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THE PANEL PAINTING OF SAINT MARK BY THE ITALIAN RENAISSANCE ARTIST 'THE BALLETTA' A STUDY FOR THE RESTORATION

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Abstract

This paper presents a study of the panel painting representing Saint Mark exhibited in the Diocesan Museum of Colle del Duomo in Viterbo. The panel painting has never been investigated before this study; therefore, we would like to obtain information about the painting technique and the wood support in the view of a possible restoration that is desirable due to the poor state of preservation of the artwork. The panel painting was attributed by art historians to the Italian Renaissance artist Francesco D'Antonio Zacchi, well-known as 'The Balletta', operating in Central Italy during the 15th century. The painting representing Saint Mark may be considered a late work of the artist probably realized before 1476, supposed year of 'The Balletta' death. The artwork was investigated by different analytical techniques. The wood support was identified as poplar; the panel painting's materials were analysed by ultraviolet fluorescence photography (UVF) and Hypercolorimetric multispectral imaging (HMI), this last covering a spectral range from about 300 to 1000 nm. The UVF technique allowed to map the conservation status of the panel painting highlighting grouting and retouching; the HMI gave information about pigments such as cinnabar/vermilion, azurite, iron-based pigments and lead white, and made it possible to map the distribution of the painting materials through the algorithms of the processing software included into the HMI system.

Keywords: diagnostics, imaging, techniques, wood, characterisation

1. Introduction and historical details about the painting and the artist

In this contribution the study of an interesting 15th century panel painting is presented in the context of the known activities of the painter to whom it is

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attributed to the Italian master Francesco d'Antonio Zacchi better known as 'The Balletta'. The artwork, never investigated before, represents Saint Mark, with the attributes of the pen and the book to recall the written Gospel and with the classic winged lion (Figure 1). The painting was made for the church of Saint Mark in Viterbo and remained there until it was transferred, in an unspecified period, to the rectory for safety reasons. It became part of the Museum Colle del Duomo's collection in 2014. The panel painting is today exhibited in a room of the diocesan museum of Colle del Duomo in Viterbo.

Figure 1. The panel painting representing Saint Mark: (A) RGB calibrated image obtained by HMI and (B) photograph of the backside.

Francesco d'Antonio Zanchi was born in Viterbo, son of Antonio and Lorenza. The year of his birth is not known yet. His son Gabriele was also a painter. From the will of 'The Balletta', drawn up in 1439 during a period of illness, it is possible to know the name of the mother and that of his wife,

Jacoba, whose state of pregnancy is remembered [1]. We also learn the name of a trusted collaborator Valentino Pica - Valentino Giannis Picche pictori de Viterbio - to whom he left the tools of the workshop [2, 3]. Between 1435 and 1457 he was called by the Municipality to hold the positions of councillor and prior [1, 3]. The date of his death is not known, but Signorelli [1] indicates that in 1473 the Prior of Saint Spirito in Faul commissioned him a painting on wood, now lost and that in 1476 his son Gabriele donated to the church of the Trinità in Viterbo in suffrage for his father. Therefore, the date of death can be placed after 1473 and before 1476, the year from which there is no more information of the artist.

'The Balletta' worked mainly in Viterbo, the city where he had a workshop. The presence outside the city is testified by frescoes in Tuscania (the Madonna enthroned in the church of San Biagio, detached) and in Carbognano (the Madonna di Sant'Eutizio).

The only signed and dated work (1441) is the polyptych of the church of Saint Giovanni in Zoccoli, which constitutes a term of stylistic comparison for other paintings dating. Caporossi [3] summarizes the catalogue and the sources of attribution and dating, citing the contributions of Bentivoglio (2015), Corbo (1978), Faldi (1954, 1970), Pedrocchi (1983) and Latella (1996) [2-7]. Some other paintings belong to the period prior to the Polyptych of the Church of San Giovanni in Zoccoli; specifically: the Madonna Enthroned with Child of Tuscania, the fragment of the Madonna Enthroned with Child of Santa Maria in Poggio currently preserved in the Civic Museum of Viterbo, the two-sided triptych of Tuscania, the panel with Madonna enthroned with child and Annunciation in a private collection in Krakow, the Avignon triptych representing the Madonna enthroned with Child between Saint Bernardino of Siena and Saint Peter. A large fresco in the former Church of Saint Antonio in Viterbo is cautiously attributed to Balletta, probably the first work known to date by Balletta (1426).

