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RECONSTRUCTION OF RAPHAEL SANTI'S PAINTING WORKSHOP FROM THE UMBRIAN-FLORENTINE PERIOD BASED ON THE AUTHORIAL REVERSE TECHNOLOGY

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Abstract

In the first stage of the research all the elements of painting technique and technology were developed, and painting materials as close as possible to those used by Raphael were prepared in order to obtain a research material compatible with the original material. Then, based on the technique and technology developed, an experimental image of the Madonna and Child was made as a test painting intended to simulate the complete structure of Raphael's original image. In the last stage, physicochemical tests of the experimental image were performed. Observation of the image in IR radiation, X-ray and stratigraphic examination of the image painting layers were performed. The infrared, X-ray and stratigraphic tests were compared with the analogous test results of three selected paintings by Raphael, which allowed interpretation of test results from the original works to a greater extent than before. In addition, experimental image research has highlighted the limitations of research into the stratigraphy of the painting layers, as well as instrumental studies that affect the current state of knowledge about Raphael Santi's painting workshop.

Keywords*: Raphael Santi; Reverse technology; Experimental image; Painting workshop; Optical and stratigraphic tests, Research limitations*

Introduction

This article presents the results of an authorial transdisciplinary research method aiming at an accurate reconstruction of Raphael Santi's (1483-1520) painting workshop in the Umbrian-Florentine period. This article was written based on the doctoral thesis [1] and additional technological research carried out by the author [2]. It is assumed that this period covers the years 1500-1508 and is associated with Raphael's early works, during which the artist most likely created works of art without external help. The author of the article hopes that multidisciplinary research will verify and complement existing knowledge about Raphael's painting workshop. The reconstruction of painting techniques and technology, as well as workshop methods and procedures were based first on existing knowledge and subsequently on the creation of an experimental image on which to conduct physico-chemical tests and compare the results with those obtained from an analysis of Raphael's original works. The research cycle also aims to assess the research capabilities of instrumental analysis.

It was assumed that the experimental image – which served as a painting simulator – would accurately reflect the structure of Raphael Santi's artwork and would allow optical and stratigraphic tests of a significant number of works by Raphael Santi [3]. The implementation of

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an experimental image provided research material identical to Raphael's paintings. This allowed a full comparative analysis on a wide range of themes. The image is inspired by Raphael's drawing from the Albertina in Vienna, which depicts the *Madonna and Child* holding a symbolic pomegranate. Raphael's sketch was drawn in black chalk on paper, is small in size and probably dates from 1504 [4].

Until recently, the implementation of an experimental image on which to conduct physico-chemical research was not possible. Only in the last few decades, new research has been able to shed light on many new aspects of the technique and technology of Raphael's painting [5, 6]. Analytical and optical research has revealed much insight into the details of Raphael's methods. Instrumental analysis revealed the widespread use of glass powder as an additive for oil paints [7], traces of the use of lead stylus [5]. It was also discovered that the role of tempera was significantly smaller than previously assumed, while the importance of the oil technique and related auxiliary materials has been underestimated [5]. The presence of lead-tin yellow in the imprimitura (eng. *primer*) has also been discovered [5], as well as the use of metallic bismuth as a pigment [6]. However, the results of physico-chemical studies of Raphael's works, obtained thanks to modern research devices and modern methodology, do not always result in unambiguous and conclusive findings [1, 3, 15].

Fig. 1. The experimental image of *Madonna and Child. S*ampling locations for stratigraphic tests: **1** - the upper part of the sky with the golden halo of *the Madonna*; **2** - the red dress of *the Madonna* (right forearm); **3** - the complexion of *the Child*; **4** - the grey consol

There are several restrictions to conservative methods and research instruments, especially in the field of stratigraphic research. One of the most common restrictions of stratigraphic research stems from the difficulties in establishing a successful visual demarcation of individual painting layers [1, 6]. The same problem of the lack of legiblity of each separate technological layer seems to apply to the layers of *gesso sottile*, especially the layers of adhesive insulation, which usually does not present as a separate layer in stratigraphic results [1, 6]. Many other materials – i.e. powder glass particles added to natural smalt or ultramarine – are difficult to identify through visual stratigraphic research, due to a similar morphology [7]. In

the case of instrumental research, restrictions refer to difficulties in detecting pigments, binders, and fillers. For example, while analyzing the complexion areas, a surprising lack of lead tin yellow was detected [5, 6], the addition of which seems necessary to obtain the right shade. This result may stem from the small amount of the pigment added compared to others. The author's assumptions about the limitations of stratigraphic and optical research were formulated on the basis of his own observations and experience accumulated during the technological reconstruction of the works of former masters, in addition to an analysis of the instrumental studies of Raphael's paintings and an in-depth study of literature on the subject of physico-chemical tests [3, 5, 6].

