

The Greek-Roman Theater of Taormina: Towards a Reconstruction Proposal

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This article presents some results achieved by the IBAM CNR for the reconstructive study of the Greco-Roman theater of Taormina, aimed at the realization of a CG film presented at the G7 summit (26-27 May 2017). The reconstruction is currently presented to visitors on display inside one of the two basilicas at the entrance to the theater. The work was commissioned by the archaeological park of Naxos-Taormina and proposes the ancient monument in its original appearance in two distinct phases. The first phase, dating back to the first quarter of the 2nd century AD, involves an impressive renovation, with the expansion of the seating capacity and the construction of an external ambulatory, in addition to the reconstruction of the whole *frons scaenae*. The second phase is ascribable to the 3rd century, and changes the theater building and the orchestra, with the transformation of the orchestra area into an arena, a testimony to the tendency to replace theatrical performances with gladiatorial games and *venationes*. Our reconstruction uses rapid 3D relief methodologies based on drone and ground photogrammetry, together with the interpretative potential offered by the 3D modeling environment. This approach has led to some unpublished solutions, such as the solution of the connection of the *velarium* with the hill supported only by ropes. However, the main objective of this work is linked to understand the architectural of the monument in an overview that places it in its original context and that allows visitors to appreciate the various elements of its originality.

Key words:

Museum Communications, Virtual reconstruction, Taormina, Theater.

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RECONSTRUCTION AS A DIALECTICAL RELATIONSHIP

The role of the specialist in virtual archeology is closely connected to the dialectical relationship between humanistic knowledge and the possibilities offered by 3D modeling and simulation tools. Only from a continuous verification in 3D of the technical-constructive, dimensional and spatial aspects, is it possible to validate some hypotheses that come to life from the philological study of the sources, from archaeological data, and from contemporary comparisons. Many of the original results, achieved by heterogeneous teams of humanists and virtual archeology specialists, are possible thanks to this moment of verification and study of monuments directly in the 3D environment. Very often only a minimal part of the reconstructive hypothesis proves plausible and compatible with functional logic and the constructive and stylistic principles used by a given civilization in a precise historical period. Thanks to the continuous verification of the possible relationships between historical-aesthetic information and technical-constructive principles, which are closely intertwined with observations and possible deductions in a 3D environment, we are now able to filter the various solutions. The analysis of the dimensions and the observation of the constructive elements in space, facilitated by the digital approach, allows for the determination of the incidence of loads and the thrust of arcs and vaults, to interactively visualize the structures, and to overlap the traditional analyses with the archaeometric analyses (e.g. georadar, IR, etc.). In this approach, the basic survey and the different interdisciplinary contributions are placed in touch with the reconstructive phase. All deduction develops

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from them and an interpretation takes substance; it is therefore the result of a dialectical relationship between historical-aesthetic values and technical-constructive principles [Gabellone et al. 2015b; Malfitana et al. 2016]



Fig. 1. The scene of the theater of Taormina today.

ARCHITECTURAL CHARACTERISTICS OF THE THEATER

Little information is available on the Hellenistic stage of the theater. It probably had to present a *cavea* with *analèmmata* converging to nine wedges, but with a smaller extension than the current one, as we know from the remains of a sanctuary of this phase placed on top of the *cavea*, which was then occupied by the external ambulatory added to the theater at the moment of reconstruction in the imperial age. The Hellenistic *cavea* partly used the rocky outcrops to carve the steps and partly used blocks of local stone to place the steps where the rock was absent. Some registered seats are conserved, with paleographic characters of third century B.C. The theater of Taormina can be counted among the most ancient Greek and Sicilian great theaters with a curved, not trapezoidal *cavea*, as in even older ones, which date back to the 3rd century B.C. (Fig. 1). In the theater, there are also some frame elements with narrow and elongated teeth according to a common typology between late 2nd and early 1st century B.C. that, if they were relevant to the building (but the circumstances of discovery are ignored), they could indicate some intervention in the late Hellenistic age. Almost certainly the Hellenistic scene of the theater of Taormina was in the same position as the current scenic building, numerous limestone blocks in the masonry that must have been taken from the masonry of the Hellenistic scene at the time of its demolition are reused.