Around the time of the Polyptych of San Giovanni in Zoccoli, due to stylistic characteristics, can be set the panel with the Madonna and Child conserved in the Walters Art Gallery in Baltimore, the *Madonna del Cardellino*, the Madonna enthroned with the Child and an adoring donor (detached fresco of Santa Maria in Gradi now in the Civic Museum in Viterbo) and that of the Church of San Eutizio in Carbognano. In 2017 Todini attributed two works auctioned by the Dorotheum to Balletta [3].

Another signed, but undated work of Francesco d'Antonio Zacchi is the polyptych of Santa Rosa, kept in the church of the same name, probably commissioned on the occasion of Rosa's second canonization process set around 1457. It depicts the Madonna and Child between the Saints Rose and Catherine of Alexandria. In the figures of the polyptych the Sienese ancestry of the painter appears to be confirmed, manifested in a further graceful and elegant stylistic dimension that well summarizes the last phases of the Italian flamboyant Gothic tradition.

According to Faldi, the two frescoed chapels in the church Santa Maria Nuova in Viterbo and the panel painting of Saint Mark belong to a late phase of 'The Balletta' production, which can be traced back to after the middle of the 15th century [7]. The frescoes in a chapel depict the Madonna and Child, seated on a Gothic throne, the Baptist, a devotee, and the Eucharistic Christ; in the other chapel, dedicated to Saint Ambrogio, the Crucifixion with the Madonna and saints is represented [8].

Faldi published the panel painting of Saint Mark for the first time in 1954 [6]. The panel painting was confirmed as a later realization [7, 9], referable probably to the last years of activity. The panel painting is neither signed nor dated, but it has a late-Gothic taste quite typical of the artist in the last period of his life [8]. The above-mentioned art historians agree in attributing Saint Mark to the second half of the 15th century, since it can be dated before 1476, year from which there is no information of the artist [7, 9].

'The Balletta' is considered a fine interpreter of the late Gothic currents still in vogue in Viterbo, a city where painting showed for a long time an attitude of traditional forms conservation, without being influenced by the innovations that the major contemporary Florentine masters, as it can be observed precisely in the painting which depicts Saint Mark. In his hometown, he was able to form his own style by assimilating suggestions from Sienese and Umbria-Marche painting. 'The Balletta' was a prominent figure in the cultural and political environment of Viterbo and a successful painter, knowing how to interpret the taste of the clients who indicated models distant in time.

The historical research was combined with a scientific investigation of the painting starting by non-invasive analysis on site through hypercolorimetric multispectral imaging (HMI) technique in order to highlight the potentiality of non-invasive methodologies to gather information on artworks composition and state of conservation. Scientific analyses help to provide relevant data to choose the most appropriate approach for restoration and also suggest suitable methods for conservation. The knowledge approach of materials and of behaviour of the multi-material artworks is the key to avoiding inconsiderate interventions [10]. The analysis of the painting was completed by the investigation on the support aimed at evaluating its state of conservation and at characterising the species, being a relevant aspect in cultural heritage study with a multidisciplinary and interdisciplinary approach [11-13].

The investigations conducted and reported here, on the wooden support and on the pictorial layer, return a set of scientific information detected with the intent of minimal invasiveness and respecting the uniqueness of the work of art. These data effectively describe the state of conservation of the work, characterise the materials and will be useful for deciding when and how to undertake the restoration operations.

2. Experimental

2.1. Wood analysis

Wood identification was carried out by observing macroscopic and the microscopic characters using consolidated practices [12] with the minimum intervention criterion [14]. The thin sections were obtained manually with scalpel and blade from the wooden support and examined by the Zeiss Axioskop optical microscope in laboratory. Photomicrographs were captured through a Zeiss AxioCam digital camera connected to the microscope. The anatomical features were compared with identification keys [15] and the anatomical description followed the terms in IAWA [16].

To contribute to the definition of the state of conservation, the criticalities of the support that could have consequences on the pictorial conditions were observed and identified, evaluating whether they were linked to the choice of support and/or to subsequent construction and conservation vicissitudes.