The first research goal is to perform – on a multidisciplinary test and a wider range than before – a detailed interpretation and reinterpretation of optical and stratigraphic tests of the original works by Raphael. The second research goal is the identification of potential limitations in the research methods and instruments used, which affect the current state of collective knowledge on Raphael's painting techniques and technology. At the same time, it is assumed that the identification of the limitations of the methods and instruments used will allow the indication of areas where unambiguous interpretation of the results may prove difficult or even impossible. The application of the proposed research method will allow for a deeper understanding than previously possible of the painting technique and technology, as well as the workshop procedures applied by Raphael during the Umbrian-Florentine period. This will also help to define the scope and possibilities of critical analysis of optical and stratigraphic tests of a significant number of works by Raphael Santi.

Materials and methods

The author assumed that the information necessary for a correct interpretation of the optical and stratigraphic tests of Raphael's original works can be obtained from additional tests carried out on a contemporary experimental image of *Madonna and Child*. In addition, it was assumed that tests on a contemporary experimental image would allow to identify potential limitations of physico-chemical tests – in both areas of research instruments, as well as in conservation methods. To prove the validity of both statements, the following research methods and materials were used:

- The creation of an experimental image in accordance with Raphael Santi's materials, technique, technology and method. Painting materials consist of pigments, fillers, oil and tempera binders, resins, adhesives, wooden support as well as natural brushes. The first development was the composition of *gesso sottile* and the method of its preparation on wood. In addition, the multifunctional role of glass powder was explained – as a significant addition to oil paints [2]. The author also developed the methods of making the underdrawings, which could have been used by the master of Urbino. A recipe was created for so-called *tempera grassa* and oil-resin binders, as well as intermediate varnishes. Methods for the acquisition of copper resin have been developed, which is characterized by a beautiful color and resistance to discoloration [1, 9]. The optimal proportions of Raphael's imprimitura (*imprimatura*) were reconstructed, as well as the workshop procedures related to its application. As part of technical and technological research, the author also restored the composition of the *Madonna and Child* complexion [13, 14].
- The observation of the experimental image in visible light (VIS). The image was taken with a Fujifilm X-T1IR camera for specialized applications with the ability to work with visible light. Halogen lighting.
- The infrared examination of the experimental image was performed with a Fujifilm X-T1 IR camera for specialized applications with IR capability up to 1000nm. Filters: up to infrared transmitting radiation above 780nm, 840nm and 900nm. Halogen lighting.

- X-ray examinations of the experimental image were performed with the company's X-ray machine Toshiba: rotating anode X-ray tube 9000rpm, two focuses 0.6×1.2 mm, maximum voltage 150kV, anode heat capacity 300kHU. Voltage range: 22-150kV every 1kV for radiography, 50-125kV for fluoroscopy. Lamp current range: 10-630mA for 19 different values for radiography, 0.5, 1, 2, 3.4mA for fluoroscopy. Minimum exposure time: 1ms.
- Microscopic research and observations: 4 stratigraphic samples of the experimental image were carried out on a Nikon Eclipse Ci UV / VIS microscope with an HBO Osram mercury burner light source and halogen lamp, Nikon Optiphot-2 with halogen lighting.
- A detailed description and interpretation of the results of the experimental image research was carried out to obtain the database necessary to conduct further comparative analyses.
- The results of the research on IR reflectography, X-ray and stratigraphy of the paint layers carried out on the experimental image were compared with the analogous research of the selected paintings by Raphael Santi.

Results and discussion

Experimental image test results

Infrared experimental image analysis generally did not reveal any trace of sketch transfer in the form of black dots (spolvero technique). Parts of the image revealed gray strokes, clearly indicating the use of lead stylus (Fig. 2). Unfortunately, the limitations of the research did not allow conclusive results to be produced.