According to the most recent studies, the building that is currently visible is commonly considered the result of a grandiose reconstruction in the Imperial period, established in the Trajan-Hadrianic age. After this total reconstruction, another important phase of interventions is signaled by the restructuring of the scenic building and the orchestra transformed into an arena. These modifications, in addition to those of the internal ambulatory connected to the *porticus* in the *summa cavea*, are attributed to the Severan period, established on the basis of the date of the capitals and other elements of the trabeation put into operation on that occasion in the *frons scaenae* modified for transformation of the orchestra in the arena. This dating is also supported by the fashion, well documented in Asia Minor, which spread in the 3rd century, adapting the theaters to games gladiators and *venationes* that is to functions that characterized amphitheaters. Surely it is the sign of a popular interest in games rather than cultural representations. The reconstruction in the Trajan-Hadrianic period brought about a spectacular display of

white marble, polychrome stones for the columns, the coverings of the scene and the orchestra and the enormous extension of the *cavea*, so as to cover a small temple of the Hellenistic period that tops the mountain. The Pensabene study hypothesizes that the *cavea* could hold between 8.900 and 11.150 spectators [Pensabene 2008]. At the *cavea*, which however maintained the form of Hellenistic horseshoe tradition very slightly, there was added a double crowning ambulatory: the external one opened on the façade with 47 arches framed by pillars and the internal one consisted of a portico that housed the steps of the *summa cavea* (perhaps in wood because there are no traces on the north wall to which they had to lean) and which was supported by a crypt below.

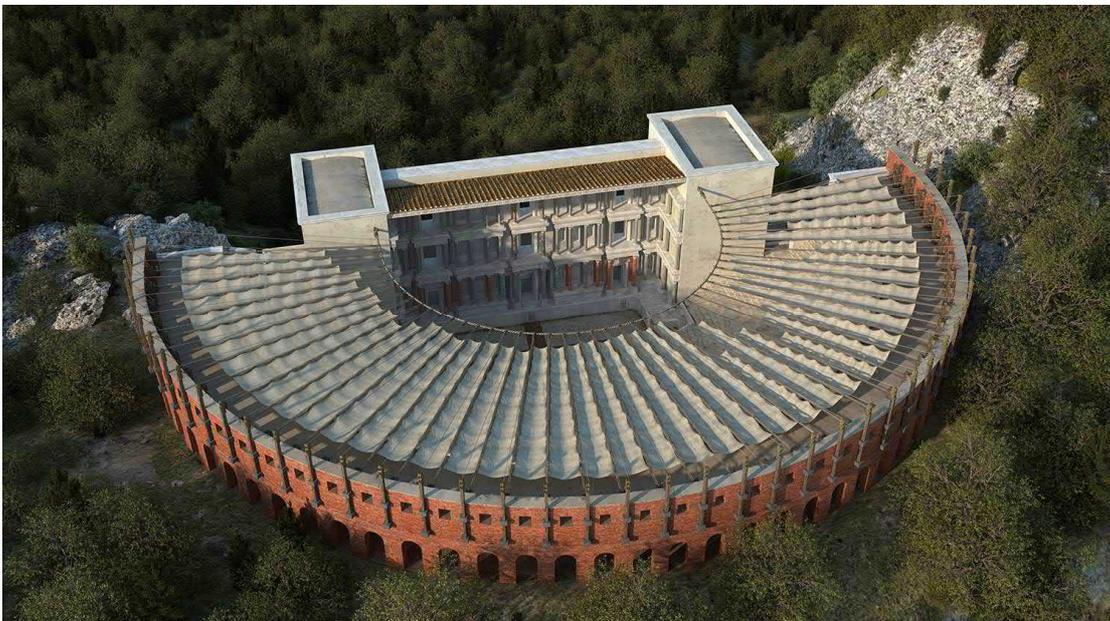


Fig. 2a-2b. The current state restituted with drone flight and virtual reconstruction of the entire theater.