2.2. Hypercolorimetric multispectral imaging (HMI) and Ultraviolet fluorescence photography (UVF)

Hypercolorimetric multispectral imaging is an innovative technique developed by the Italian society Profilocolore srl [17]. It is based on an acquisition system and two software tools for calibrating and processing the images, respectively. The acquisition system consists of a Nikon D810FR 36 mega-pixel camera, modified to obtain full-range spectral reflectance measurements. Lighting was obtained by xenon flashes after removing their front plastic lenses, thus also allowing the UV wavelength to be emitted. The UV induced fluorescence (UVF) was obtained by filtered led projectors as UV source and UV-IR cut filter (400-700 nm) in front of the camera. In order to obtain calibrated and so reproducible images, a number of white patches surrounding the object and of 36 patches colour-checkers built using colour samples from the NCS - Natural Colour System®© catalogue have to be add in the scene, as radiometric references. The spectral reflectance of the references was accurately measured in the range 220-1050 nm in Profilocolore laboratory, with 0.7 nm accuracy (Instrument System Spectroradiometer CAS 140 CT and dark room). The calibration procedure was performed through the proprietary software SpectraPick® that allows for obtaining seven monochromatic images, 16 bit TIFF format, containing the spectral reflectance values at 350, 450, 550, 650, 750, 850 and 950 nm (these last three named IR1, IR2, and IR3 respectively), and a single AdobeRGB TIFF 16 bit colour image. The achieved precision across the whole 36 megapixels image is higher than 95% on the spectral reflectance images and colour error less than CIE2000 $\Delta E = 2$ for the colour image. The whole calibration and alignment process requires few minutes and can be performed in situ for an immediate results analysis. After the image

acquisition and calibration, the multispectral images were processed through the HMI software PickViewer®, also in this case developed by Profilocolore.

3. Results and discussion

3.1. Description and conservation state of the wood support

The support consists of a single cuspidate table, 112.0 cm high and 51.0 cm wide at the base. The thickness varies from the base (2.1 cm) to the upper part (3.5 cm). A preliminary naked eyes observation of wood rear surface allowed for recognise the wood defects due to original characteristics of the tree such as knots, grain deviation, reaction wood (Figure 2).

Figure 2. Rear of the wooden support. Details of the observed defects: (a) and (e) - knots, (b) discoloration, (c) truncated fibres, (d) damage caused by entomatic galleries.

Large knots deriving from the branches were found located in the extreme parts of the support (Figure 2a and 2e). Deformations, cracks and fissures have occurred over time. On the back, the natural colour of the wood had undergone superficial variations, due to natural aging [18], but also discolorations presumably due to conservation in environments with high localized humidity (Figure 2b). The surface was rudimentary finished, and traces of the workmanship remained. In the central area, truncated fibres were detected (Figure 2c), indicating the presence of reaction wood, in this specific case, tension wood, typical of wood belonging from a dicotyledonous species. The plank was tangentially cut and was used vertically. On the rear, holes for the emergence of xylophagous insects, probably anobids, scattered over the entire surface, were easily noted, but the attack does not appear to be active. In the central part the larval galleries are particularly concentrated and have weakened the wood (Figure 2d). Within some entomatic galleries, the presence of gnawing is noted. Cupping was observed (Figure 3), a typical deformation due to tangential cutting, accentuated by the different sensitivity of painted and untreated rear surface to moisture variations in conservation environment. This kind of deformation is unavoidable, due to the different shrinkage behaviour in radial and tangential direction.

Figure 3. Basal part of the panel painting. The warping of the support is easily observed.

3.2. Wood identification

In cultural heritage the botanical species identification is necessary to perform an accurate scientific investigation because different botanical species of wood demonstrates different technological properties such us durability, mechanical properties, colour, workability and so on.

Generally, the selection of the identification method depends on the examined artefact, on wood features detectable at naked eyes and on the possibility of sampling for laboratory analysis. At naked eyes, a light colour wood of an angiosperm tree was identified, and the microscopic observation proved the wood was heteroxylous, with distinct rings, diffuse porosity, elliptical vessels solitary or in short radial chains of two to four elements (Figure 4). The rays were monoseriate and in the radial section all the ray cells were procumbent with large, simple ray-vessel pits. These features oriented to identify poplar (*Populus* sp.) wood, one of the most widely used in Italian peninsula for wooden support of panel paintings. The species of the genus Populus cannot be distinguished based on the anatomical characteristics of the wood, therefore identification is at the genus level [16]. The poplar wood could have been

obtained from *Populus alba* L., *P. nigra* L., *P. tremula* L. or natural hybrids of these species.

