

The Architectural Perspective of the *Apotheosis of Venice* by Veronese: Geometrical Analysis and Digital Restitution

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Abstract

The research examines a large di sotto in su canvas entitled Apotheosis of Venice, realized between 1579 and 1582 by Paolo Veronese for the ceiling of the Hall of the Great Council of the Ducal Palace in Venice. The telero, surveyed with the tools of digital photogrammetry, was compared with a preliminary model of smaller dimensions. From the geometric comparison of the two works, in reference to the location of the main vanishing point and its relation to the real enclosure, it was found that the author planned the perspective apparatus of the painting by assigning a precise position to the observer. Applying the operations of perspective restitution to the architectural apparatus of the canvas and reconstructing the plans and the heights of the painted scene, we have come to a stereometric modeling that has allowed a greater understanding of the work. Further considerations which emerged from the analysis of the preparatory drawing have also made it possible to hypothesize the use of a direct system of perspective construction by the Caliari workshop.

Keywords: Paolo Veronese, quadratura, survey, perspective, perspective restitution.

Introduction

The object of the study of this essay is a large canvas (904 x 580 cm) dated 1582 [1] and entitled *The Apotheosis of Venice*, created by Paolo Caliari (known as the Veronese) for the ceiling of the Hall of the Great Council of the Venetian Ducal Palace (fig. 1). The work depicts the personification of Venice with the appearance of a queen seated on her throne between two crenellated towers, symbols of solidity and impregnable. The sovereign is crowned by a winged Victory while Fame plays a golden trumpet to proclaim her glories. At her side there are gods of Olympus to symbolize her role as peacemaker of the peoples, guarantor of freedom and bearer of happiness and abundance. Behind her, an imposing scene, conceived as a dynamic and luminous theatrical scenography, from whose twisted columns rise two bronze

statues: Mercury as the emblem of eloquence, and Hercules, of strength. The architectural scene is animated by the presence of a large group of nobles, foreign prelates and bystanders who, looking out from a balustrade, celebrate the good governance of the city, while some soldiers keep watch over the crowd.

Of this famous painting there has been preserved a preparatory drawing (fig. 2) of considerably smaller dimensions (ca. 52.5 x 35 cm) but very similar to the final work. The similarity between the sketch and the work has allowed us to undertake a comparative analysis aimed at identifying similarities and differences between the two figurative works. Furthermore, the two formats, notably different from the dimensional point of view, have also al-



Fig. 1. Paolo Caliari, *Apotheosis of Venice* (1582), Hall of the Great Council in the Ducal Palace, Venice (photo by Silvia Masserano).

lowed us to investigate perceptual problems related to the criteria for using the painting, and above all to hypothesize the methods used by the painter for its realization.

The survey of the painted canvas

The photographic survey of *The Apotheosis of Venice*, aimed at acquiring a study image of the work were conducted

with the aid of a reflex camera equipped with a telephoto lens, the back of which was placed parallel to the floor so as to realize partial ortho-photographs of the ceiling. The shots were taken at regular distances, using the parallel axis technique, in order to cover the entire pictorial field by means of a general grid of frames, from which to extract the photographs that allowed a reconstruction of the image of the canvas. A further survey was made for the acquisition of details, so as to increase the level of detail of significant elements, especially as a function of the subsequent perspective restitution. These images were then mounted with the technique of digital photo-mosaic, which allowed the interpolation of the same through the partial overlapping of the edges, using the Photoscan software for semi-automatic photomodeling. The image processing phase envisaged the maintaining of the frame made up of the wooden frieze, even though it could actually be masked with the options provided by the software (fig. 3). It was decided, in fact, to eliminate what is present outside the edges of the canvas with a photo-editing software for greater quality control: this procedure also provided an intervention on the color range in order to make the shades correspond even more to the current state of conservation of the painting.

Comparative analysis

Once the digital image of the *telero* was obtained, the analysis of the painting was begun. As with any large-format composition, Caliari had to make numerous study drawings for this work [2] in order to define the organization of the *chiaroscuro* model, the work that preceded the painting of the canvas and defined the master's guidelines to the assistants. To date, the only study model concerning the composition of this work, was made between February 1578 [3] and 1582: it is a drawing done with pen and dark brown ink, treated chromatically with watercolor bistro and white lead, divided into squares with black chalk, on reddish paper, fixed on a backing and folded horizontally (fig. 2).

This drawing is the result of the phase of the work in which various ideas were grouped on a perspective frame in order to be able to make changes [4], so it cannot be identified as the *chiaroscuro* model. In fact, the organization of some characters and objects depicted in this sketch does not correspond exactly to those painted on the canvas. Rather, the function of this work was to establish the



Fig. 2. *Apotheosis of Venice*, preparatory drawing (1578-1582). In Marini, *Aikema* 2014, p. 195.

organization of the main subjects without specifying their characteristics, that were instead specified in a subsequent model, together with the arrangement of the figures of secondary importance and other elements [5].