Towards the *praecinctio* the crypt presented a wall 2.60 m. high which also formed the podium on which stood the colonnade of the upper portico. The *cavea*, divided into nine wedges and three *maenians*, with *tribunales* above the outlet of the *parodoi*, thus reached a maximum diameter of 107 m., and the orchestra of 28.94 m. (translatable with slight approximation to 360 and 100 feet).

Two large *basilicae* or *versurae* connected directly to the *parascaenia* flanked the scenic building, to which the *porticus post scaenam* was attached at the back. The *basilicae* (the west one of 12 x 16.5 m, the east one 10.5 x 16 m) had internal walls articulated in niches and formed large rooms. Several Late Antique interventions are visible in the *porticus* in the *summa cavea*, which is closed by a wall that encompasses the columns, and readapts the arena to connect with aquatic shows in which the marble coverings of the building walls were also removed, surrounded, and its pavement replaced by mortar. The reconstruction in the Trajan-Hadrianic period brought about a spectacular display of white marble, polychrome stones for the columns, the coverings of the scene and the orchestra and the enormous extension of the *cavea*, so as to cover a small temple of the Hellenistic period that tops the mountain. The Pensabene study hypothesizes that the *cavea* could hold between 8,900 and 11,150 spectators [Santangelo 1950, 1955; Sear 1996, 2005, 2006].

THE PROJECT OF COMMUNICATION

The reconstructive study presented here aims to create and disseminate video in CG projected during the work of the G7 summit (26-27 May 2017). Currently the reconstruction is shown to visitors inside one of the two basilicas, at the entrance to the theater. The work was commissioned by the Archaeological Superintendence - Archeological Park of Naxos-Taormina and re-proposes the ancient structure in its original appearance, in the two phases of the Roman period just described. We will not dwell on the architectural features and archaeological evidence of the monument, but we will try to trace the elements of interest that have emerged from the three-dimensional study aimed at museum communication [Gabellone et al. 2015a, 2017].

Our first aspiration was to move the center of interest from the exclusive technological innovation, to the scientific rigor of the contents represented through a realistic graphic rendering. The need to propose innovative solutions that contain some progress compared to the state of the art can sometimes be extraneous to the logic of communicative effectiveness of a "product" to be used, which must instead compare its value and its utility in relation to the final level of satisfaction of the public. It is precisely on this aspect linked above all to the quality of the scientific data and to the communicative efficacy of the transmitted data that it is possible to conceive of a Virtual Archeology "product" as culturally valid. Something that is able to transcend pure technicalities and points straight on quality, even when this means using video game metaphors and visual effects used in modern cinematography, to represent rigorous scientific information in simple, immediate, but also spectacular language. From the methodological point of view, the reconstruction of the theater uses the reliefs coming from image-based restitutions, realized with drone and ground flight. (The survey was provided by Firefighters, authorized to fly over the restricted area. The 3D model was realized using Agisoft Photoscan, stand-alone software). The drone flight allowed for the detection of the three-dimensional trend of the entire architectural complex, which includes, in addition to the scenic building, the *versurae* and the *cavea*, the intricate access systems made with stairs and ramps. The considerable differences in height connected by these ramps strongly characterize the site, but make it difficult to understand if not returned to and represented in a correct three-dimensional shape. The first objective of the project of communication therefore concerns the perception of the spatiality of the whole, which alone gives the theater a unique connotation of remarkable scenographic interest, in which the landscape and the exhibition are an integral part of the original architectural project.

