DYNAMIC IMAGES OF TRUE, PAINTED
AND REFLECTED ARCHITECTURE[1]

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Abstract: The Autumn Hall was created between 1687 and 1689 by Domenico Piola within a decorative project that involved the entire second noble floor in Palazzo Brignole Sale (Rosso), Genoa. The quadratura of the walls were realised by Antonio Haffner; the most engaging spatial effect, however, is on the vault with quadratura by Sebastiano Monchi representing of the myth of Bacchus and Ariadne. Surveys were conducted by integrating various techniques in order to acquire the necessary information to apply specific interpretative geometric methods to study the interaction between the true architecture and the painted architecture. Therefore, a number of optical tricks connected not only to perspective but also to the protruding elements and furniture were brought to light, thus demonstrating how these true and illusory spaces are inseparable and need to be analysed through different techniques of representation in order to reveal their complexity.

Keywords: Representation, Architecture, Perspective, Modelling.

Resumen: El salón del Otoño fue realizado entre 1687 y 1689 por Domenico Piola durante el proyecto de decoración que involucró toda la segunda planta noble del palacio Brignole Sale en Génova. Antonio Haffner realizó las cuadraturas de las paredes, pero de todas maneras el efecto espacial que más cautiva el observador lo encontramos en la bóveda, donde podemos ver representado el mito de Baco y Ariadna con cuadraturas de Sebastiano Monchi. Muchos han sido los estudios hechos mediante la integración de diferentes técnicas con tal de adquirir toda la infomación necesaria para aplicar también métodos interpetativos geométricos al análisis de la interación entre la aquitectura real y la aquitectura pintada. De esta manera se ha logrado reconocer a algunos estratagemas ópticos relacionados con la perspectiva y contemporáneamente con los elementos arquitectónicos reales y con los mismos muebles. Todo esto nos demuestra como el espacio real y el espacio ilusorio son inescindibles y deben de ser analizados a través de diferentes técnicas de representación para descubrir su evidente complejidad.

Palabras clave: Representación, Arquitectura, Perspectiva, Modelación.

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1   Architectural perspectives in the seventeenth century

Perspective allows the observer to focus his gaze on an illusory space, but the spatial effect may be rendered more complex thanks to the use of further optical tricks which need to be examined by integrating several representation tools.

During the seventeenth century the knowledge on perspective phenomena reached its peak and artists were able to intentionally apply not only a geometric linear perspective on a plane, but relief perspective also, enabling them to manage projections on round or composed surfaces. This knowledge is proven in treatises as well as architectonical and theatrical realisations, among which it is worth quoting the study of Girard Desargues (*Brouillon project d'une atteinte aux evenemens: des rencontres du cone avec un plan,* Paris 1639; Abraham Bosse, *Moyen universel de pratiquer la perspective sur les tableaux ou surfaces irrégulières*, Paris, 1653) and the *Prospettiva Spada* by Francesco Borromini (Rome, Palazzo Spada, 1652-1653).

A practical example of the application of this knowledge can be observed also in interior decoration, as is evident in Palazzo Brignole Sale in Genoa (known as Palazzo Rosso for the red colour of its facade), Italy. The building was constructed for the Brignole Sale family (1677) by the architect Pietro Antonio Corradi (1613?-1683) and the decoration programme started ten years afterwards by the request of Gio Francesco Brignole Sale [1].

Particular interest is focused on the cycle of the Seasons in the second noble floor which involved some of the most talented artists in Genoa, i.e. Gregorio de Ferrari (1647-1726), Domenico (1627-1703) and Paolo Gerolamo Piola (1666-1724) as well as experts on quadratura, Antonio (1654-1732) and Enrico Haffner (1640-1702).

In addition to the four rooms of the Seasons, the cycle includes the Loggia of the Ruins by Paolo Gerolamo Piola and Niccolò Codazzi (1689), which was previously studied [2]. This decorative collective forms one of the most significant moments for painting and frescos in Genoa, due to the cultural contact with the most prestigious centres for painted perspective (such as Rome and Bologna), and the particularly original interpretation of the artistic style at the end of the seventeenth century [3] [4].