The X-ray image of the experimental image revealed the presence of tempera underpaintings rendered in a traditional line method; the white lines/streaks (parts of the sky and the Madonna's coat) accurately represented brush strokes (Fig. 4). The complexion areas of *Madonna and Child* (not including the lightest parts) appeared on X-ray images as dark areas, most probably a consequence of the areas being composed of thinly applied layers of paint consisting of heavy elements – lead white, cinnabar.

Stratigraphic studies of the experimental image under visible light (VIS) as well as UV radiation have revealed numerous examples of lack of demarcation between the intermediate (individual) layers of paint. This phenomenon was observed in the areas of red, blue, and gray (Fig. 6, 8, 12). The identification of layers proved impossible during the testing of areas of *gesso sottile* (Fig. 6, 8, 10, 12), intermediate varnish (Fig. 6), as well as adhesive insulation which did not form a separate film on the stratigraphic section, appearing only as a slightly darker area (Fig. 6, 8, 10, 12).

Comparison of experimental image test results with test results on selected Raphael Santi paintings

Infrared, X-ray and stratigraphic tests of the paint layers were chosen for comparative analysis. These three research areas were chosen for their broad spectrum of testing which provides a large database for comparative analysis. Selected results of experimental image tests were compared with the results of the analogous research of the following paintings by Rafael: *St. Catherine of Alexandria, The Ansidei Madonna* and *The Mond Crucifixion.*

Comparative analysis of an infrared refectography of the experimental image and that of *St. Catherine of Alexandria* revealed sketch lines of similar thickness, saturation, and hatching. These similar results could imply Raphael’s use of the lead stylus for sketch work (Fig. 2, 3). In contrast, comparative research on sketch transfer was inconclusive due to limited research possibilities. Undoubtedly, the use of identical device with higher sensitivity would facilitate a more detailed infrared analysis on a larger scale. For this reason, underdrawing analysis is eligible for further research.

Fig. 2. The experimental image *of Madonna and Child*, infrared reflectogram: **1** - reveal the anterior contour of Madonna's left eyebrow arch; **2** - reveal the vertical auxiliary line and undrawing lines, made with a lead stylus; **3** - traces of the original contour and modelling of the folds of Madonna's dress, made with diluted natural shading; **4** - visible *pentimenti* of the finger; **5** - visible transfer of the drawing in the form of dark dots.

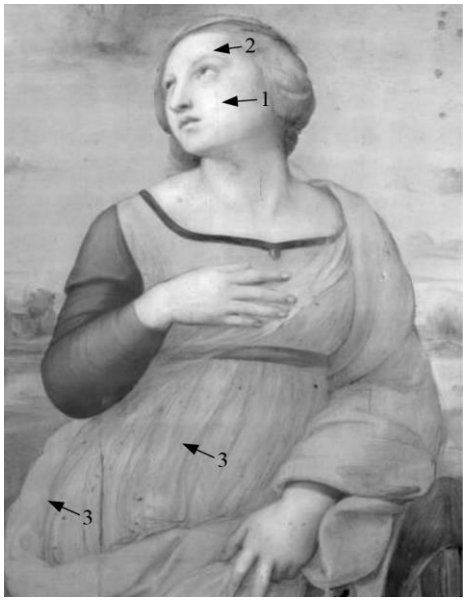

Fig. 3. Raphael Santi, *St. Catherine of Alexandria*, infrared reflectogram [16]: **1** - fine vertical auxiliary line - most likely lead stylus; **2** - traces of linear underdrawing - lead stylus (?); **3** - underdrawing probably done with a tool that is difficult to identify, leaving dark lines.

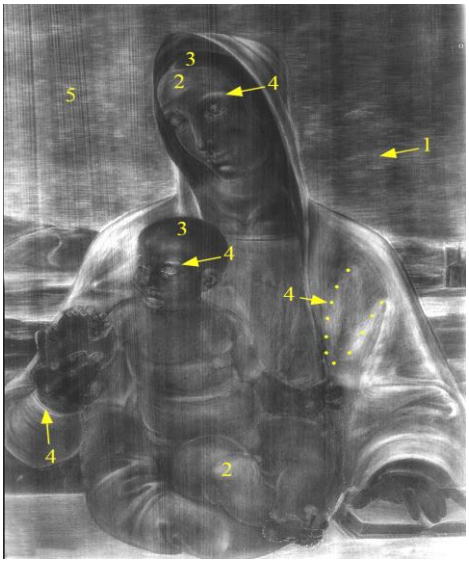

Fig. 4. The experimental image of *Madonna and Child*, X-ray radiography: **1** - a horizontal brushstroke visible on the sky - result of applying the hatching method and lead white; **2** – the light areas of *Madonna and Child*'s complexion are the effect of lead white, lead yellow and cinnabar; **3** - the dark areas of the hair are the effect of parts of the complexion that do not overlap and contain heavy elements; **4** – the author's corrections (pentimenti) of drapery; **5** - the granular structure of the linden boards.

