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A portrait by Philip Otto Runge? Visualizing modifications to the painting using synchrotron-based X-ray Fluorescence Elemental Scanning

by Matthias Alfeld, Koen Janssens, Karin Rickers, Barend Thijsse, Joris Dik

Abstract

“Pauline im Weissen Kleid vor sommerlicher Bauernlandschaft” is an early 19th century painting showing a seated lady against a rural background. Based on stylistical arguments the painting was first attributed to Philip-Otto Runge in the 1980’s. The figure was identified as Runge’s wife Pauline Bassenge. However, the painting had not been included in the authoritative *catalogue raisonné* of Runge of the mid 1970’s. The painting and its attribution have remained a source of debate within the community of Runge scholars.

Here, we present the outcome of a technical analysis of the painting. X-radiography revealed the presence of multiple pentimenti in the portrait. Our analysis with scanning X-ray Fluorescence Spectrometry visualized the initial version of the portrait in greater detail than possible using conventional imaging methods. In that earlier version, the lady gazes directly at the viewer, with loose, blond hair, wearing a more revealing dress. We discuss this dramatic alteration of the painting’s appearance in its historical context and suggest a possible connection between the initial version of the painting and a drawing by Philip Otto Runge.

Introduction

Philip-Otto Runge is regarded as one of the foremost painters of German Romanticism, second only to Caspar David Friedrich. Besides painting, Runge practiced the art of papercutting, wrote poetry, contributed stories to Grimm’s fairy tales and published new ideas on colour theory, which included the first three-dimensional colour system. Runge thus pioneered the 19th century notion of a *Gesamtkunstwerk*, combining several art forms to express artistic ideas. He is most known, however, for his work as a portraitist, which includes masterpieces as *Die Hülsenbeckschen Kinder* as well as several portraits of the artist’s wife *Pauline Bassenge*. These include *Pauline im grünen*

Kleid (1805), *Pauline im Weissen Kleid* (1805), *Wir Drei* (1805, burnt 1931) and *Pauline mit dem Sohn Sigismund* (1807).

Whether the present painting (**figure 1**) is part of that series remains a source of continuing debate in the Runge community. The artwork first surfaced in 1988 in an article by Cornelia Jagt, in which she readily attributes the painting to Runge and dates the work to the spring of 1804, just after Runge's marriage to Pauline.¹ The arguments for this attribution are mostly of stylistical nature, based on comparison with Runge's known oeuvre. In addition, Jagt identified possible references to this work in Runge's extensive correspondence. A further, compelling argument for the paintings' early 19th century origin was found in the figure's clothing. The white dress with purple belt was unambiguously identified as North German fashion typical for the years 1801-1806.

However, the painting had not been included in the earlier catalogue raisonné on Runge from 1975.² Träger knew the work, but seems to have left it deliberately unmentioned in his authoritative monograph. The painting's attribution is currently rejected by several Runge scholars. The painting's date and the identification of the seated lady as *Pauline* are equally disputed.

So far, the painting's attribution was discussed on the basis of *connoisseurship* and literary evidence. Material analysis of the work had not been considered in previous discussions. In collaboration with the owner of the painting it was therefore decided to carry out a technical study. It was hoped that this would provide further clues for the painting's origin.

Methods and techniques

Close visual inspection of the painting showed indications of hidden paint layers, suggesting heavy alterations of the painting's composition. This prompted the owner of the painting to perform an x-ray radiography (XRR). This radiography revealed different *pentimenti* in the painting, mostly in the area around the head, neck and shoulders (figure 1). However, the x-rays were difficult to read, because of the presence of broad horizontal strokes, which are probably due to the application of a lead white containing ground on the canvas.

Pigment analysis was carried out by Dr. H. Kühn, revealing the presence of a typical, early 19th century painting palette.³ Pigments included lead white, Schweinfurther Grün, Naples yellow, vermilion, cobalt blue, as well as various earth pigments.

Vermillion (containing mercury, Hg as characteristic element) and Naples yellow (containing antimony, Sb) are known to be excellent tracers for the visualization of hidden paint layers using synchrotron-based x-ray fluorescence spectrometry (SR-XRF), described earlier in this journal⁴ and elsewhere.⁵ In view of the poor image quality of the conventional radiographs, and given the larger question at hand, we therefore decided to bring the painting to beamline C at DESY, Hamburg, Germany to acquire SR-XRF elemental scans (**figure 2**).