The present research analyses the Autumn Room and its study has been carried out within a Research Project of National Interest (P.R.I.N. 2010-2011, "Architectural Perspective: digital preservation, content access and analytics"; National Scientific Coordinator: Prof. Riccardo Migliari. Genoa Local Unit Scientific Manager: Prof. Maura Boffito).

2   The Autumn Room in Palazzo Brignole Sale (Rosso): space, surveying, restitution

The Autumn Room was decorated between 1687 and 1689 by Domenico Piola [5]. The quadratura of the walls, realised by Antonio Haffner, it has been modified in the following centuries and it were recently restored (the restoration was performed in collaboration with the Central Institute of Restoration, 2013) with the reappearance of a fake door painted on the west wall in a symmetrical position to the entrance door that connects the central hall. The remaining surfaces of the walls are decorated with perspective frames created for the insertion of several works of art from the private collection of the Brignole Sale family, among those, paintings from Guido Reni, Tintoretto and Gerolamo da Passano.

The most involving spatial effect is the depiction on the vault and due to its complexity two subsequent surveys were necessary to examine it in depth. In the first survey (May 2014, Roberto Babbetto, Gabriella Garello, Mariana Teixeira) a Nikon D90 was used, equipped with a 35 mm prime lens, with a slide bar with predefined holes (*Z-Scan*). The data collected by the triplets of parallel and oblique shots, besides the points surveyed with the motorised total station Leica TS15, were analysed (Z-Map-MenciSoftware and Photoscan-Agisoft software) to obtain a scaled and georeferenced point cloud of the vault, a high-resolution orthophoto and a texture to be applied to a 3D digital model subsequently realised.

In the second survey (May 2014, Leonardo Baglioni, Cristina Càndito, Michela Mazzucchelli) photographic survey techniques were used to achieve high-resolution images through tools of panoramic construction (Reflex Digital Full Frame Nikon D800 camera with a 50 mm prime lens and a Clauss VR Head ST motorized panoramic head) [6]; it was therefore possible to create navigable equirectangular projections and a high-resolution photo map of the vault.

Together the obtained work provides both three-dimensional spatial perception and elements useful in studying the painting planning methods. The Autumn Room has a quadrangular plan measuring approximately 8 metres per side while the apex of the vault is ever so slightly shorter (7,40 metres) and its volume resembles a cube.

On the vault the myth of Bacchus and Ariadne is represented with quadratura by the Bolognese artist, Sebastiano Monchi (?-1706). The perspective trompe l'oeil opens up a higher space in which the mythological characters are leaning out onto the real space thanks to a figurative device that had already been tested on the perspective vault during the fifteenth century and perfected subsequently with the use of more

3

articulated optical devices. The reference to grapes, the symbol of autumn and of the god, Bacchus, is highlighted by the vines and the bunches of grapes painted on the quadrangular golden frame of the vault impost, which was realised by Giacomo Maria Muttone.
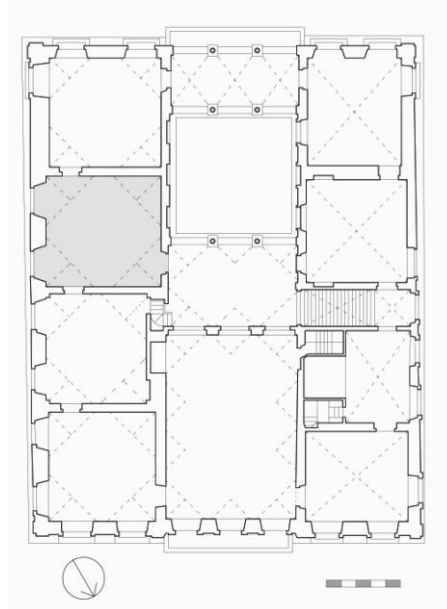

Figure 1 - Palazzo Brignole Sale-Rosso (Genoa, Italy), the plan of the second noble floor. The four rooms of the Seasons at east and the Loggia of the Ruins at south

Figure 2 - The Autumn Room and the painted door in the western wall (spherical photography)

The space depicted in the fresco is a garden architecture, where a balustrade is placed on a octagonal golden frame decorated with volutes and cartouches, vegetation elements and mascarons. Around the balustrade an area surrounded by an aerial portico with architraves can be noted. The portico is octagonal too but it presents rounded elements to create a mixtilinear fenced area, that takes its inspiration from the nymphaeums of ancient Rome. Therefore the balustrade acts as a passage between the real modern world and the unreal ancient world, belonging to the mythological scene where the characters are painted or made from stucco.