It is also noted that in the model, the dimensions of Venice and of the divinities that surround her are very small compared to the dimensions that were attributed to them in the finished work. Moreover, since the left-hand niche is empty and the right-hand niche houses a

different statue from the solution used in the painting, it is assumed that the assistants assigned to perform certain portions of the work were given the opportunity to introduce some elements according to their own creative flair. Also for what regards the scenographic apparatus, there are some differences between the model and the painting.

The dentils that decorate the central part of the cornice of the entablature in the sketch are fewer than those present in the canvas: this depends on the fact that in the finished work the segment of cornice placed at the center is wider. Then, in the final version, the depth of the two protruding portions of the architrave supported by the twisted columns is also increased.

In the preparatory drawing the twisted columns are not subdivided into drums and are not fluted, and the crenellated towers, presumably the result of a belated idea, in the *telero* are wider. But the greatest discrepancy concerns precisely the change in perspective shown by the comparison between the preparatory drawing and the finished work, a modification that allowed the painter to accentuate the inclination of the scene in order to make the whole imposing architectural structure seem to loom upward. Without doubt, the entity of the prospective rectification between this preparatory drawing and the execution of the work required the preparation of the lost *chiaroscuro* model.

From a perspective point of view, the sketch and the work are organized according to different methods of foreshortening. To quantify the extent of this variation –and to understand its possible reasons– a geometric comparison was made between the sketch and the painting concerning the position of the main vanishing point and its relation to the real environment.

In the drawing, if we consider the geometry referring to the contour of the trabeated cornice, a sequence of right angles can be noted. By extending the angular verification to all presumed straight profiles and belonging to surfaces similar to horizontal planes, the same result is noted. This finding implies the parallelism of the planes that can be associated with horizontal surfaces and consequently the presence, in the preparatory drawing, of a perspective device with a horizontal picture plain.

In the painting a similar comparison has revealed, except for negligible imperfections, the same results and therefore the same perspective apparatus. However, as already mentioned, the position of the elements that make up the internal reference of each system is different.



Fig. 3. Ortho-photomosaic and ortho-rectified image of the painting (elab. Silvia Masserano).

Prolonging in the sketch the perspective lines comparable to the orthogonal to the painting, that is, the corners of the triumphal arch perpendicular to the horizontal reference plane, the position of the main vanishing point was determined, whose projection on the floor of the environment destined to receive the work did not indicate either a specific location connected to particular positions, nor a position linked to the peculiar conformation of the hall. In the *telero*, the extension of the edges similar to the orthogonal to the painting has determined, in the common con-

vergence point, the position of the main vanishing point at a distance of 16.50 m from the intersection of the canvas axes and the virtual extension of the longer axis. This location corresponds exactly to the center of the room (fig. 4). Considering the findings that emerged from the above-mentioned verifications, it can be seen that from the execution of the sketch to that of the painting, Veronese perfected the position of the main vanishing point to arrange the point of view in the center of the room, exactly in front of the Doge's throne.