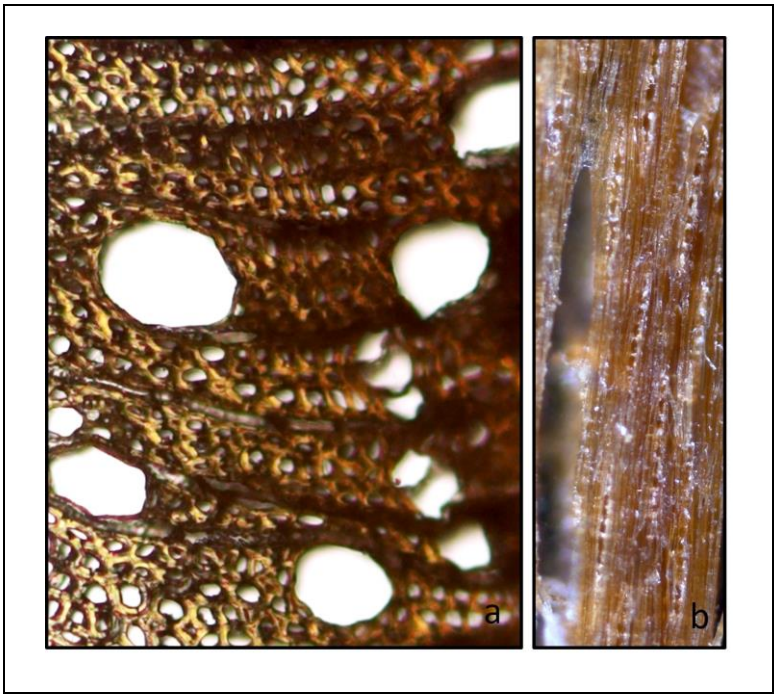

Figure 4. Microscopical features: (a) transversal section, diffuse porosity and elliptical vessels can be observed, (b) tangential section, monoseriate rays.

The poplar is a widespread throughout the Italian peninsula, ensuring an easy supply of individuals of suitable dimension to provide planks of the requested size. In the current territory of Viterbo these species are currently present and are found in riparian areas or in hilly environments, according to the ecological characteristics of the species. Uzielli reports that *Populus alba* was preferred for panel paintings for its better qualitative characteristics [19].

The preference for poplar wood is probably due to technological reasons. In fact, processing is simple; low density allows easy handling of large painted panels; the poplar wood does not present problems of seasoning and the anatomical characteristics guarantee homogeneous surfaces and the limited content of extractives give a light-coloured surface [20]. This wood demonstrates a certain dimensional stability due to low shrinkage coefficients [21]. Furthermore, the thickness of the support contributes to the dimensional stability of the wooden support, since the fluctuations in environmental humidity, which determine those of the wood, are dampened by the time required for moisture to penetrate the deeper layers. Buzzone and Galassi [22] reported that the selection of wood species was connected to cost and local availability and that this habit was particularly found in central Italy, effectively confirming what was found by Marette [23].

3.3. Description and conservation state of the painting layer

A first examination of the painted surface was made by using the ultraviolet fluorescence photography (UVF) a technique particularly useful for investigating the conservation status of the paintings' surfaces, able to reveal repainting, grouting, cracks, organic fluorescent materials and so on [24]. UVF image allows to observe the presence of a non-homogeneous varnish exhibiting a light blue fluorescence. Some dark zone may be due to restoration retouches that generally appear darker in UVF than the original materials (Figure 5A-B). The point yellowish fluorescence visible in the halo of the saint is due to the probable presence of lead white that appears white under UV fluorescence (Figure 5C). The pink fluorescence of the saint's mantle can be associated to an organic lake pigment (Figure 5D). The general status of the surface acquired through UVF will be useful to support the restoration on the painting that is desirable to especially to stop the degradation of the support.