Bacchus and Ariadne are triumphantly placed in the centre, next to a leopard and Silenus, surrounded by small satyrs and *amorini* spiralling in the sky. The characters of Bacchus and Ariadne are repeated in the eight lunettes and in the spaces above the four paired Corinthian capitals. Additionally, thanks to this narrative device the events preceding the triumph of Bacchus and Ariadne are illustrated, e.g. the famous slumber of Ariadne, abandoned by Theseus in Naxos after he had been defeated by the Minotaur.

The stucco was not only utilized to decorate the vault impost and the octagonal frame of the lunettes, but it was also moulded to create partially three-dimensional figures in order to strengthen the illusion of a virtual space in the decoration [7]. The characters of the fresco climb over the balustrade partially invading the true space, as can be observed with the leopard on the west wall which seems to be coming out from the space underneath. The lunettes play a part in this spatial representation, as in the right lunette on the south wall where the centaur's hind leg goes over the golden frame underneath, which signifies the frame is not an insurmountable limit for the representation.

In order to examine the characteristics of the illusory space, perspective restitution techniques were applied. To achieve this study, the orthophoto representation was considered as a part of the flat surface coinciding with the impost plane of the vault.

By lengthening the outline of the columns it was possible to verify that the vanishing point of the vertical lines coincides with the apex of the vault and it constitutes the unifying element of a perspective that still holds a few surprises. It can be noted that the column shafts are approximated in that they resemble simple cylinders, i.e. without the proper taper that would have added a superfluous complication to the construction.

Once the viewpoint *O* was established as belonging to the central axis of the room, its height from the floor was hypothesised to be around 1,65 m. and its overturning on

5

the impost in *O'* was identified in order to measure the perspective elements when no other references can be identified. Thanks to the alignment of *O'* with the centre of the necking of a perspective column, it was possible to find the line to which the centre of this same column belonged.
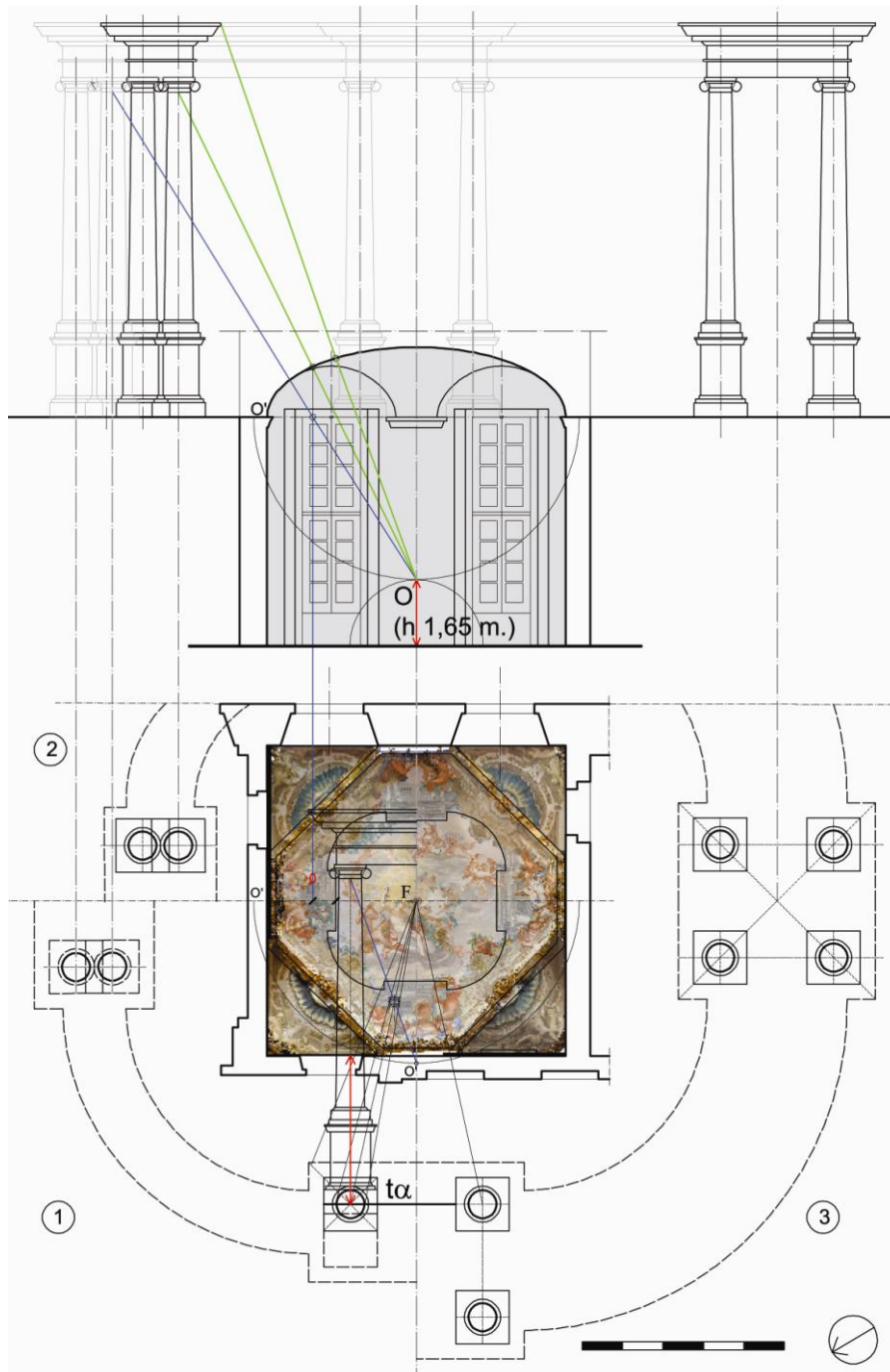