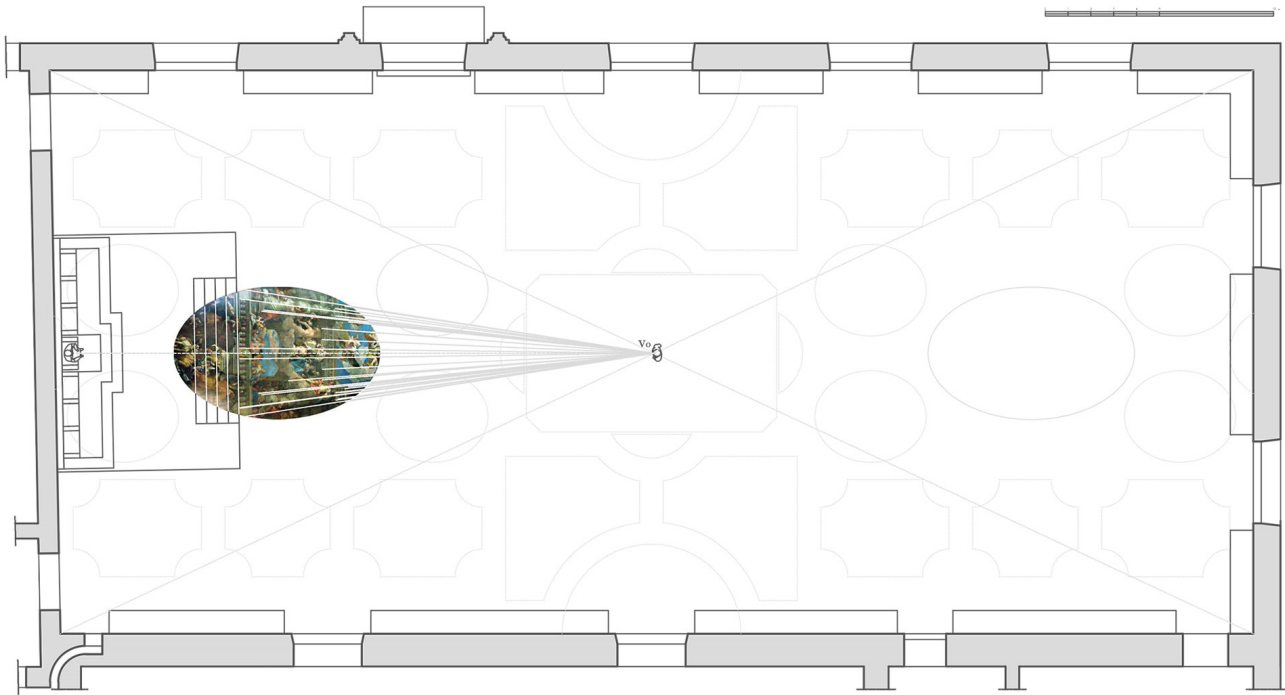


Fig. 4. Position of the main principal point of the painted perspective of the telero (elab. Silvia Masserano).

Perspective restitution

In the perspective device of *The Apotheosis of Venice*, the horizontal reference plane can coincide or be parallel to the picture. Accepting the first hypothesis, the main distance corresponds to the spatial interval between the observer's eye and the pictorial surface of the canvas. Having learned this parameter through a simple metrical comparison, the internal reference of the system was completed and the prospective restitution operations could be started, a process which, for reasons of symmetry, was applied to only half of the painting in which the architecture was most visible. Before embarking on the executive protocol, some geometrical relationships were recognized, necessary for identifying the perspective axis of the tortile column, and for reporting some measurements attributable to the proportions dictated by the composite order. The connections in question

concerned, beyond the center of the *sommoscapo* and the circumference drawn on the extrados of the abacus, the corners of the plinth which, related to the aforesaid axis through trajectories inclined by 45°, allowed the specification of the heights connected to the overall development of the column. Having established a reasonably plausible dimension for the *sommoscapo*, it was possible to find the height and the *imoscapo* of the tortile column. With this last measure it was possible to compare the extension of the column axis, and to observe that in the restitution its proportion did not respect the theoretical precepts prescribed by the composite order; a totally anomalous condition for an architect-painter. The irregularity could depend only on the measure attributed to the main distance of the reference system, which was lower than the one established by Veronese. From this observation it was deduced that the painter did not define this parameter by means of a survey, but he quantified it by relying on other criteria.

In *La pratica della prospettiva* [6], a compendium published in Venice in the decade preceding the realization of this canvas, Daniele Barbaro suggests placing the eye of the observer at a suitable distance in relation to the size of the painting, leading the aforementioned spatial range to a geometric construction demonstrated in application to five different examples. In particular, by applying to the work in question the instructions dictated by the last of the five cases, the position of the canvas assumed a distance from the point of view equal to twice its real length.

By making this correction, the restitution of the size of the *sommoscapo*, of the *imoscapo* and of the height of the tortile column, was actually proportioned according to the ratios established by the composite order. Therefore, maintaining the same reference, the prospective restitution of the architectural scenery was undertaken.

The restitution of the painted architecture began precisely from the twisted column which was completed with a base and a composite capital. The restitution then continued with the reconstruction of the entablature, perfected in the profile of its cornice by means of a homothetic magnification. Then the dentils and floral decorations were inserted, and after having modeled the projection from the wall parameter of the architrave, the pilaster was added next to the tortile column. With a few altimetric references transferred through the pilaster on the axis of the column, the side niche and a column under the central arch were also outlined.

Therefore, always, by means of the homothetic magnification, the depth of the level of the central focal point was proportioned and, consequently, the relative intrados surface. The base of the tortile column was supported by the cymatium of a pedestal corresponding to the one represented in the painting, while that of the column under the arch was recomposed together with its pedestal according to the proportions of the composite order. The different levels of the two bases justified the presence of an incline that was geometrized by means of some steps, visible between the balustrades drawn in the preparatory sketch. As far as the parapet is concerned, since no precise reference was available, it was possible to create a space between the balustrade and the base of the architectural structure, formulating a hypothesis of alignment for the axes and the twisted column. At the foot of the balustrade, the underlying cornice was added, sketching in, as far as possible, the recess framing the Lion of St. Mark.