Fig. 5. Raphael Santi, *St. Catherine of Alexandria*, X-ray radiography [16]: **1** - the sky as a homogeneous white area with a different structure compared to the analogous part of the sky in the experimental image - the effect of applying a large amount of lead white; **2** - a small white area of the complexion is a consequence of a thicker layer of lead white, cinnabar; **3** - slightly painted dark areas of complexion; **4** - author's corrections (pentimenti) of drapery; **5** - the granular structure of the poplar boards.

Comparative analysis of X-ray images showed that tempera underpaintings were not applied by Raphael in the traditional Italian technique, but rather as an area of applied thin tempera. This conclusion was based mainly on the analysis of the blue areas of the paintings, which most often were painted with azurite with a tempera binder. The best evidence of this is the variety of structure in the blue areas of the experimental image (the sky and the Madonna's robe) in the form of white lines and stripes clearly mimic individual brush strokes (Fig. 4); while parts of sky in *St. Catherine of Alexandria* by Raphael (Fig. 5) appeared on X-ray as areas with definitely lighter spots, proving that Raphael painted with fairly broad strokes of a flat brush and several layers of washed white azurite and natural ultramarine. Especially the X-rays of the lower tracts of *Saint Catherine of Alexandria* compared to analogous parts of the experimental image are whiter, which may indicate that Raphael was using many more layers of paint containing large amounts of lead white, which blocks X-rays.

The X-ray results confirmed the speculation that the creation of Raphaelian complexion involved the application of a few relatively thin layers of blush containing mainly heavy elements, such as lead white and cinnabar. This conclusion justifies the similarity of the X-ray results of the complexion structures in both research paintings. Area of compexion on the experimental image as well as on the original, appeared as characteristic dark spots (Fig. 4, 5). The Raphaelian areas of red robes, greens, and complexions, usually attempted in an oil or oil-resin technique appear on the X-ray as grays gradations that gradually shift to white in the lightest areas of the painting. This finding is analogous to the results regarding the experimental image (Fig. 4, 5).

Comparative analysis of stratigraphic samples of Raphael's paintings do not allow a conclusive demarcation of the intermediate (individual) layers of paint, gesso sottile and adhesive insulation. This is evidenced by the fact that all Raphaelian stratigraphy test samples from areas of red, blue and gesso sottile that were observed in visible light (VIS) and UV radiation, form one thick layer of colour – analogous tests on the experimental image give similar results (Fig. 6, 8, 10, 12, 7,11).

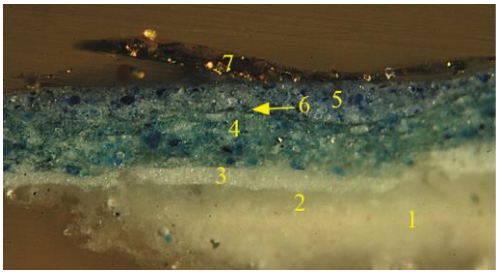

Fig. 6. The experimental image of *Madonna and Child*. Paint cross-section from the upper part of the sky with the golden halo of *the Madonna*. Microphotography in visible light, sample 1: **1** - off-white gesso sottile; **2** - the area of adhesive isolation; **3** - the layer of *imprimitura* (lead white, lead-tin yellow, lead glass); **4** - the layer of blue (azurite, lead white) – without delimitation of 2 intermediate layers; **5** - the blue layer (natural ultramarine, lead white, lead glass), no delimitation of 3 intermediate layers; **6** - the layer of intermediate varnish; **7** - the golden layer of the shell.