Figure 3 - Plan and section: the perspective restitution and the hypothetical reconstruction (C. Càndito): 1-with the ortophoto; 2-with the vault intersection (see Fig. 5); 3-Ideal Architecture (see Fig. 6).

6

To pinpoint another element of the homology relation between perspective and its restitution, it was necessary to establish the planimetric position of the axis of this same column where its depth constitutes the homology trace.

In order to scale the rest of the order elements, a decision was made to measure this distance with the modules proposed by Andrea Palladio regarding the ionic order (*I Quattro libri dell'architettura*, 1570) [8]. The proof that these choices were compatible was provided by the amazing approximation with which the projection of the reconstructed column imoscape base was identified.

Once the reference elements were pinpointed, the other dimensions of the illusory architecture could be determined, as with the heights of the balustrade.
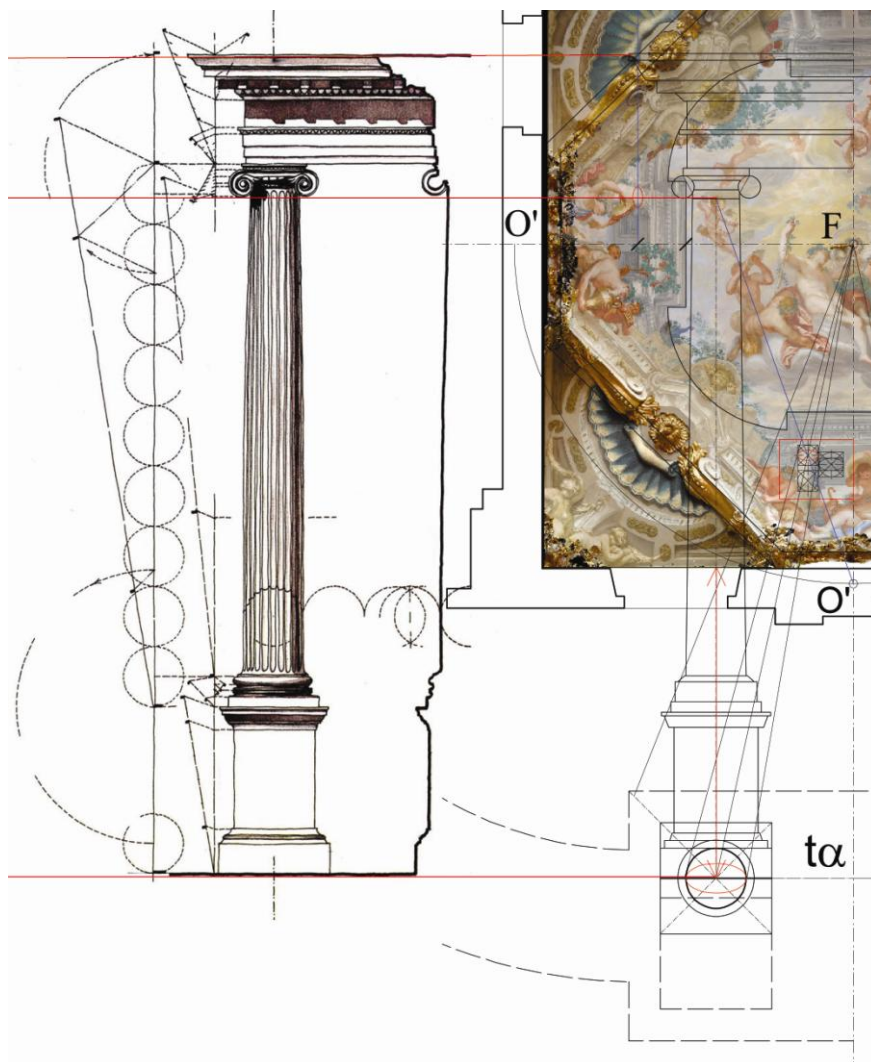