The restitution could not go further, but it was decided to complete the part below, respecting the alignment with the

point of view, but attributing arbitrary depths to it. To the counter-façade, the same configuration of the main façade was instead conferred. The façade of the architectural structure was also composed from the plan and the section reconstructed. In addition to the aforementioned clue provided by the sketch, concerning the presence under the central arch of a staircase, by an accurate observation of the *telerio*, another detail was discovered that allowed extending the composition of the painted architecture. The detail in question was found at the end of the entablature superimposed on the right Solomonic column, where a self-bearing shadow was depicted, whose conformation similar to that projected by the epistyle superimposed on the tortile column, indicated the existence, beyond the margin of the *telerio*, of a further twisted column placed to support it. In light of these considerations, two giant columns were added to the two side niches (fig. 5).

The reconstruction thus restored an imposing structure, elevated by a short staircase, with a vaulted passage and decorated with statues and bas-reliefs like a triumphal arch. The hypothesis that it is a celebratory construction is supported by the presence of capitals modeled according to the principles of the composite order, an order also called triumphal, because it is used precisely in triumphal arches. The main honorary meaning of this particular architectural structure thus adheres perfectly to the theme of the painting.

Digital model construction and projective verification

With the metrical information deduced from the perspective restitution, the three-dimensional *maquette* of the triumphal arch was modeled in a digital environment (fig. 6). Then, using the parameters taken from the perspective analysis, a perspective view of the model was generated to verify the results achieved.

To make the comparison even more effective, the presence of human figures was superimposed on the perspective simulation, which evidenced only one incongruity concerning the pose of one of the two servants, taken up in the act of climbing up the left-hand tortile column and, consequently, of the man with a turban portrayed behind him. Compared to the perspective reconstruction the two subjects are moved away from the shaft of the tortile column. The defect is attributed to an imprecise correspondence of symmetry between the two halves constituting the painted architecture (fig. 7).