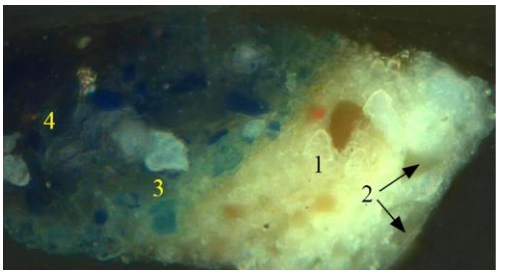

Fig. 7. Raphael Santi, *The Ansidei Madonna*. Paint cross-section of area of dark blue drapery of *the Madonna*. Microphotography in visible light (magnification 400×) [16]: **1** - the layer of *imprimitura* (lead white, lead-tin yellow, lime-soda glass); **2** - large particles of lime-soda glass; **3** – the light blue layer (azurite, lead white); **4** - the dark blue layer (natural ultramarine, lead white, lime-soda glass), probable inability to distinguish the intermediate layers.

Both stratigraphic samples of organic reds have a homogeneous structure (Fig. 8, 9). Blue layers – containing mainly azurite and natural ultramarine – share a similar morphology and particle size (Fig. 6, 7).

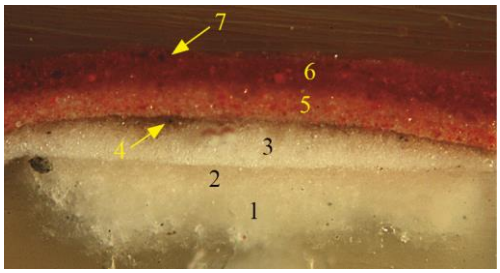

Fig. 8. The experimental image of *Madonna and Child*. Paint cross-section from red robe of Madonna (right forearm). Microphotography in visible light, sample 2. **1** - off-white gesso sottile; **2** - the area of adhesive isolation; **3** - the layer of *imprimitura* (lead white, lead-tin yellow, lead glass); **4** - ochre-transparent underpainting layer (natural shade, lead glass); **5** - the light red layer (cinnabar, madder, lead white, lead glass), no delimitation of 4 intermediate layers; **6** - the dark red layer (madder, lead glass), no delimitation of 4 intermediate layers; **7** - a dark red layer (carmine + lead glass).

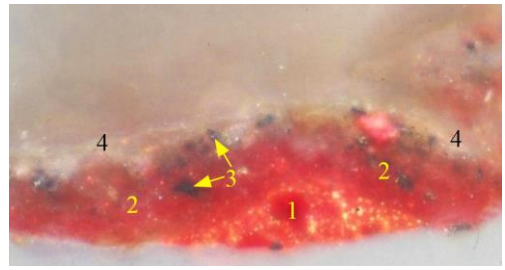

Fig. 9. Rafael Santi, *The Mond Crucifixion*. Paint cross-section from red robe of *St. John the Evangelist*. Microphotography in visible light (magnification 320×) [16]: **1** - the light red layer (cinnabar, madder, lime-soda glass?); **2** - the layer of organic reds (madder or kermes?), intermediate layers cannot be distinguished. **3** - the particles of organic black; **4** - the layer of unknown composition - pentimenti (?).

Glass particles are illegible in both the organic red samples and imprimitura observed in visible light. However, glass particles were detected under UV radiation but only in the original sample. This most likely stems from the fact that Raphael used larger fragments of glass [6]. All analyzed layers of imprimitura sampled from the experimental image range between 20 to 50 microns – identical to those of Raphael [6]. The similarity in structure and colour between the two juxtaposed samples was best seen in areas of the complexion.

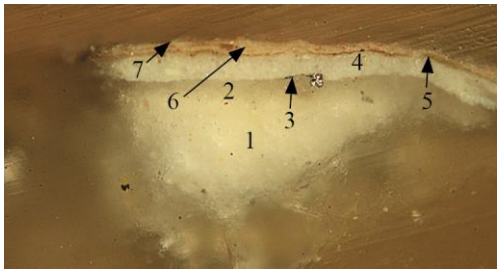

Fig. 10. The experimental image of *Madonna and Child*. Paint cross-section of the Child's complexion. Microphotography in visible light, sample 3. **1** - off-white gesso sottile; **2** - the area of adhesive isolation; **3** – the layer of underdrawing (lead stylus); **4** - the layer of imprimitura (lead white, lead-tin yellow, lead glass); **5** - ochre-transparent layer of underpainting (natural shade, lead glass); **6** - the layer of pink (iron red, cinnabar, lead white, lead-tin yellow, lead glass); **7** – the layer of pink (iron red, cinnabar, lead white, lead-tin yellow, lead glass).