Use was made of the white radiation created in a bending magnet of the second generation synchrotron ring DORIS III. From this white beam an energy band of 35.2 keV with 1% $\Delta E/E$ was selected via a Ni/C multilayer monochromator. Contrary to previous experiments⁵ the painting was too large to be positioned on the experimental table and was thus mounted on a motor stage positioned slightly behind the normal experimental table, so the beam had to cross a distance of 180 cm after leaving the vacuum system of the beamline in air, before encountering the painting. However, due to its high energy the intensity loss is calculated to be less than 10%.

The surface of the painting was scanned sequentially with a beam collimated to 490 μm (h) \times 300 μm (v) by a pair of slits positioned 60 cm before the painting. The fluorescence radiation emitted from the excited spot on the painting was collected with two Vortex-EX60 and two Vortex-EX90 Silicon-Drift-Detectors (SDD) from SII Nanotechnology. The detectors were positioned in an angle of 40, resp. 57 degrees (Vortex-EX60) and of 27, resp. 35 degrees (Vortex-EX90) to the incident beam 15 cm away from the painting. The detectors were equipped with 2 mm thick Ta collimators that featured an opening of 3 mm. The analog detector output was processed with a XIA-XMAP Multi-Channel-Analyzer (MCA) to obtain digital energy dispersive spectra of the collected fluorescence radiation, as seen in **figure 3**. The painting was continuously moved through the beam and every second a spectrum was saved. This corresponds to a pixel size of 1 mm.

For the evaluation, the spectra acquired by the four detectors were added up for each pixel and the elemental net signals without contributions from scattered primary radiation, spectral interference, partial detected photons and electronic noise were determined with the programme package AXIL.⁶ From the net intensities elemental distribution maps were assembled, that were corrected for fluctuations in the primary beams intensity by normalization to the intensity of the incoherently scattered primary radiation (Compton scattering).

Results

Figure 4 shows the different elemental distribution images of the scanned area, including cobalt (Co), mercury (Hg) and antimony (Sb). The latter element proved to be dominant in the yellow earrings of the lady, suggesting the use of lead antimonate yellow, also known as Naples yellow. Note how the antimony map clearly reveals loose hair curling down over the lady's shoulder. In addition, antimony is present in the fleshtone of the unmodified facial features. Nose, mouth, chin and cheeks in the Sb image perfectly coincide with the surface painting, from which we can conclude that it appears to have been left unchanged. The original dress had an open V-neck, which exposed more of the figure's skin as seen in the Sb distribution as well as on the x-ray radiograph. The fact that antimony was found in the incarnates of the surface painting suggests that Naples yellow was only present in minor quantities, without having a strong yellow effect on the typical pinkish hue of the fleshtones. We assume that the Naples yellow in the original hair would have been present in equally low concentrations. Therefore, the original hair colour need not be bright blond, but it would certainly have had a lighter colour than the dark hair of the figure that is now visible.

One of the most striking observations concerns the direction of the lady's sight. While the lady in the surface version sensually looks aside, her eyes in the initial composition seem to gaze directly at the viewer (**figure 5**). Note how the eye white in the Sb image suggests a centered position of the irises, looking straight at the viewer. The eye white of the surface version is positioned differently, and shows strong XRF signals of cobalt. Apparently, the lead white in this area had been mixed with cobalt blue. Such a mixture does not occur elsewhere in the painting, which strengthens the idea that the position of the eyes has been changed later on.

Furthermore, the lady's hair had been tied up with a purple ribbon, consisting of a mixture of cobalt blue and vermillion. Interestingly, the width of this ribbon as well its elemental composition perfectly match the purple belt over the lady's waist, which has been left unchanged. Note that the strongest XRF signals of cobalt and vermillion occur are fairly complementary positions, which must be caused by different blueish and reddish hues in the purple ribbon. This suggested the appearance of a *changeant* fabric [ref ?], with different colours for weave and weft threads, creating a playful tonal effect.

When the Sb, Co and Hg maps are employed to adapt some of the areas of the original painting, the (subjective) colour reconstruction shown in Fig. 5 is obtained.