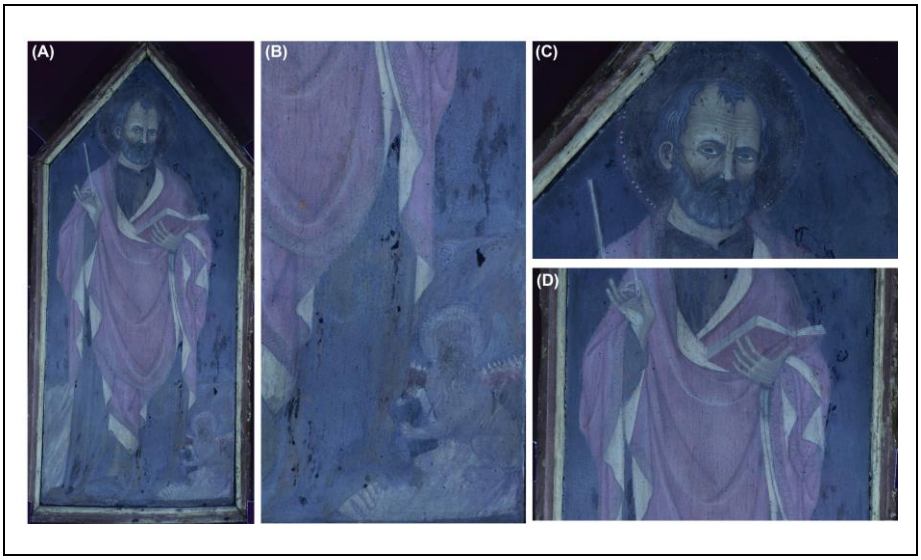

Figure 5. UVF image of the entire painting: (A) and some details of the surface, (B) portion with the lion, (C) head of Saint Mark and (D) portion of the painting with the mantle and the book.

The panting materials were investigated in a completely non-invasive modality by using the HMI technique, specifically by applying the algorithms of PickViewer® software, but also by selecting the single calibrated and monochromatic bands produced by the calibration software. Specifically, the three IR bands give information about the underdrawing and about possible pentimenti (Figure 6). The IR2 band shows the drawing used to define the folds of the mantle, the book contours and pages, the hands of the saint. The reflectographic image further shows the cracking of the painting layers probably

caused by the natural binder drying but also by the support movements. The images in the Figure 6A highlights several little holes due to the woodworms.

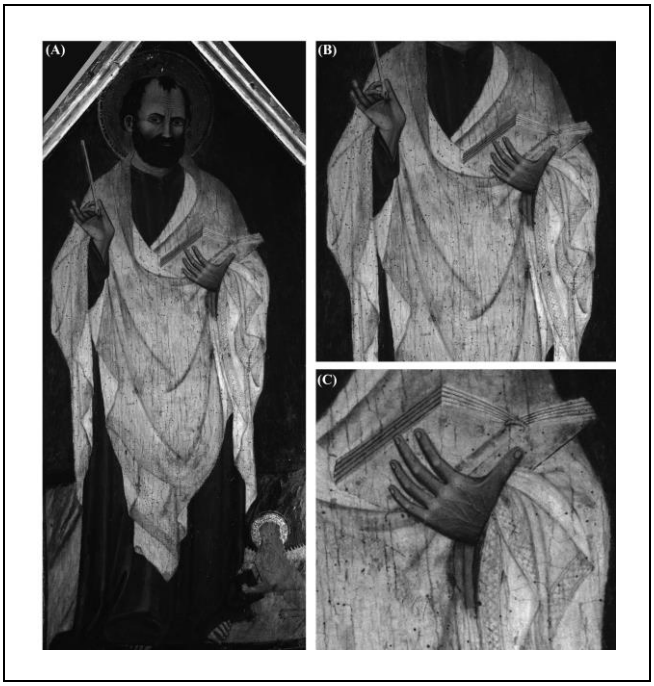

Figure 6. HMI images of the painting: (A) IR2 band centred at 850 nm, (B) detail of the Saint Mark mantle and (C) of the hand with the book.

