

Radiography & Raman Spectroscopy in the Analysis of Vermeer Painting Techniques



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Vermeer: “The Sphinx of Delft”



Personal Life

- Born in 1632 as Johannes Reijniersz Vermeer in Delft, Netherlands
- Baptized in the Protestant Church, later converted to Catholicism upon marrying his wife, Catherina
- The two had ten children and lived together at Oude Langendijk until his death at the age of 43



As An Artist

- Was the master painter of Delft and specialized in domestic genre scenes
- Completed only a small number of paintings a year, selling to several wealthy patrons, many of whom were local
- Used expensive and rare pigments like natural ultramarine and lapis lazuli
- Some theorists speculate that he used a camera obscura when painting
- Despite his current success, Vermeer struggled as an artist during his life and was in debt upon his death
- Vermeer came back into the public light 100 years after his death with the article by art critic Thoré Bürger

Hans Van Meegeran

- Vermeer was once again thrust into the public light in the mid-20th century with the reveal of art forger Hans Van Meegeran



Radiography & Raman Spectroscopy



Radiography

- use of X-rays to view unseen or hard-to-image objects with an x-ray photon source



Raman Spectroscopy

- studies the inelastic scattering of monochromatic light, usually from a laser in the visible, near infrared, or near ultraviolet range. The laser light interacts with photons or other excitations in the system, resulting in the energy of the laser photons being shifted up or down. The shift in energy gives information about the photon modes in the system.
- can be performed without any contact with the studied artifact (non-destructive)

Analysis



The Use of X-Rays

- In *Girl with a Pearl Earring*, the image shows a pinhole above the girl's eyebrow; this is the vanishing point of the picture
- Pinholes are also visible at the vanishing points of Vermeer's interior scenes and of *A Young Woman Seated at the Virginals*
- No preparatory drawings of Vermeer exist, yet Vermeer's paintings include a sophisticated use of perspective
- This fact and the pinholes suggest that Vermeer inserted a pin with a string attached to it and used the string to correct his orthogonals (lines that meet at the vanishing point) and thus to refine his perspective



The Use of an Infrared Reflectogram

- Used to reveal clues as to what the underpainting looked like
- Underpainting = colorless version of the painting used by the artist to fix such things as composition and the distribution of light
- The Underpainting was the first stage of painting for Vermeer and his contemporaries

Young Woman with a Water Pitcher

- Infrared reflectogram suggests that in the original version, the map on the wall is much larger, there is a chair in the foreground, the brim of the basin is larger, and the basin is of a slightly different shape



Woman with a Pearl Necklace

- Infrared reflectogram suggests that the original version had a painting on the wall behind the figure, an instrument on the chair in the foreground, and exposed floor tiles



A Young Woman Seated at the Virginals

- Infrared reflectogram suggests that in the original version, the skirt continued further up and the shawl was shorter
- Important because the lower portion of the shawl is what has provoked the most negative criticism about the painting and constitutes evidence that the painting is not Vermeer's
- The reflectogram, the fact that the handling of the lower part of the shawl is not typical of Vermeer, and the presence of two layers of lead-tin yellow in this area indicate that this part of the painting may have been done by a different hand some years after its completion by Vermeer

Pigment Analysis

- Vermeer's known palette: azurite, carmine, charcoal black, green earth, indigo, ivory black, lead white, lead-tin yellow, madder lake, red ocher, smalt, ultramarine, umber, weld, verdigris, vermillion, yellow ocher
- Most prominent pigments found in *A Young Woman Seated at the Virginals* were lead-tin yellow, green earth, and ultramarine - all are typical of Vermeer
- The use of ultramarine to enhance the cream tones in the wall behind the woman, an almost subliminal effect, is also typical of Vermeer

Canvas analysis of *A Young Woman Seated at the Virginals*

- Canvas is course – the same kind of canvas is used in *The Lacemaker*, a painting attributed to Vermeer on the same scale
- In both paintings the thread count in each direction is the same; this is highly unusual
- X-rays show irregularities in a fabric's weave
- The canvasses of the two paintings are shown to be similar in this respect; this almost certainly means that they were cut from the same bolt of fabric
- The combination of pigments in a fabric is visible under a microscope
- Pigment combinations in the two paintings' canvasses are the same and also match two other paintings of Vermeer
- Particle sizes in the canvasses of the two paintings are the same

Conclusion

The importance
Radiography and
Raman Spectroscopy
for the future of
preventing art
fraud....

Importance of Radiography and Raman Spectroscopy in Art Analysis

- Many of Vermeer's paintings have now been proven to be real and analysis gives clues as to his technique and pigment use
- Radiography and Raman spectroscopy are rapidly becoming preferred as an essential tool in the examination of works of art, especially because of their nondestructive nature. Before any restoration efforts are undertaken, practitioners must scrutinize subjects at intensely detailed levels in order to make key observations that will uncover not only the history of the piece, but also structural and qualitative information that is essential for its preservation and restoration. Radiographic imaging is applied to the examination of virtually all media including paintings, sculptures, woodworks, engravings, pottery, paperwork, bronze and iron, among others