Discussion

We have shown that below the sensual, introvert and conservatively dressed portrait lays a much more daring rendering of the same lady with a more revealing dress and loose, curly blond (?) hair, gazing directly at the viewer. We can only guess as to the reason and date of this metamorphosis. Was it the artist who changed his mind? Did the portrayed lady herself deem the original version too audacious? Or has the painting been purged by later owners? These questions will probably never be answered. The distinctive head dress with its characteristic ribbons on the other hand, need some further discussion.

During the aftermath of the French revolution, there was a strong tendency to imitate classical antiquity. In the years of the French *Directoire* (1795-1799) the ancient Greek society was highly admired for its democratic, civilian character. The fine arts, the decorative arts as well as architecture saw a strong revival of classical ideals. Such neoclassical tastes also had a strong impact on fashion and notably on hair styles. On the European continent various hair cuts appeared under such terms as ‘à la Vénus’ or ‘à l’Egyptienne’.⁷ This tendency to follow classical hairstyles is shown in **figure 6**, where a *coiffeur* models a wig after Greek sculpture. A popular hair style was the so-called *Titus cut* (*Tituskopf* in German) which is nicely demonstrated on Runge’s *Die Huelsenbeckschen Kinder*. The eldest daughter is shown with short, thick curls that are combed into the child’s face. Interestingly, the purple hair bands in the initial version of our painting are equally derived from classical examples. Such hair ribbons were known as *taenia* (latin for tape) and were used to tie up the hair, occasionally in double bands, as seen in our portrait. In that sense the original version of the painting dovetails with fashion trends of the early 1800’s. This finding is in full support of Cornelia Jagt’s date of the painting to the years 1801-1806 based on the lady’s costume.

What remains puzzling though, is the sudden change of hair colour. Why would the lower lady have (more) blond hair, while the hair colour of the surface painting is evidently dark brown or black? While this could be an arbitrary choice of whoever modified the painting, there may also be a historical explanation. One of the leading fashion magazines in early 19th century Germany was the *Hamburgisches Journal der Mode und Eleganz*. This contemporary magazine informs us that it was fashionable for

ladies to change their hair colour by wearing different wigs at different times of the day. In its 1802 edition, the *Journal* states the following about ladies' wigs:

*Ihr Kopfputz wird dreimal täglich verändert und besteht in drei verschiedenen Perücken, nämlich in einer schwarzen, die des Morgens, einer braunen, die des Nachmittags, und einer blonden, die des Abends.*⁸

Could it therefore be possible that the hidden lady would have worn such a conspicuous, blond evening wig, but that she was overpainted with a more demure, dark coloured wig for the morning?

With these new insights in the original appearance of the portrait, a renewed confrontation with Runge's existing oeuvre seems worthwhile. We noticed a striking resemblance with a drawing by Runge dated to the early 1800's (**figure 7**). The drawing is now lost and only known through photography. Traeger tentatively identified the young lady on the drawing as *Maria Elisabeth*, the artist's eldest sister. Stylistically it is closely connected to a number of drawing of classical heads by Runge such as *Antoninus* and *Juno Ludovici*. The figure in the drawing wears a white dress with an open V-neck. What is more, her hair is double-tied with a *taenia*, identical in width and style to the covered portrait in this painting. The viewing angle in both works is different, which complicates a meaningful comparison of the physiognomy. Given the compelling similarities, however, could both works of art be related? Did the drawing possibly serve as a preparatory study for the present oil painting? Are there other connections between the original version of the painting and Runge's known oeuvre? These questions now deserve the attention of the Runge scholarly community as much as the painting should be given a fresh consideration.

