed two large halls.

## III. THE COMMUNICATION PROJECT

The reconstructive study presented here is aimed at the realization of a GC documentary movie projected during the G7 summit (26-27 May 2017): at present, the reconstruction is exposed to visitors within one of the two *basilicae*, at the entrance to the theatre. The work was commissioned by the Archaeological Superintendence-Park of Naxos-Taormina and it re-projects the ancient structure in its original aspect, in the two phases of the Roman age just described. We will not dwell on the architectural features and the archaeological evidence of the monument, but we will try to trace those elements of interest that emerged from the tridimensional study aimed at museum communication, which remains for us the real purpose of this work. Many products turn the focus exclusively on technological innovation, at the expense of content accuracy and often of graphic rendering. This is often justified by the need to propose innovative solutions that have some advances in state-of-the-art, but this is only an attitude in line with the expectations of that specific research branch, completely alien to the logic of communicative effectiveness of a “product” to use, which will have to compare its value in relationship with the audience’s final satisfaction level. It is precisely this crucial aspect, linked to the quality of the final output, to the quality of the scientific data, to the communicative effectiveness of the transmitted data that it is possible to

conceive of a valid “product” of Virtual Archeology. Something that can transcend from pure technicalities and to focus on the quality, even when it means using the video game metaphors and the spells of visual effects used in modern cinematography to present rigorous scientific data with a simple and immediate language. From a methodological point of view, reconstruction uses the fast 3D reliefs made thanks to image-based software based on Structure from Motion (SfM) algorithms, using photos taken with the use of drones. The drone has been able to detect the three-dimensional trend of the entire architectural complex, which includes, in addition to the scenic building, the *versurae* and the *cavea*, as well as the external access systems made with stairs and ramps. The great difference in levels connected by these ramps strongly characterizes the site. But they make difficult to understand it if one doesn't set a proper three-dimensional form. Thus, the first objective of the communication project concerns the perception of spatiality, which ever alone provides a unique connotation of remarkable scenic interest, in which landscape and exposure are an integral part of the original architectural design. This particular physiognomy of the context justifies the chronological evolution of the theatre. This could be one of the reasons that supported Taormina's candidacy for the G7 summit. In any case, the viewpoint of the artists has been taken into consideration and it is an integral part of the communicated message. We have therefore tried to emphasize the interest of this site as a privileged subject of many pictorial representations through the use of an animated sequence in which a selection of paintings has been converted into

3D. The use of this simple technique allows you to shift the accent - and therefore the viewer's attention - to certain details, moving them from the foreground in a three-dimensional space. Thus, for example, in the various paintings it is possible to find interesting elements outside the ruins, with the *cavea* occupied by sheep flocks, with gentlemen comfortably carried by carriages, with shepherds or painters sitting on the steps to observe the sunset. The result is a romantic and ruinous view, where the architectural remains of the scene are part of an idyllic landscape, interesting to be displayed to today's visitors.

Always connected to this theme regarding the space and emotional perception of the monument, there is a second animated content, called “The look of Icarus”. To the visitor is offered a different point of view of the monument, that is, its contextualization in the naturalistic and archaeological environment. The flight of the drone frames the building with a top view and delineates the contours and relationships with the town, the hill and the sea. The process of approaching and knowledge of the monument becomes even clearer.

This is the starting point for the reconstruction proposal, in which the three-dimensional model engages in the present context with a metric-morphological approach, but also with reference to the perception of the naturalistic and scenic spaces that are an essential component of its uniqueness.