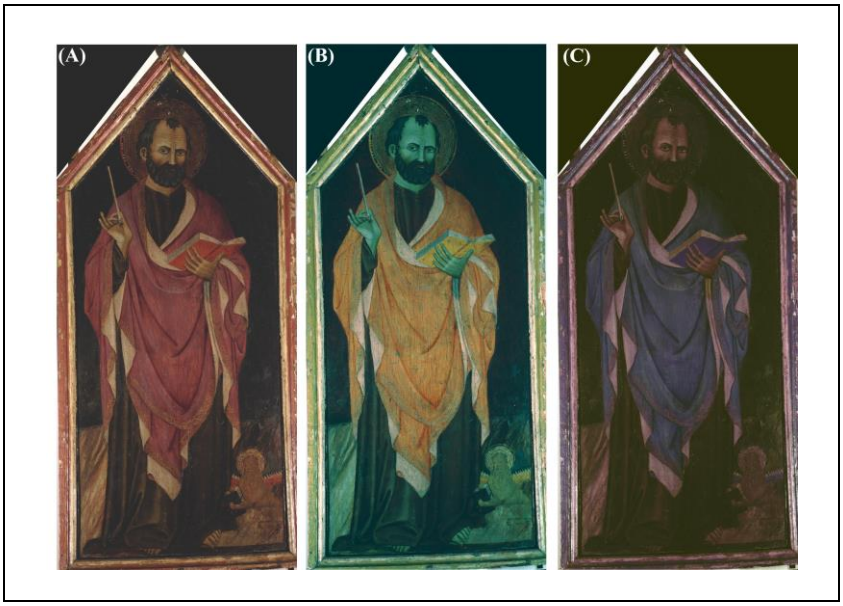

Figure 7. HMI images of the painting: (A) RGB calibrate image; (B) IRFC and (C) UVFC images.

The first processing with PickViewer® was addressed to obtain infrared and ultraviolet false colour (IRFC and UVFC respectively) outputs (Figure 7B and 7C).

The most evident changes appeared for red colour of the book and of the lion wings that in IRFC become orange-yellow and in UVFC blue-violet. This result suggests the presence of vermilion/cinnabar (HgS) as reported in various literature papers, even if the false colours of pigments must be only indicative of their possible composition [25]. In fact, the false colour could depend on the binder, on the presence of surface varnished and on other pigments mixed with the main ones. Similar response is observed in the book cover and in the lion wings; for this reason a further processing was done. In fact, processing software of HMI may be used for several other application on paintings, such as spectral/chromatic similarity tool, normalised difference index, principal component analysis, etc. In this specific case, the chromatic similarity was applied to the red of the book (Figure 8). This algorithm produces a B/N image where the white pixels represent the materials with the same characteristics (in terms of colour) and the black pixels have not any similarity.

Figure 8. HMI images of the painting: (A) RGB calibrate image, (B) result of the chromatic similarity algorithm.

The similarity is evident between the book cover, the lion wings, a thin contour of the saint's halo and with some areas of the mantle and of the frame. This result suggests that the book, the lion wings, and the halo's contour are made of cinnabar/vermilion whereas the mantle for the saint is made of other pigments/dyes with some red zones of HgS.

The white parts of the paintings appear white pinkish in IRFC suggesting the use of lead white both in the mantle lapel and in the flesh tone. The blue of the background and of the saint dress is dark both in UVFC and IRFC. By comparing this result also with the UVF response, it can be supposed the use of azurite as blue pigment.

4. Conclusions

In this paper the study of a panel painting attributed to the Renaissance Italian artist Francesco D'Antonio Zacchi, well-known as 'The Balletta' was presented also in the light of the historical contest of the artwork and of the painter.

The historical and artistic information were investigated through literature research mainly based on a recent paper written by Caporossi in 2022 [3]. From this research it emerged that 'The Balletta' made both panel and wall paintings around Viterbo district (Central Italy). The Saint Mark painting was a late production of the artist.

The panel painting exhibits a bad state of preservation probably due to the incorrect conservation conditions. The most relevant conservative aspects concern the wooden support that is characterised by evident warping that was probably due to past bad environmental conditions such as fluctuations of thermo-hygrometric parameters. The wooden support is also characterised by chromatic alteration caused by contact with water. The presence of water associated to high temperatures was also responsible of entomatic attack that is evident from the several holes visible on the back of the painting.

The evident deformation of the wood support caused cracks on the painting layers particularly evident in the reflectographic images.

The multispectral imaging supplied other relevant information to better know the artwork. Specifically, ultraviolet fluorescence highlighted the presence of grouting and retouching and the aged surface varnish. The hypercolorimetric multispectral imaging, through the processing software, allowed to obtain the false colours images that gave information about the possible pigment composition and to map their distribution on the painting.

We hope that our study will be useful to help and support a future and restoration of the painting so that to improve the state of the artwork and to enrich the Colle del Duomo collection.

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