References

¹ C. Jagt, "Pauline im weißen Kleid vor sommerlicher Baumlandschaft" : ein wiederentdecktes Bildnis Philipp Otto Runges", in: *Pantheon*, vol. 46, 1988, p. 106-116

² J. Träger, *Philipp Otto Runge und sein Werk: Monographie und kritischer Katalog*, Prestel, Munich, 1975

³ private report by Dr. H. Kühn, dated [XX.XX.XXXX](#)

⁴ J. Dik, A. Wallert, G. van der Snickt, K. Janssens, K. Rickers, "Silverpoint underdrawing? A Note on its Visualization with Synchrotron Radiation based X-ray Fluorescence Analysis", *Zeitschrift fuer Kunsttechnologie und Konservierung*, 2008, vol. 24, p. 382-385

⁵ J. Dik, K. Janssens, G. van der Snickt, L. van der Loeff, K. Rickers, M. Cotte, "Visualization of a Lost Painting by Vincent van Gogh Using Synchrotron Radiation Based X-ray Fluorescence Elemental Mapping", *Analytical Chemistry*, 2008, vol. 80, p. 6436-6442

⁶ Vekemans, B.; Janssens, K.; Vincze, L.; Adams, F.; Van Espen, P. "Analysis of X-ray Spectra by Iterative Least-Squares (AXIL) – New developments", *X-ray Spectrometry*. 1994, 23, 278–285.

⁷ Hanna Plutat-Zeiner, "Französische Revolution, Directoire und Empire (1789-1820)", in : Maria Jedding-Gesterling, Georg Brutschner (Hrsg.), *Die Frisur: Eine Kulturgeschichte der Haarmode von der Antike bis zur Gegenwart*, München, 1988, p. 149-164

⁸ cited from Plutat-Zeiner, p. 154: *Hamburgisches Journal der Mode und Eleganz*, August 1802, s. 325

Figure 1

left: Philipp Otto Runge, Pauline im weissen Kleid vor sommerlicher Bauernlandschaft (?), 1804, oil on canvas, 105,7 x 85,2 cm, private collection, Germany; right: x-ray radiography



Figure 2

Setup of the painting in hutch of beamline L at DESY, showing the position of the painting, slits, and detectors and x-ray pencil beam

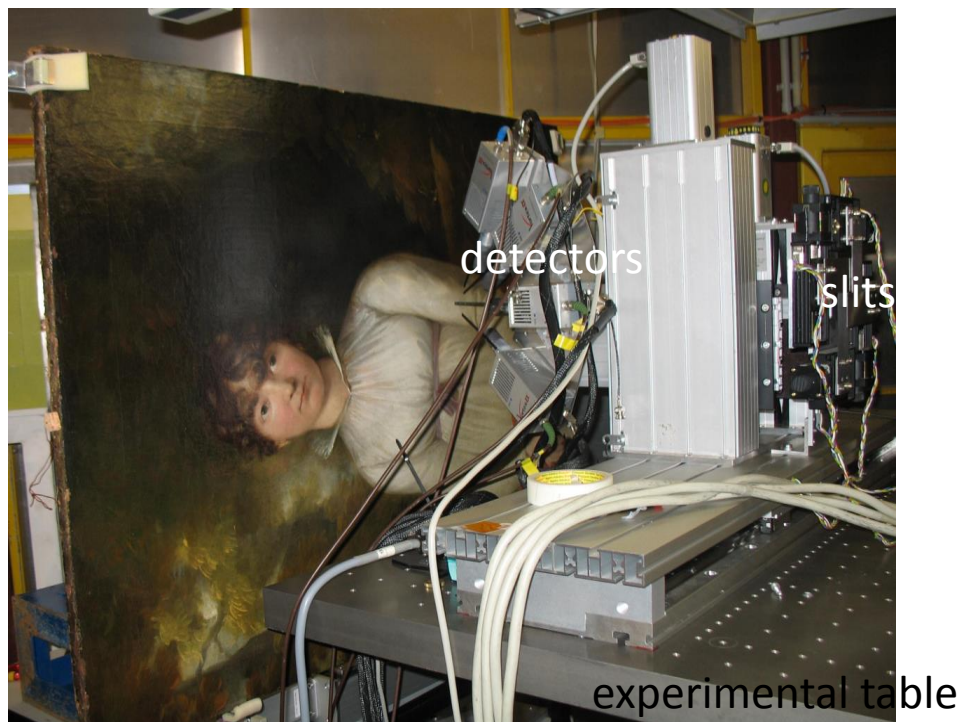


Figure 3

Summed spectrum of the four detectors with major elements in the painting. The background under the Fe, Co, Hg and Pb signals was subtracted via AXIL.