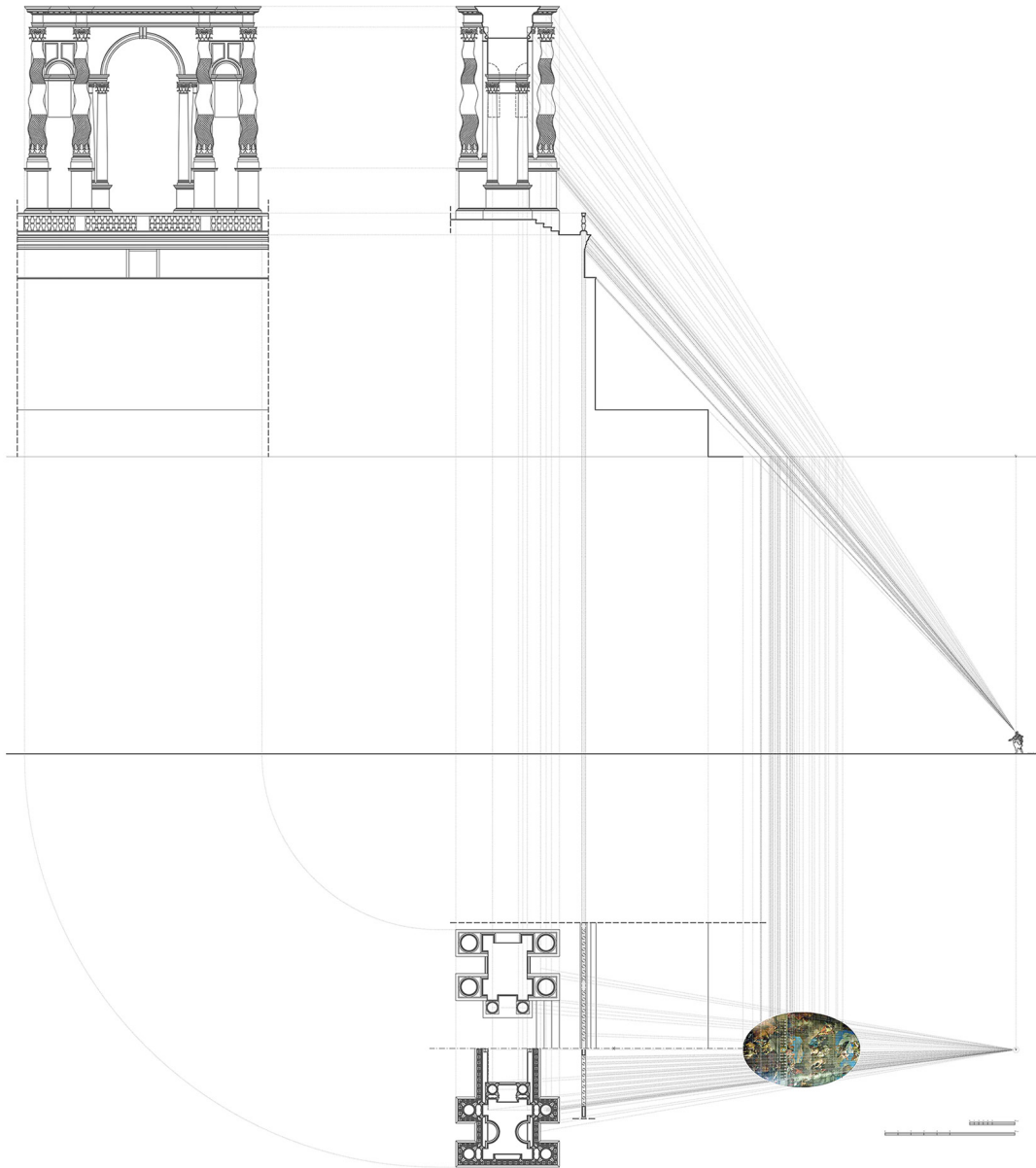


Fig. 5. Mongian projections restituted by the perspective restitution of the painted architecture (elab. Silvia Masserano).

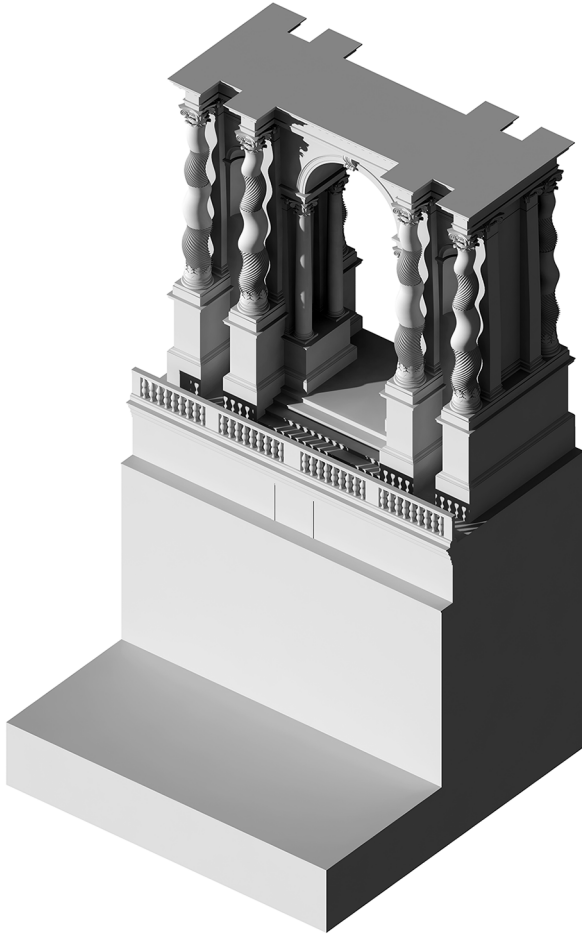


Fig. 6. Digital maquette of the triumphal arch (elab. Silvia Masserano).

Conclusions

Veronese acquired his particular inclination for the representation of foreshortening from the painting of mannerists known between Mantua and Parma, and among these, the work of Giulio Romano certainly represented an important stimulus for Caliari. He knew the work of Giulio Romano, and certainly also the ways in which he used to



Fig. 7. Overlapping of figures on the perspective of the digital model (elab. Silvia Masserano).

realize his famous *di sotto in su* perspective illusions, systems that Paolo already applied with the inspiration of a specialist at the young age of 23. In this respect, the cartographer Cristoforo Sorte also played an important role, as he had learned directly from Romano how to realize *di sotto in su* effects using an ingenious artifice. The expedient involved the following: the three-dimensional model of the architecture that was to be depicted was built and placed

on a mirror duly divided into squares by a grid of threads (fig. 8); observing the image reflected in the mirror with an eyepiece placed at a distance equivalent to the predetermined principal distance, one could easily visualize the perspective from underneath the object, which was easily copied onto a sheet provided with a grid congruent to the grid of threads arranged above the mirror [7].

The acquaintanceship and long-standing familiarity that linked the cartographer Sorte to Caliarì makes it probable that Veronese also knew of this method: in fact, for the realization of the ceiling views, it is possible that he used a mirror as a tool for perspective. The propensity for this hypothesis is based on some observations that emerged during previous prospective investigations.