This particular physiognomy of the context justifies the remarkable variety of artistic representations that portray the site in every time: a point of view that is an integrated part of the communicated message and that we have tried to underline through the use of a continuous animated sequence in which a selection of paintings has been converted into 3D. The use of this simple technique permits shifting the accent - and therefore the attention of the spectator - to certain details, taking them up again in a three-dimensional space (Fig. 3). Thus, in the various selected paintings it is possible to find interesting elements, sometimes unrelated to the ruins, with the *cavea* occupied by flocks of sheep, with gentlemen comfortably transported by carriages, with shepherds or designers sitting on the steps intent to watch the sunset. The result is a vision that is most often romantic and ruinist, where the architectural remains of the scene are part of an idyllic landscape, which we considered interesting to be transmitted to today's visitors. Always connected to this theme, related to the spatial and emotional perception of the monument, there is a second animated element, called "The look of Icarus". The visitor is offered a different point of view, namely a contextualization of

the theater in the wider naturalistic territory of the park. The drone flight frames the building from above and outlines its contours and its relationship with the town, the hills and the sea. The process of approach and knowledge of the monument thus becomes even clearer. It is the starting point for the proposed reconstruction, in which the three-dimensional model is grafted into the current context both with metric-morphological approach, which is with its architectural form reconstructed on the current remains, but also with references to the perception of naturalistic and scenographic spaces, which, as we have seen, are an essential component for reading its uniqueness.

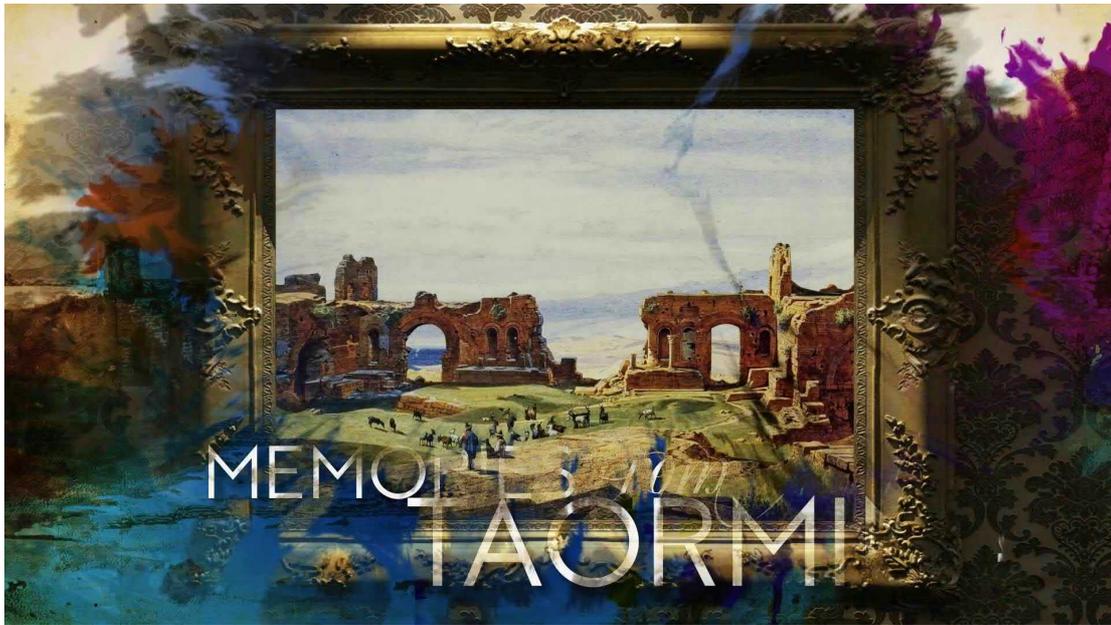


Fig. 3. Grab-screen of 3D painting, from video "Memories from Taormina".



Fig. 4. Reconstruction proposal of the scene.

THE VIRTUAL RECONSTRUCTION

We could say that the main objective of this virtual reconstruction was to contextualize the theater at different scales: the architectural organism in its natural environmental space and their elements in their original location. To this end, sequences have been continuously used to show fragments of columns, capitals and statues, all linked to their hypothetical reconstruction (Fig. 4).



Fig. 5. The porticus in summa cavea with the velarium coverage.



Fig. 6. The velarium coverage and the scene.