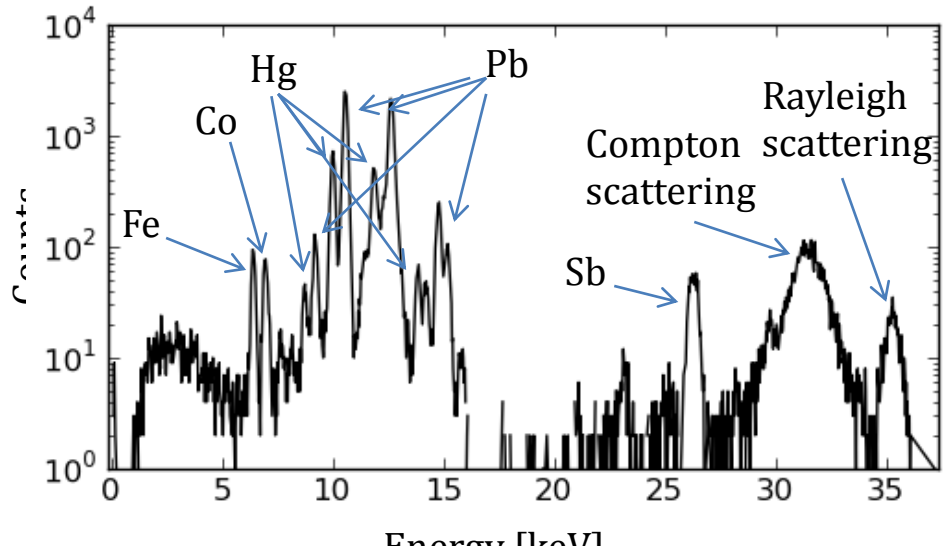


Figure 4

Elemental distribution showing the distribution of cobalt blue (Co), vermilion (Hg) and Naples yellow (Sb).

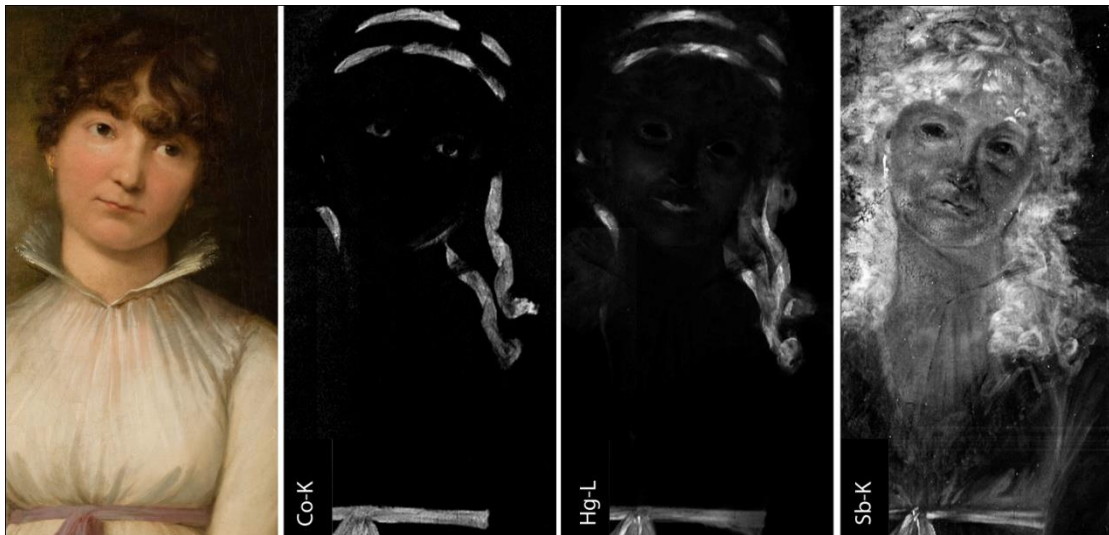


Figure 5

(left) Details of figure 1, showing the figure's eyes in the final version, the more centered position of the iris in the distribution of antimony (Sb) in the middle, and a digital reconstruction of the eye position according to the Sb distribution below. (right) Colour reconstruction of the original portrait.