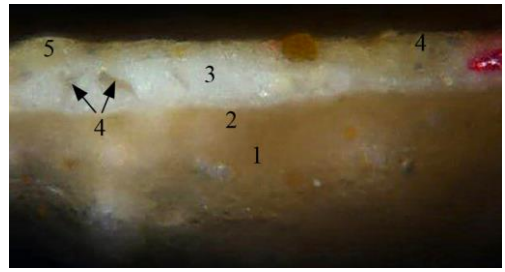

Fig. 11. Raphael Santi, *The Mond Crucifixion*. Paint cross-section of complexion of the crucified the Christ [16]: **1** - layer of white gesso sottile; **2** - the area of adhesive isolation; **3** - layer of imprimitura (lead white, lead-tin yellow, lime-soda glass); **4** - a large particles of lime-soda glass; **5** - the layer of a pink complexion (composition unknown).

The similarity in structure and colour between the two juxtaposed samples was best seen in the complexion areas. There are, however, fundamental differences between the particle size of powdered glass added to paints (Figs. 10 and 11). A visual (VIS) comparison of gesso sottile layers showed similarities between both samples in the areas of adhesive insulation, which proves that Raphael also used a layer of skin glue placed on a gesso sottile base (Figs. 10 and 11). The need to add adhesive insulation on absorbent gesso sottile was noted in the author's

technological research conducted by Łukasz Nawrocki before the creation of the experimental image.

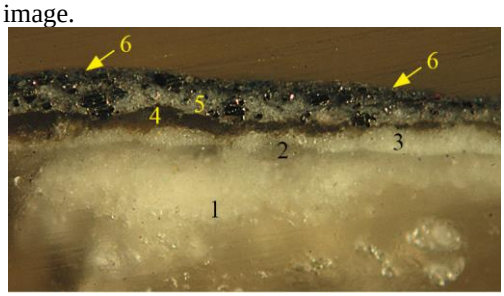

Fig. 12. The experimental image of *Madonna and Child*. Paint cross-section from a grey console. Microphotography in visible light, sample 4: **1** - off-white *gesso sottile*; **2** - the area of adhesive isolation; **3** - the imprimitura layer (lead white, lead-tin yellow, lead glass); **4** - the ochre-transparent underpainting layer (natural shade, lead glass), no delimitation of 2-3 intermediate layers; **5** - the light grey layer with large metallic particles (bismuth, lead white, lead glass), no delimitation of 2-3 intermediate layers; **6** -the grey-blue layer (madder, azurite, lead white, lead glass, vine black).

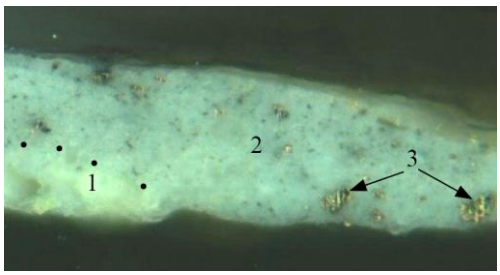

Fig. 13. Raphael Santi. *The Ansidei Madonna.* Paint cross-section of the light grey part of the architecture. Microphotography in visible light [16]: **1** - the imprimitura layer (lead white, lead-tin yellow, lime-soda glass); **2** - a lighter grey layer (lead white, bismuth, lime-soda glass), probable a lack of present intermediate layers; **3** - bismuth particles with characteristic luster.

Conclusions

Thanks to multidisciplinary testing and reverse technology, the author's research method has emerged, based on a comparative analysis of a reconstructed experimental image (contemporary painting simulator) and the original paintings by Raphael. This method facilitates a wider range of research so far impossible. The proposed analysis method is particularly effective in stratigraphic, X-ray and infrared research.

Stratigraphic tests of Raphael's images were used to identify paint layers, adhesive layers, and particle morphology of pigments and fillers. X-ray comparative analysis was used to gather information on the technique and structure of Rafael's paintings – in particular areas of blue and complexions. Infrared tests were not able to provide conclusive evidence to support the thesis of Raphael's modified method of pouncing technique (spolvero). Although the inability to detect traces of black spots would imply an inadequacy of the research instruments.