Through dynamic camera movement the real fragment is framed in 3D averaged photogrammetry and is placed virtually in its original position as observed from the live tour, to then close the sequence with the object completely rebuilt (Fig. 2a-2b). The visitor does not need further information for understanding spatial relationships and for a correct re-reading of very often misunderstood or fragmented elements. The language used is deliberately concise, to fully exploit the communicative potential of three-dimensional representations and to deliver complex processing in a simple, intuitive way, suitable for a heterogeneous and generic public. A simplicity of the results to which corresponds an extremely versatile and evolved technology, but where, paradoxically, the effort to be made is actually more difficult than in the past.

In fact, the rendering process represents reality like never before and this is its true weakness. The representation of a 3D model must in fact solve every detail with realism, even in the sense of this term linked to the possible, to the likely, to something that can exist in reality, which we have never seen, but which obviously requires a rational response. On the contrary, the traditional line drawing provides only information of form, delineating only the contours of the objects. These can give space to the interpretive imagination of those who observe them and take on different connotations. Thus, the virtual reconstruction, with its ability to present photorealistic ancient contexts, sometimes becomes "too beautiful", because perhaps it goes beyond what is possible, beyond those answers that scientific rigor would require of us not to formulate. The result in this case, however, would be complete renunciation, against the concept of "reconstruction of the figurative" and "reintegration of the image" [Carbonara 1976] of an ancient work, reaffirmed by various scholars. In any case, the reconstruction is based on the logical findings described above and materializes them in some solutions that we are going to describe [Gabellone 2017].

Let's start from the reconstruction of the platforms, used for example on the architraves of the great scenic openings. Many reconstructions erroneously present these arched openings, while a more careful analysis shows that almost all the openings were here solved with a straight architrave (with a flat plate) surmounted by a discharge arch. The result is a scene punctuated by simple rectangular openings, in line with the widespread prototypes of the Imperial period in southern Italy.

Still in reference to the scene, in the first imperial phase, there were on either side of the two *hospitalia* doors the columns set on a curvilinear podium. This also had to support columns that were partly found to be inserted into the wall. These were followed by two other columns isolated on a pedestal that framed the door directly. A sort of propylaeum was thus created in front of the gates, including the direction, similar to what can be found in other theaters, such as that of Merida and Sabratha, a city in north-western Libya.

Another element of interest is the solution of the connection between the two basilicas and the *cavea*, which was to be affected, in our opinion, by the previous Hellenistic structure. The three-dimensional study could confirm the possibility of a scenic body (scene and basilicas) isolated, distinct from the structure of the *cavea*. In our reconstruction proposal the walls of *analèmmata*, which generally contained the *cavea* along the side passages (*parodoi*) to the right and left, do not extend in height to the top of the *cavea*, but delimit the extension at a lower altitude, allowing a glimpse of part of the landscape behind it. This is also justified by the misalignment of the containment wall (*analèmmata*) with the basilica on the north-west side and by the presence, on the basilica on the opposite side of a system of stairs and openings grafted directly on the rock surface. We consider the hypothesis of a vertical closure of connection with the *cavea* made with heavy walls having the same height as the basilicas as scarcely plausible.

A further element worthy of interest is the attestation of a flight of steps destined to host some rows of spectators in the portico of *summa cavea*. This has been described in the past by several scholars. According to these descriptions it had to lean on a masonry substructure shaped like a lame arch. We could follow the remains of the grafts of this structure only in some portions of the *porticus* to the North, in the rest of its journey we cannot find traces of it. The reconstruction of this staircase was conceived here with a simple wooden structure, which in part (in the northern section) unloads on the "crypt" formed by the lame vault and in the remaining part it rests on a wooden supporting structure. It is not clear whether the second renovation of the building, which we discussed at the beginning, has partly demolished this crypt, or if it was not very functional from the beginning of its construction and has never been completely finished (Fig. 5).