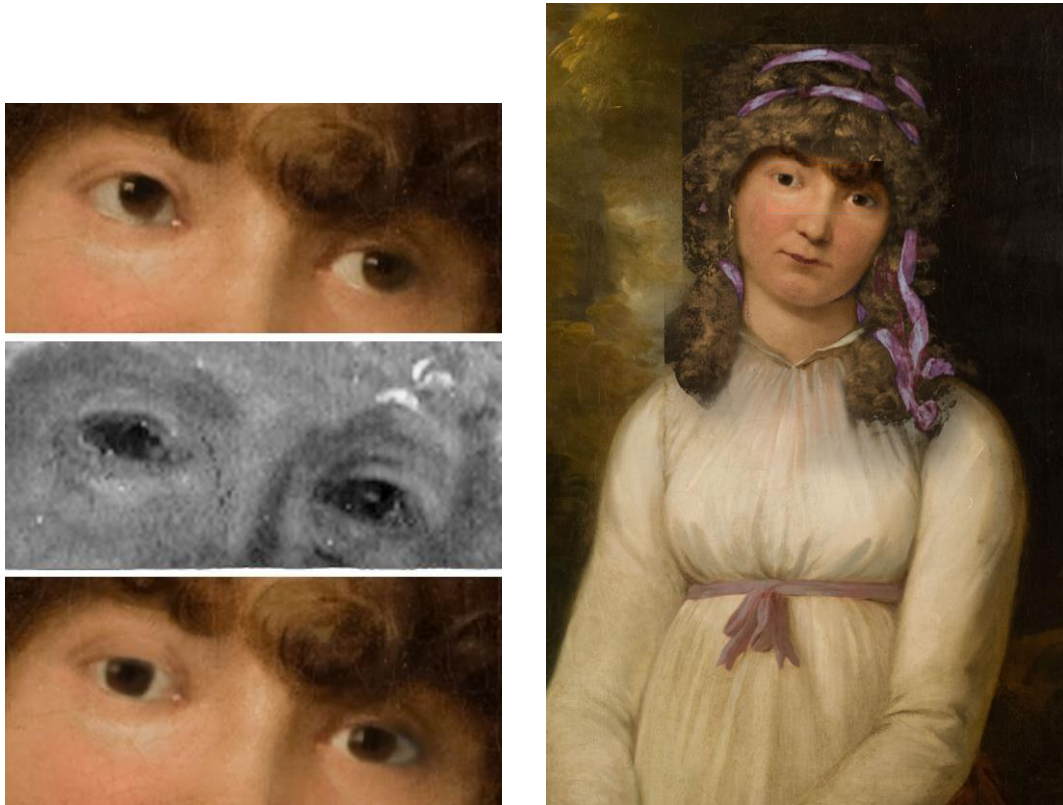


Figure 6

Le Coiffeur, Debucourt, France, early 19th century

Detail of a lithography, 21x27,5cm, Collection Schwarzkopf, Inv. 46

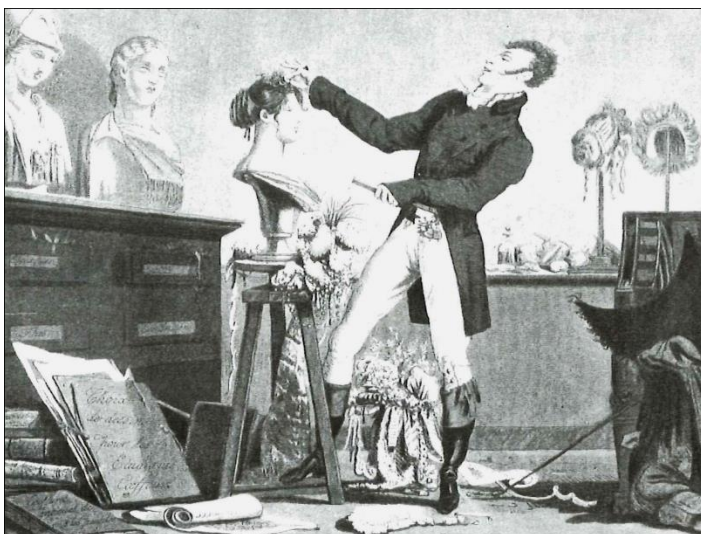


Figure 7

Philipp Otto Runge, Bildnis der Schwester Maria Elisabeth, black and white chalk on yellow paper, 53,3x42,9cm, formerly Pommersches Landesmuseum, Stettin, but considered lost in WW2