During the analysis carried out on some ceiling canvases by Veronese [8], prospective systems emerged in which the heights of the architectural apparatuses converged towards a vanishing point, while the extensions of the horizontal edges describing the depths of the same structures reached, on the opposite side, another vanishing point. Perspectives of this kind, which can be assimilated to devices with an inclined picture plane, can be easily reproduced using the mirror method, tilting the *maquette* towards the observer. It has also been noted that in the settings of Veronese *sotto in su* paintings, there are often: spiral columns raised by plinths, with twisted shafts and subdivided into four drums and ending with a composite capital; arches equipped with entablatures from the intrados decorated with mixed decorative elements, complete with cornices supported by corbels alternating with floral elements and variously shaped banisters. The repeated presence of these elements in the ceiling perspectives leads to the hypothesis that in the Caliarì workshop three-dimensional reproductions of these elements – reduced in scale – were used to facilitate sketching, in the preliminary drawings, of more complex compositional structures in the background. This assumption can be upheld by recalling the profession practiced by the head of the Caliarì family, a stone mason specialized in the reproduction of architectural elements, who certainly must have produced a large number of these objects in demonstration of his skill. It is therefore likely that this kind of models could be present in workshop belonging to Paolo, who could use them in various formations and, by placing them on a mirror, quickly choose, the perspectives most suitable for the pictorial themes of the numerous orders entrusted to him.

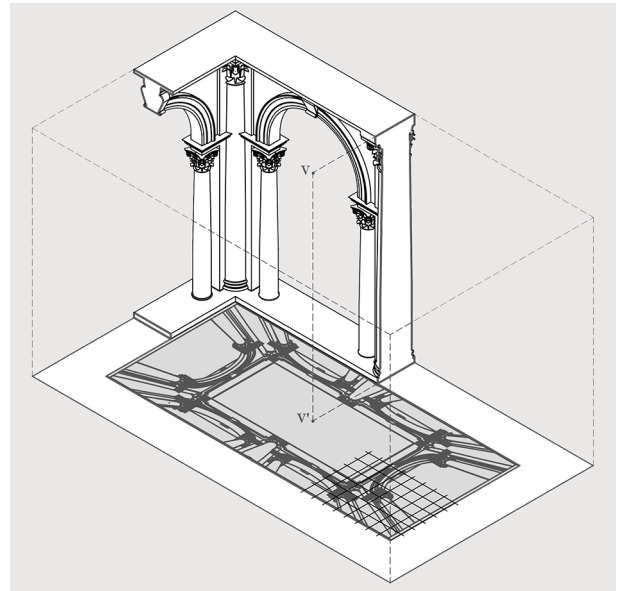


Fig. 8. Reconstruction of the perspective tool created by Cristoforo Sorte (elab. Silvia Masserano).

From the sketch of the *Apotheosis* to the finished work, the perspective of the architectural apparatus changes. This sketch must be followed by the model with the final, definitive perspective, but if the perspective of the scene is changed, the presence of the squaring on an “outdated” system is not understood: the grid was used to transfer the preparatory drawing from one support to another, because the cells of the grid provided precise points of reference that facilitated the reproduction of the subject, in its form and in its proportions. This grid was traced onto the finished drawing, but in some parts of the *Apotheosis* sketch the aforesaid grid is veiled, if not actually covered, by watercolor, rather than by highlights applied with white lead.

This can be explained by hypothesizing that the grid was drawn when the watercolor was not completely dry, or that the chromatic treatment partly absorbed the grid markings drawn with chalk. In the latter case, the application of the color must be attributed to a phase chronologically subsequent to that related to the drawing of the grid. But if it is assumed that the