Particularly interesting, especially in relation to the second renovation that sees the theater transform into an amphitheater, is the presence of the *velarium*. His attestation is certain and is evidenced by the large brackets placed at regular intervals along the outer perimeter of the back wall of the corridor in *summa cavea*. The shelves, in lava stone, are arranged at regular intervals in correspondence with the surviving arches of the back wall and have a recess for the joint of the *velarium* draw pole. Probably, in correspondence to these surviving corbels, but at a

vertical distance of about two meters, there had to be additional slotted shelves, which served to firmly anchor the pole to the back wall. A complex tensioning system of the supporting structures of the *velarium* had to ensure the counter pressure of the weight exerted on the pole and the distension of the entire structure (Fig. 6). It is difficult, due to the lack of the necessary space beyond the back wall, to imagine the presence of winch-like elements similar to those documented for the Colosseum in Rome. It is more probable that for the theater of Taormina there were some winches placed on the covering of the background ambulatory, with a tensioning system that does not impact the external perimeter and is almost invisible to the spectators. The problem of the actual load bearing structure is different and more complex, which should have two possible solutions: the first with a system of cantilever beams counterbalanced by a rope having the function of a tie rod; the second with a system entirely made up of strings of different sections. In the first case, the need to cover the entire *cavea* poses considerable dimensional problems, with a space to be covered not less than 30 meters, which could reach 40 meters if we hypothesized an extended coverage up to the vertical projection of the orchestra. The solution proposed here therefore takes into consideration a complex system of ropes that could probably cover lights even over 40 m. We have also proposed a similar prototype for the Catania amphitheater: it is a system analogous to the current tensile structure that had to be supported by the mutual contrast given by opposing forces acting only by ropes of different sizes. The system had to be tense in unison by a group of specialized employees, who, at the same time pulling the sails, would bring the entire structure under tension, similarly to what happens with modern tensile structures, today made with steel cables. This explains, as we know, the adoption of sailors for the extension of the velar, an operation that for the Colosseum bothered a considerable number, housed in the *castra misenatum*, camps located near the Colosseum itself. However, we know that this solution that only uses strings should not be the only one used in the Roman world. We know a fresco from Pompeii where the amphitheater is only partially covered and apparently supported by beams. The fresco, very famous, is one of the few that shows a realistic setting and episode. The amphitheater of Pompeii is faithfully portrayed, with the city walls behind it and the large gym with a central pool to its right. The episode represented is that of the fight broke out between Pompeiani and Nucerni in the year 59 A.D. in which there were numerous deaths, so much so as to induce the Roman Senate to prohibit the performance of gladiatorial games in the amphitheater of Pompeii for ten years. In many other recent reconstructions, the *velaras* are represented with mixed supporting structures in wood and ropes, but the considerable light to be covered (here 40 m) would require a structural verification of the beams, in our case replaced by large diameter ropes.

Many are still the elements of uncertainty that would deserve a reflection and a new study, especially in relation to the appearance of the back wall of the scene, to some details of the scene itself, and especially to the original materials and colors. What emerges in summary from the reading of our reconstruction is a building covered with *velarium*, with a scenic rectilinear body, with peculiar elements of various interest, partially open on the sides and grafted on a hill in a panoramic position, with a *porticus in summa cavea* crowning a horseshoe *cavea*.

For modeling, texturing and rendering was used Maxon C4D and V-ray.

CONCLUSION

The use of new digital languages for communication has now become a prerogative of all those museums that intend to move on the path of new social dynamics. The reconstructive study in three dimensions allows us to respond with greater precision and verisimilitude to the insistent request that archaeologists have overwhelmingly launched to illustrators, designers, artists of all time. Also in this project, the reconstruction has had to confront with missing data, because the rarest circumstance is precisely the one in which the available data are abundant and sufficient to define with safety a scientifically unassailable and univocal proposal. Despite this, it is undeniable that the fascination linked to the attempt to 'imagine' possible solutions is useful for fueling a constructive debate on the appearance of buildings in the past. This is what we wanted to do, in addition to the attempt to deliver to the public with a scientifically respectful attitude to the data, as the appearance of an ancient monument that today presents itself in its bare structure.

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