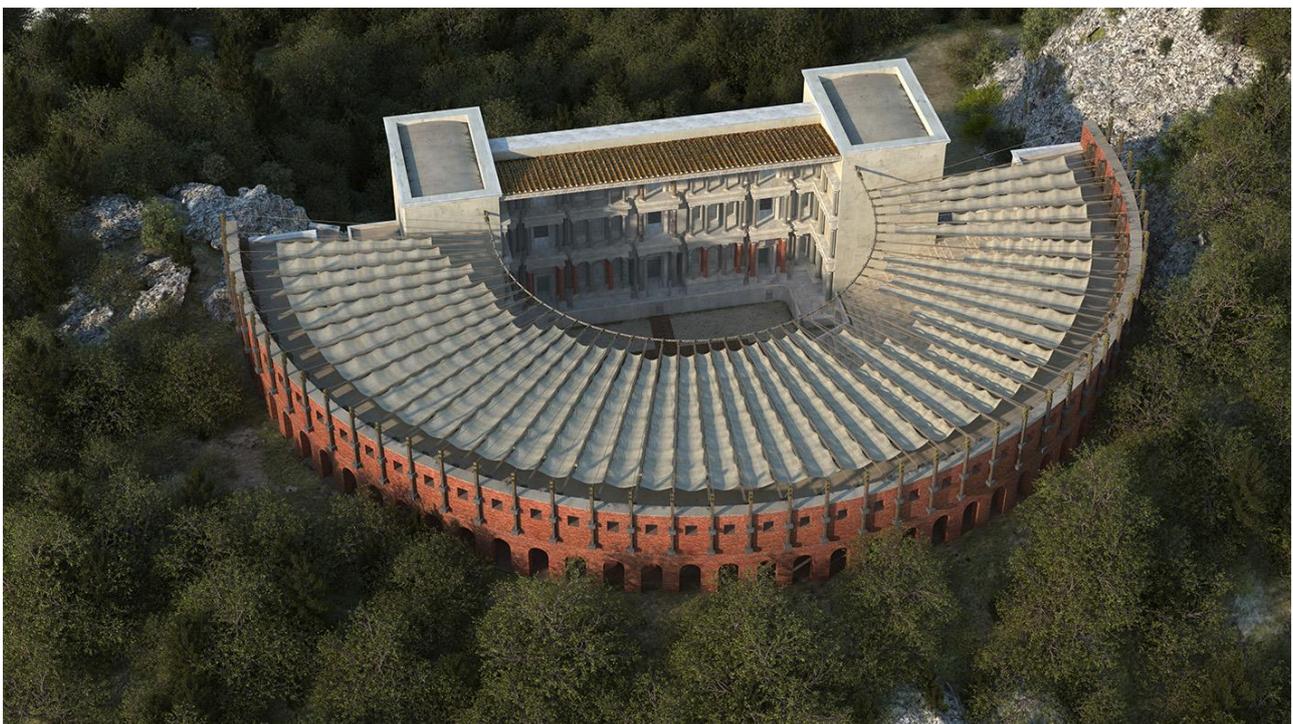


Fig. 4: View from N-E of the 3D reconstruction of the theatre within its landscaping context.

#### IV. THE VIRTUAL RECONSTRUCTION

We could affirm that the main objective of this virtual reconstruction was to contextualize the theatre on different scale. First of all, the structure of the theatre in the natural space and then the architectural elements in their original location. For this reason, sequences have been used to show fragments of columns, capitals, and sculptures, all linked to their reconstruction. This allows, through a dynamic movement of the camera, to virtually collocate the fragments achieved from the SfM in their original position. Then, from the fragment, the entire object is virtually reconstructed. The visitor does not need any further information for understanding the space relationship and for achieving a correct re-reading of quite often misunderstood elements. The synthetic language used here fully exploits the communicative potential of three-dimensional representations, to deliver complex computations in a simple, appropriate way for a heterogeneous and generic audience. Considering the communicative power and the verisimilitude of synthesis images, the effort to make reconstructive solutions is perhaps more difficult than it has been in the past. The rendering process represents the reality as never before and this is in fact its real weakness. The representation of a 3D model must in fact solve every even if with regard to something possibly existed in the past but nowadays not any longer. The traditional outline, on the contrary, only provides information on the shape, delineating only the contours of the objects. This can offer way to the interpretative fantasy of those who observe them and can