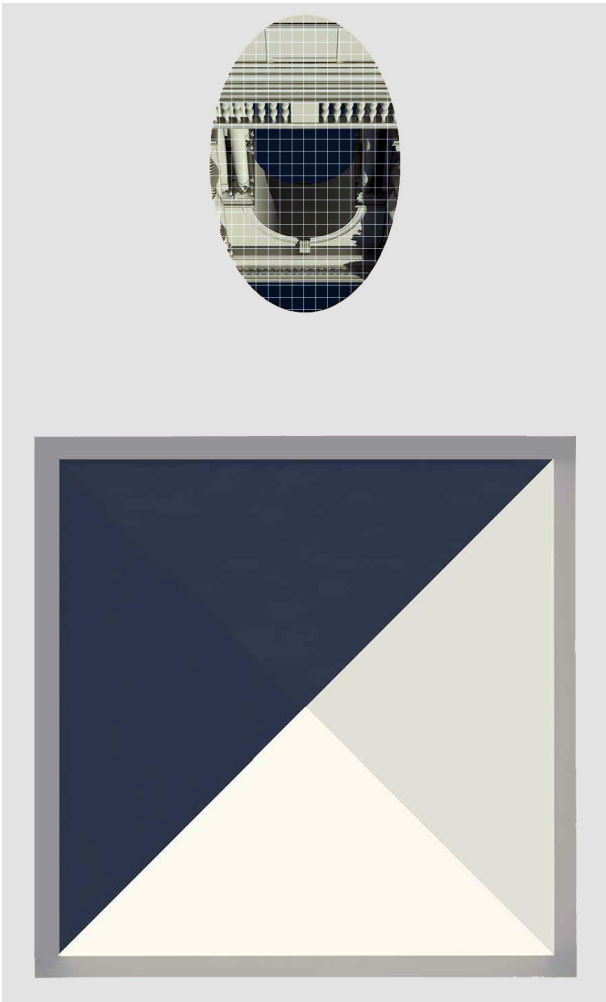


Fig. 9. Simulation of the perspective view obtained by reflection of the partial model in the mirror (elab. Silvia Masserano).

grid was traced even before the architectural backdrop, then the grid could have a dual function, mainly as a support in the construction of the architectural structure and secondly, duly reinforced, as a device for copying the drawing on the next support.

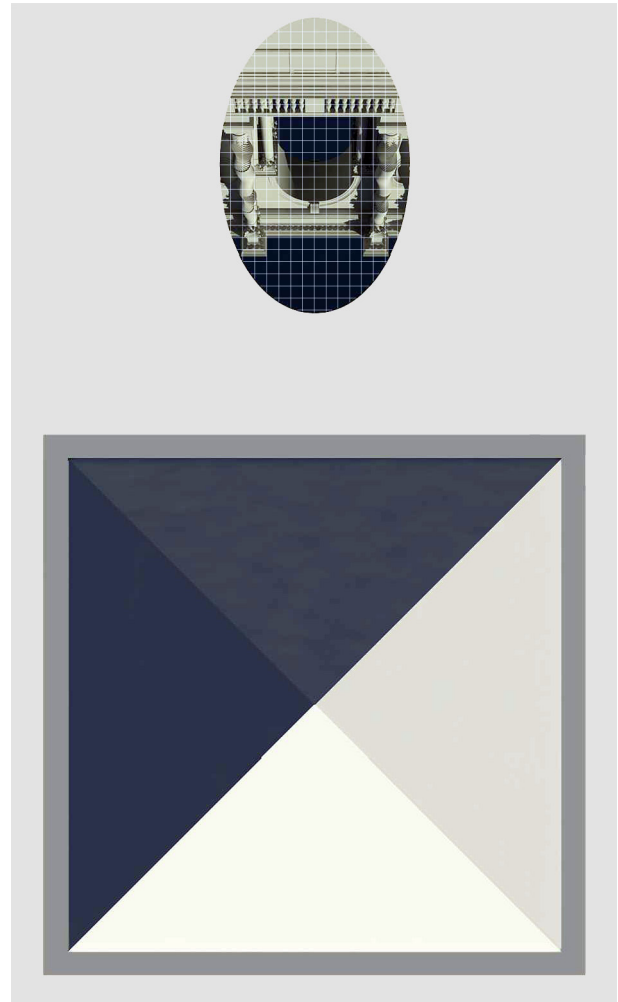


Fig. 10. Simulation of the perspective view obtained by reflecting the model in the mirror (elab. Silvia Masserano).

In the preparatory drawing for the *Apotheosis*, the apparent contour of each of the two twisted columns, drawn in pen with brown ink, is developed with the sole aid of a projected ray drawn in charcoal and without the support of other guidelines. In *di sotto in su* perspective, the geo-

metric construction of a complex subject cannot make use of such a limited reference, therefore the supposition that they were copied from real life or that they were reproduced by tracing seems more well-grounded.

If a mirror is used, the shading of the model in the reflected image is specular; that is, reversed from left to right, in respect to the real object. To correct this defect, it is sufficient to trace the drawing on the back of the drawing sheet, an operation that makes it possible to reproduce only the outline of any object represented. This circumstance would explain the absence of a complete outline of perspective construction in the preparatory sketch.

Although the above observations may lead to the hypothesis that in Caliarì's workshop it was customary to use a reticulated mirror for preparing *sotto in su* views, we should remember that the tool for perspective described by Sorte envisaged the same length both for the height of the model and the main distance (fig. 8), a circumstance instead ignored by the result of the perspective restitution on the work: the height of the model produced by the perspective restitution is, in fact, greater than the extension assigned by the painter to the pointer, a dimension that according to the indications of the cartographer had to be equal to the main distance.

