
Original colours of Van Gogh's drawings

REVIGO research project

As part of the NWO Science4Arts programme, the Van Gogh Museum has worked with several partners on a four-year study of the original colours in Van Gogh's paintings and drawings. The REAssessing Vincent van Gogh (REVIGO) project, as it was called, has now been completed and the results are remarkable. Analysis revealed that Van Gogh's pen and ink drawings originally displayed greater colour and contrast.

Exposure to light has turned the black, violet and purple inks pale and brown. Based on the analysis results, researchers at the Cultural Heritage Agency of the Netherlands have been seeking to reconstruct both the original and the future appearance of the pen and ink drawings digitally.

Earlier research into the drawings

Earlier research into Van Gogh's working methods had already raised questions about the inks he used and their original colours. Fifty drawings, for instance, had previously been analysed using a portable X-ray fluorescence spectrometer as part of the 'Van Gogh's Studio Practice' project (2005-13). A substantial proportion of these drawings, which Van Gogh made in Belgium and France (1885-90), were found to use not only iron gall ink but also one containing chromium, which suggested chrome logwood ink. The German chemist Friedlieb Ferdinand Runge (1795-1867) introduced this type of ink in 1847 as a non-corrosive alternative to the iron gall variety, which caused steel pen nibs to rust, making them useless.

Results

Sampling the ink

The earlier research revealed which metal salts were present and hence what type of ink had been used, but not its original colour. The latter is determined by the organic components present in the ink and whether, and if so how, these are bonded to the metals. These organic components had to be identified from an ink sample to be able to reconstruct the colour.

For the REVIGO project, ink samples were taken from seven drawings and twenty letters from the Van Gogh Museum and the Morgan Library & Museum in New York. We used the MOMS (Magnesium Oxide Micro Swabbing) method, developed in 2015, to minimize potential damage.



Using MOMS to take a sample from a drawing: Vincent van Gogh, Farmhouse in a Wheatfield, 1888, Van Gogh Museum, Amsterdam (Vincent van Gogh Foundation)

A few nano-particles of ink were removed from the surface of a drawing or letter with a magnesium oxide swab. The inorganic composition of these ink particles was then analysed using X-ray fluorescence spectrometry and energy-dispersive X-ray spectroscopy. The organic components, meanwhile, were identified through ultra-high-pressure liquid chromatography and mass spectrometry.

Faded aniline dyes

We were surprised to discover that the chrome logwood inks had been mixed with purple, violet and blue aniline dyes, something not mentioned in any of the nineteenth-century formulae we had studied. Runge's formula merely states that logwood extract should be mixed with potassium chromate.

Blocks of logwood had been imported to Europe from Central America since the sixteenth century. The extract was obtained by boiling chips of the wood in water. A certain amount of the colouring elements was lost in this process, and so the manufacturers supplemented the extract with aniline dyes. Ink-makers frequently used blended logwood extract of this kind to produce chrome logwood ink. They also added a dilute acid solution as a preservative. The upshot of this, however, was that the chrome logwood ink only became visible after writing, prompting ink manufacturers to add further aniline dyes, so you could actually read what you were writing.

Aniline dyes lose their intense colouring power when exposed to light, which causes them to fade to a brownish colour. Some of Vincent's drawings will

therefore have been a lot more colourful and richer in contrast when they were first produced. In a few cases, the ink colour has been preserved to some extent beneath the mat.



The colour of the ink has been preserved beneath the mat. Detail of: Vincent van Gogh, Heath, 1888, Van Gogh Museum, Amsterdam (Vincent van Gogh Foundation)

Conclusion

The in REVIGO newly obtained knowledge enables us to reconstruct the drawings digitally and to predict what the works in question will look like in the future.

Would you like to find out more about REVIGO? Dutch science platform *The Knowledge of Now* (De Kennis van Nu) made [a 15 minutes documentary](#) about new techniques thanks to which it is possible to discover the true colours of artworks. The video is subtitled in English, skip to 09:19 minutes to see the REVIGO project.

Thanks to

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