have different connotations among themselves. Thus, the virtual reconstruction with its ability to present antique photorealistic contexts, sometimes becomes “too beautiful” because it may go beyond what is possible, beyond the information that the scientific data can provide. The result in this case would be the complete renounce, (against the concept of “reconstruction of the figurativity” and reintegration of the original artwork) of an ancient structure, reiterated by several scholars. Let’s now describe some of the solutions proposed in this reconstruction. We started from the reconstruction of straight arches, often used as architraves in the large scenic openings. Many reconstructions erroneously present these as arched openings, while a more careful analysis shows that almost all the openings were solved here with linear architraves (made with straight arches) overlaid by a discharge arc. The result is a *scaena* marked by simple rectangular openings, in line with the prototypes of the imperial age spread in southern Italy. In the first imperial stage of the scene, all the doors, including the *regia* one, was framed by two pairs of walling pedestals on which high columns and pilasters were positioned. These were partially placed in the walling of the scene at the sides of the doors. It was created thus a kind of *propileum* in front of the doors. A similar solution is present in the theatres of Merida and Sabratha, a town of northwestern Libya. Also the solution of the connection of the two basilicas with the *cavea* had to be linked, in our opinion, to the previous Hellenistic system. The three-dimensional study



Fig. 5: The 3D reconstruction of the theatre: detail of the scaenae frons above the porta regia.

was able to confirm the possibility of an isolated body of the *scaena*, well distinguished from the structure of the *cavea*. In our reconstruction proposal, the walls of the *analèmmata*, which generally used to contain to the right and to the left sides the *cavea* along the lateral passages (*parodoi*), did not extend up to the height to the top of the *cavea*, but delimited them up to a lower level, leaving visible part of the landscape behind. This is also justified by the misalignment of the containment wall (*analèmmata*) with the basilica on the N-W side and from the presence in the opposite *basilica* of a system of stairs and openings grafted directly on the rock plan. So we believe that the hypothesis of a vertical closure with the *cavea* made of heavy walls of the same height as the basilica is improbable. Another important element is the attestation of steps designed to accommodate the viewers in the *porticus* in *summa cavea*. This has been described in the past by several scholars, according to which it had to lean on a masonry substructure conforming to a portion of arch. We could follow the grafts of this structure only in some northern sections of the *porticus*, but in the rest of its path there was no trace of it. In any case, the steps were conceived here with a simple wooden structure that partially (in the northern part) leans on the "crypt" formed by the "limping vault", and that in the rest part leans on a wooden structure. It is unclear whether the second renovation of the building involved a partial demolition of this crypt or if it was not functional since

the beginning of its construction and so it was never completely finished. Particularly interesting, especially with regard to the second renovation that sees the theatre becoming an amphitheatre, is the presence of the *velarium*. We have proposed a similar prototype for the amphitheater of Catania: an *ante-litteram* example of tensile structure, which had to be pulled by the contrast of opposing forces, acting only by ropes of different-sized. Specifically, this would be a system stretched by a group of skilled workers who, simultaneously pulling the sails, put in tension the entire structure nowadays made of steel cables. This, as we know, explains the adoption of sailors for the stretching of the *velarium*, an operation that for the Coliseum needed of a remarkable numbers of people housed in the *Castra misenatum*, encampments located near the Coliseum itself. In many reconstructions the *velaria* are made of mixed structures of wooden and ropes, but the considerable space to cover would require a structural check of the beams, in our case replaced by strings. What is most interesting here is the overall result of a building covered by a light structure, with a partially open-plan scenic body and grafted on a hill in a panoramic position. There are still many elements of uncertainty that deserve new studies, especially with regard to the appearance of the background of the scene, to some details of the scene itself, and above all to the original materials and colours.



Fig. 6: The 3D reconstruction of the theatre with the *velarium* in the foreground.



Fig. 7: The 3D reconstruction of the theatre: detail of the outer ambulatory with the support for the velarium.

## V. CONCLUSION

The use of new digital languages for the communication has now become a prerogative of all those museums that want to follow the new social dynamics. The three-dimensional reconstructive study allows us to respond more and more accurately to requests made by archaeologists to illustrators, designers and artists of their time. In this project the lack of data has complicated the hypothetical reconstruction, but unfortunately it is very rare to have available data abundant and sufficient to establish with certainty a scientifically unassailable and unambiguous proposal. Despite this, it is undeniable that there is a charm of trying "to imagine" possible solutions, useful to support a constructive debate on the appearance of buildings in the past. This is what we have tried to do, in addition to present it to the public, respecting the scientific data, the appearance of an ancient monument that nowadays only appears in its naked structure.

## VI. ACKNOWLEDGMENTS

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Fig. 8: A frame of the animation showing the reconstruction of the scaenae frons. <https://youtu.be/DGEjFBjyZw>

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