Figure 4 - On the left: the Ionic order by Andrea Palladio (Migliari R. 1991). On the right: the scale of the Autumn Room order. Using the distance from the hypothetical floor to the necking, one can observe that the imoscape is proportioned with the perspective restitution. (C. Càndito)

3   Transgressions and modelling

Regarding the perspective planning, an evident transgression may be observed in the distortion of the column bases which are not circular, as it would be in a perspective through a horizontal plane, but are evidently elliptical. Likewise, a distortion occurs in the coffer, which is transformed from a square into a rectangle. Thanks to this, the perspective can then be regarded as proper when the architecture is distorted and oblique (e.g. the shaft sections are actually elliptical or the axis is sloped) and when it can be looked at from multiple viewpoints in order to be compatible with the need of dynamic fruition of the space.

The depth of the portico is an even more evident transgression because by observing the capitals in perspective it is clear that the represented distance is too narrow to allow adequate passage. When examining the measurements of the reconstructed base or of the stylobate, these elements appear superimposed, thus configuring an impossible illusory space that was clearly created merely for the purpose of representation.

It is worth remembering that the simplification made in the introduction (i.e. regarding the testing through an orthophoto of the vault and its subsequent assimilation to the flat surface coinciding with the impost), does not correspond with the effective three-dimensionality of the painted vaulted surface, which needs to be examined in detail through the reconstruction of the solid perspective, that lessens the effect of the observed oblique distortion.

If the architecture is constructed based on the projection on the vault, the result is always an inaccessible portico due to the superimposition of the stylobates in depth, which is however much higher or closer to the true space. Drawing only on a series of virtual architecture measurements generated by the projections, it is interesting to speculate, among the various projective reconstructions, about the represented ideal architecture which replicates the shapes imagined by the observer thanks to a perception based on the recognition of known elements. Moreover, in the Autumn Room the optical effects are enhanced by the reflection of the wide mirror wall, thus allowing the integration of the true space and the virtual one of the fresco with the space reflected in the mirrors.