An obvious difference in the rendering of details between the upper part of the architectural scene (including the triumphal arch, the balustrade and the niche with the Lion of St. Mark) and the lower one (including only a rising supported by a simple platform), the hypothesis that the model used for reflection in the mirror included two distinct elements, the triumphal arch and the underlying support platform. To the above is added the singular coincidence recorded in the heights of the most accurate portion of the model, which corresponds exactly to the extension of the main distance.

The two findings suggest that the painter followed the instructions of Sorte in the construction of the architectural model, but that he had to raise it with a base improvised at a later time.

A digital simulation clarified the reasons for this.

After having removed from the model restituted by perspective restitution the portion relative to the raised platform, and having modeled a pointer as tall as the length of the main distance, the model was placed next to an elliptical mirror proportioned according to the size of the *telero*. Having placed the eyepiece in a position corresponding to the station point identified by

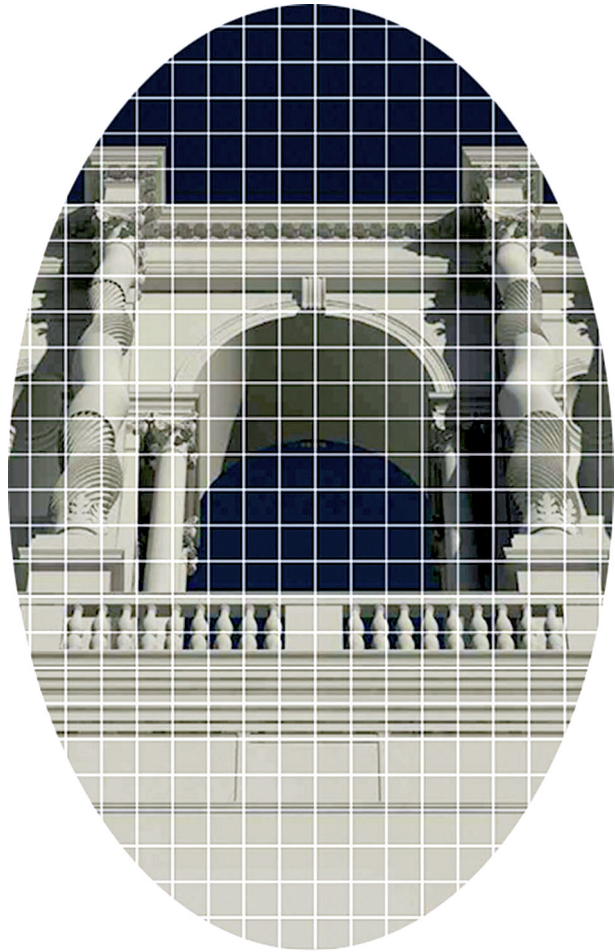


Fig. 11. Reflection of perspective in the mirror (elab. Silvia Masserano).

the perspective analysis, the image that could be captured from its apex on the reflecting surface did not show the presence of the two twisted columns (fig. 9), a circumstance that prevented recognition of a scenic background appropriate to the theme of the canvas. So in order to make the model recognizable in the mirror image as well, the painter had to raise and lower the

maquette, a condition that required the introduction of a terraced platform (fig. 10) to the “stage setting”, that was then animated with the different poses of soldiers and plebeians.

As regards the dimensioning of the grid of threads stretched over the mirror, in the digital processing the above-mentioned measurement was evaluated in the reflected image as equal to one eighth of the distance between the edges of the two protruding segments of the cornice, since in the sketch eight cells are included in the same interval of space. Finally, a further reflection imposed on the view captured on the mirror from

the eyepiece has made it possible to correct the direction of the light source, giving the digital view the appearance given by the tracing of the previous drawing (fig. 11), that is, the appearance of the final sketch. The analogies found by comparing the result of the simulation to the sketch of the *Apotheosis*, can rightly prove the assumption regarding the use of this instrument in the configuration of the *telero* of Palazzo Ducale, and allow us to presume that by means of this expedient the author was able to easily change the perspective scheme of the painted ceiling simply by changing the position of the pointer.

Notes

[1] In 1582 the *telero* was in place on the ceiling of the Hall of the Great Council, as confirmed by Raffaello Borghini in *Il Riposo*: Borghini 1584, p. 562.

[2] Cfr. Bettagno 1988, p. 75.

[3] 1578 is the year in which Veronese was entrusted with the task of carrying out the work. Cfr. Ridolfi 1837, pp. 45-47.

[4] Rearick, W.R. Paolo Veronese disegnatore. In Bettagno 1988, p. 43.

[5] A reference, for example, to one of the four figures intent on climbing the shaft of the Solomonic columns.

[6] Barbaro 1568, pp. 19-23.

[7] Cfr. Sorte 1580, p. 15.

[8] The ceiling paintings examined are those realized for the Venetian churches of San Sebastiano and Santa Maria dell'Umiltà.

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