The multidisciplinary analysis of a reconstructed experimental image – whose components and structure were well known - offered the possibility to obtain accurate information on the effectiveness of instrumental tests in determining the material and structure of a work of art. Thanks to the use of this research method, the existence of permanent limitations in stratigraphic studies was identified – specifically, an inability to differentiate between technological layers, especially intermediate (individual) layers of paint, adhesive insulation and gesso sottile. The identification of potential restrictions and limitations of conservation methods and research instruments helped to identify areas where a conclusive interpretation of the research on Raphael's paintings is difficult, even impossible**.** The proposed research method is not without limitations. Not all results of the comparative analysis proved to be conclusive or error-free. In particular, the fluorescence of stratigraphic samples taken from the experimental image and from Raphael's painting may vary to some extent. The resulting differences may stem from the use of different research devices, as well as from the significant age difference of the experimental image and the original painting. The comparative analyses suggest that applying identical devices and parameters to both categories of test samples would lead to optimal research and more conclusive and informative results.

Due to the wide range of issues raised, this area of research requires further study and development. An estension of this area of research with additional experimental images, including reconstructions and scientific conservation copies, would allow the compilation of a database against which future tests could be verified on a larger scale to authenticate conservation knowledge on the painting techniques and technology of Rafael Santi's workshop.

This method does not violate any of the rules and regulations for the protection of monuments. It does, however, shed light on the material structure and the principles according to which the original image was constructed. This way of conducting research can also be helpful in determining the authenticity and authorship of works of art, bringing a new aspect to the discussion involving conservators, art historians and artists.

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References

[1] Ł. Nawrocki, *Reconstruction of Raphael Santi's painting workshop,* **PhD Thesis**, Nicolaus Copernicus University in Toruń, 2018.

[2] Ł. Nawrocki, *Multifunctional use of glass in Raphael Santi's paintings,* **Wiadomości Konserwatorskie – Journal of Heritage Conservation**, **61**, 2020, pp. 145-157.

[3] D. Pinna, M. Galeotti, R. Mazzeo, **Scientific Examination for the Investigation of Paintings:** A handbook for conservators-restorers, Eu-ARTECH, 2009.

[4] H. Chapman, T. Henry, C. Plazzotta, **Raphael: from Urbino to Rome**, National Gallery Company, London, 2004, pp. 148-149.

[5] A. Roy, M. Spring, C. Plazzotta, *Raphael's Early Works in The National Gallery: Paintings before Rome*, **National Gallery Technical Bulletin, 25**, 2004, pp. 4-35.

[6] A. Roy, M. Spring, **Raphael's Painting Technique. Working Practices before Rome**, Proceedings of the Eu-ARTECH workshop, Nardini, 2007.

[7] M. Spring, *Colourless Powdered Glass as an Additive in Fifteenth and Sixteenth Century European Paintings,* **National Gallery Technical Bulletin**, **33**, 2012, pp. 4 -26.

[8] B. Mottin, E. Martin, E. Laval, *Raphael's Paintings in French Museums: Some New Results from Recent Technical Investigations,* **Raphael Painting Technique. Working Practices before Rome,** Proceedings of the Eu-ARTECH workshop (ed. A. Roy, M. Spring), Nardini, 2007, p. 14.

[9] R. Woudhuysen-Keller, P. Woudhuysen., *Thoughts on the Use of the Green Glaze colled 'Copper resinate' and its Colour-changes*, **Looking Through Paintings**: **The Study of Painting Techniques and Materials in Support of Art Historical Research,** (editor Hermens E.), Archetype, London, 1998.

[10] D. Bomford, **Art in the making. Underdrawings in Renaissance Paintings**, National Gallery Company, London 2002.

[11] J. Dunkerton, N. Penny, *The Infra-red Examination of Raphael's 'Garvagh Madonna',* **National Gallery Technical Bulletin**, **14**, 1993, pp. 7-21.

[12] A. Roy, **Artist's Pigments. A Handbook of Their History and Characteristics**, National Gallery of Art, Washington**, 2**, 1993, pp. 148-158.

[13] E. Barletti, A. Bisceglia., **Raffaello a Pescia. Un episodio rinascimentale, un territorio, una città,** Leonardo Libri srl, Firenze, 2023.
[14] M.P. Merrifield, **Original Treatises on The Arts of Painting**, New York – Dover Publications, 1967.
[15] T.S. Kuhn., **Struktura rewolucji naukowych**, Aletheia, 2020.
[16] ***, http://**cima.ng-london.org.uk/documentation**, [accesed on 15.08.2023]

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