The mirror wall was originally realized to be placed exactly in the position it still occupies and it is coeval to the other decorations, as demonstrated by the same gildings by Muttone that can be found on the vault also.
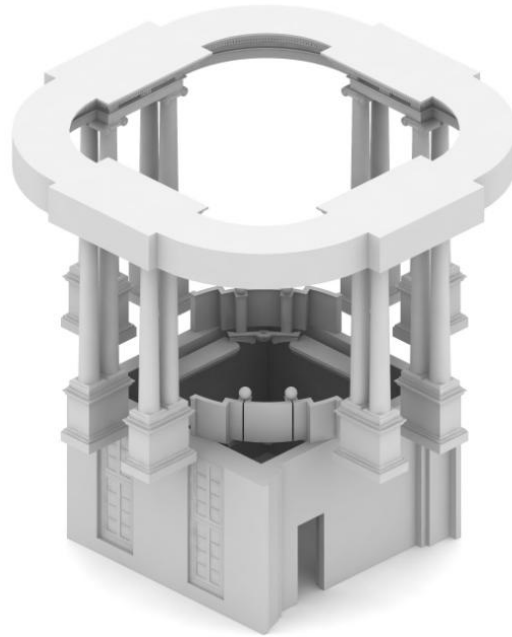
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Figure 5 - Axonometric view of the true space with the projective virtual space (case 2 Fig. 3).
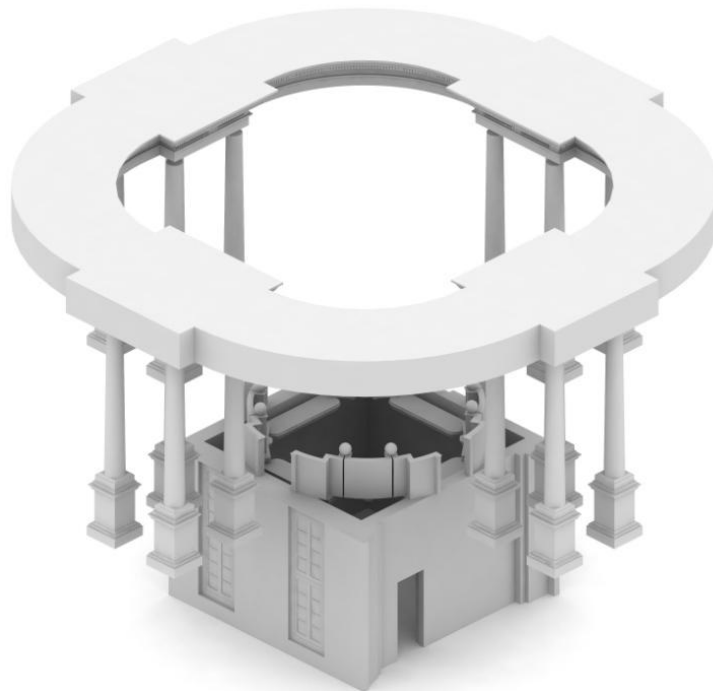(modelling by C. Marino, rendering by G.B. Ghersi).

Figure 6 - Axonometric view of the true space with an ideal virtual space (case 3 Fig. 3).
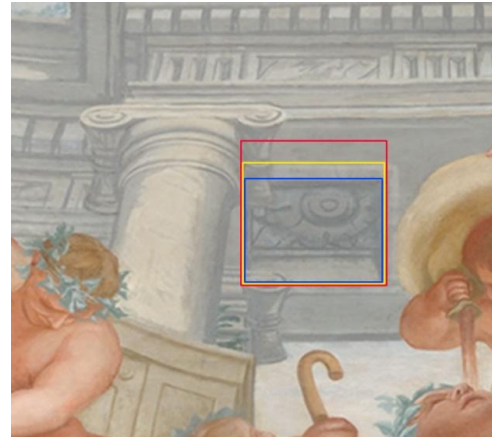(modelling by C. Marino, rendering by G.B. Ghersi).

9

Figure 7 - The coffer perspective in the textured mesh of the vault (C. Càndito).

Figure 8 - Orthophoto detail: comparison of the distortion. The coffer in the orthophoto (blue line), in the mesh surface (yellow line) and the real form (red line). (C. Càndito).

The interest for wall mirrors in the seventeenth century is widely documented by many architectonical realizations and their prototype is the Hall of Mirrors in Versailles [9] as well as optical tricks used for persuasive or entertaining purposes [10].

When observed from the centre of the room, in alignment with the vanishing point of the vertical lines, the wall mirror shows the reflection of the portion of the vault fresco towards the entrance wall of the hall, where Bacchus is next to Silenus.

This image enables the observers to be completely immersed in the painted scene and in this specific point an amorino was intentionally placed, looking towards the observer and drawing him into the representation of the architecture, ornamentation and shapes. The detail is not very visible from the orthophoto that was useful to study the perspective restitution, but in this case has to be substituted by a navigable equirectangular projection of the scene, which provides a perception similar to the natural one.

The reflected images appearing in the mirror transform continuously depending on the viewpoint of the observer and only a dynamic image can adequately represent the complex relation that is created with the true space. This spatial change is that of the observer who enters through one of doors in the room and then instinctively approaches the centre to look up at the painted vault.

This proves the great awareness of the decoration designer and painter Domenico Piola. He orchestrated a composition of quadratura, shapes, stuccos and mirrors to create a perception that today we would call immersive within a real architecture. Its

10

complexity is demonstrated by the analysis obtained with the use of the advanced technology of surveying and representation.
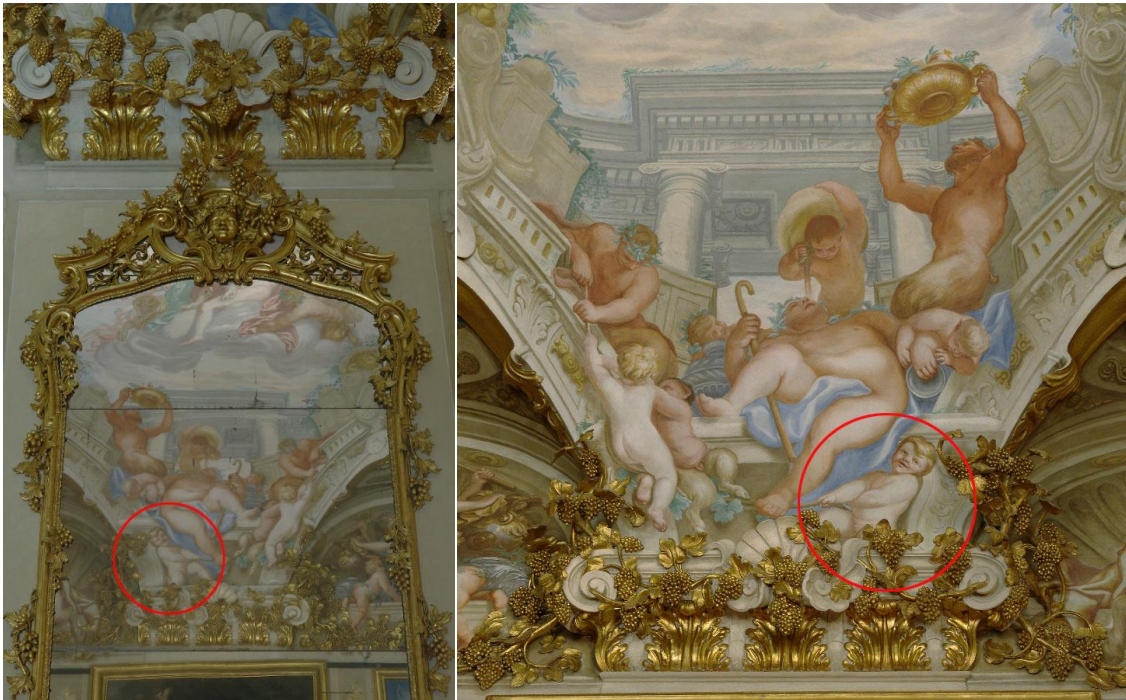

Figure 9 - Autumn Room: the mirror wall and the reflection of the fresco.

Figure 10 - The amorino that look towards the observer.

4   Conclusion

In the Autumn Room of Palazzo Brignole Sale-Rosso the architecture is painted on the walls and also on the vault with substantial geometrical complexity, thanks to which the observer can perceive the image as real only if the geometrical curvature on the vault ceiling is deformed, in a relief perspective. In the room a wall mirror is displayed that is coeval to the other decoration, as demonstrated by the grape stuccos realised by Giacomo Maria Muttone. Sections of a panoramic image prove what can be already tested by the observer's perception of the reflected images: the elements that are reflected in the mirror change according to position of the observer and only a video could adequately show the complex relation created between real static space and the virtual dynamic space.

Thanks to the collected data it was possible to study the interaction between the painted space with the true space that does not only appear wider, but also transformed into a theatrical scene. The real and painted architecture, the golden

11

stuccos and the decor mirrors enable the observer to perceive a scene that integrates real, illusory and virtual spaces, together with the knowledge of some forms of architecture that allows to identify the ideal shapes even when depicted in a distorted manner due to representation needs.

Acknowledgments

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