Michel van de Laar in his studio.
Between art and kitsch

The technique which the TU Delft and Canon-Océ developed for making relief reproductions of paintings received extensive news coverage in late September. Art experts frowned on it.

Jos Wassink

"Feel free to touch it", said rector Karel Luyben. In September, a life-size reproduction of Rembrandt’s painting The Syndics suddenly appeared in his office. The art historian and materials scientist Prof. Joris Dik (3mE) had offered the copy to the Executive Board as a demonstration of a recently developed technique that involves printing not only the colours, but also the thickness of the paint. It must be said: at first glance, the copy looks shockingly real. It makes you want to feel the beads of paint. Usually this is not allowed, but now it is.

Two days later, Joris Dik appeared on Pauw & Witteman with another copy. There as well, people were fascinated to view an almost life-like Rembrandt. The Rijksmuseum’s art experts thought that they were a little too fascinated. "It’s a shame that the 3D technique has drawn so much attention away from the XRF technique", said senior curator Michel Herkenrath (Rijksmuseum) afterwards. He was referring to the X-ray-fluorescence technique developed by Joris Dik and Prof. Koen Jansens (University of Antwerp), which makes it possible to create extremely sharp images of underlying layers of paint (and their pigments). "This technique is of enormous importance for us", states van de Laar. "I’m not sure what the 3D technique can add."

Depth

A solution looking for a problem – that is what the relief-printing technique developed by Canon-Océ could originally have been called. It involved the discovery that plastic could be applied with a high level of precision using a printhead, and then cured under UV light. Prof. Jo Geraedts (IDE and Océ) contacted Joris Dik, because he thought that the reproduction of paintings could be a promising application and because Dik had good connections with the museum art world. What was missing was a scanner that could provide information on depth.

Undergraduate student Tim Zaman (3mE) took on the challenge for his graduation project. He was supervised by the robot-vision expert Prof. Pieter Jonker (EEMCS) and the artificial-intelligence specialist Dr Boris Lenseigne (3mE). "Depth in a plane can be translated into a movement which is different for each eye", explains Zaman, with regard to the principle on which his topographical scanner is based. To the left eye, a point emerging right in front of the nose will appear to move to the left, while the right eye will perceive it as moving to the right. Because points are difficult to identify in a level surface, however, Zaman projected various grid patterns over it. The shadows of these patterns were picked up by two cameras that registered the painting at 45° angles. The depth information was retrieved from the combination of these images. It takes two minutes to scan 40 million points within an area of 10 cm by 17 cm, and it takes about 15 minutes to reconstruct them into x, y and z coordinates. The painting The Jewish Bride required 240 shots and two weeks in order to piece the points together and calculate the coordinates. The reproduction has a flat resolution of 50 micrometres and a depth resolution of 9 micrometres.

The versatile Zaman developed the scanning protocol, in addition to writing all of the software and building the prototype that he used in the Gallery of Honour for the official opening of the Rijksmuseum, while Queen Máxima passed by his lens. His graduation project was rewarded with a 10.

At first glance, the copy looks shockingly real

"The use of impasto was one of Rembrandt’s characteristic techniques", notes Michel van de Laar, referring to the technique of painting with thick layers of paint. The senior curator of paintings works in a beautiful studio at the north end of one of the buildings behind the Rijksmuseum. Upon exiting the lift, visitors enter a grey-white hall with old masterpieces placed on easels to the left and to
The right. The yellowed varnish has been removed from a part of one of these works. The original tones emerge from under this layer as fresh as a baby’s blush.

As Van de Laar explains, “Rembrandt sometimes used blobs of paint in order to represent a structure. That was one of his tricks for creating something that seems to be alive. Since the advent of photography, we have come to see images as things that are of the past. Rembrandt wanted to create living images. Impasto was a part of this process, particularly in contrast to smooth sections elsewhere in the painting.” The most finished, most thickly applied elements attract the most attention. Smooth, thinly applied elements form the background. According to van Laar, Rembrandt’s paintings were a source of inspiration for Vincent van Gogh. He explains that, upon visiting the new Rijksmuseum in 1885, van Gogh had said that he would trade ten years of his life for the opportunity sit before The Jewish Bride for fourteen days, with only a crust of bread as food. “Van Gogh felt confirmed by Rembrandt”, remarks van de Laar. “It was something along the lines of, ‘What you’re doing is okay’. Painting thickly, that is. It is therefore not surprising for reproductions to seek to reproduce the paint thickness as well. According to van de Laar, reproductions with relief were already being manufactured and sold in the late 19th century. He was referring to an invention which the Brabant publisher Henri Bogaerts had patented in 1878 under the name Peinture Bogaerts. In addition to reproducing paintings in line and colour, this technique also imitated the surface. This was done by creating a relief with a thick primer, using a metal cliché. The exclusive reproductions were touted as "jewels for rectories and monasteries as well as Catholic living rooms".

Van de Laar, whose grandfather Arnold van de Laar earned his living by painting copies on commission, sees the 3D technique largely as the next step in reproductions. There is nothing wrong with that. He has even purchased a reproduction of Isaac Blessing Jacob by Govert Flincks at the Rijksmuseum, and he enjoys it every day. The curator of 17th-century paintings Pieter Roelofs shares this view. He just happens to have the 3D copy of The Jewish Bride on his desk. First, there were glossy colour images, then canvas prints and, now, relief prints. “It’s all going to happen. In about 10–15 years, 3D reproduction will be the standard. There’s nothing wrong with that. Every reproduction is an ambassador for the Rijksmuseum.”

Painting process

Joris Dik wants more. He would like to see the 3D technique take on a serious role in the field of art-historical research. For example, it could be used in combination with the XRF technique, which reveals underlying layers of paint. Dik can see it already: printing successive stages of the painting in 3D, revealing the creation of a work of art. Van de Laar is sceptical. Although the underlying images are clear, the order is much less clear. For example, consider The Syndics. One of the background figures changes places three times; the hands on the table keep changing, and the half-standing figure on the left has taken on a different, more active posture. “All sorts of things are happening. In the painting process, everything runs together”. Because it is impossible to determine the order of the various changes, we can only guess at the successive ‘stages’. Van de Laar therefore considers it “not useful” to make reproductions from uncertain reconstructions of earlier stages in the painting process of a particular painting.
He does, however, think that the production of ‘dummies’ could be useful. These could be used for reconstructions, for example. “They could show how the final painting originally looked. As a curator, you want to return to the intention of the artist. If the media have become discoloured on their own – that is to say, without any external influences – there’s a limit. You can’t do anything about it.” For example, it has been established that Rembrandt used the pigment called ‘smalt’, a deep-blue powdered glass containing cobalt. In the course of time and because of the varnish, this blue colour in the tablecloth of The Syndics has become little more than an indefinite beige. The colour can be digitally retouched to appear as Rembrandt had probably intended. For van de Laar, a 3D print of the painting could be temporarily hung close to the original, in order to allow comparison.

Curator Roelofs also sees potential advantages in dummies. For example, they could be used for educational purposes. Professional guides now often carry along various objects to help support their stories. Relief reproductions (or parts thereof) could be very helpful in this regard. Roelofs thinks that the scanning technique could be very useful in the lending of paintings, given the long distances that paintings travel as a result of collection mobility. Currently, the curator inspects the painting before departure and upon return. Such inspections are performed decimetre by decimetre, resulting in a report. It is conceivable that these inspections could be performed automatically, and that comparison of the two datasets could provide a very precise and objective overview of changes (i.e. damage that might have been incurred during transport). A 3D scan can thus be a future standard feature of the condition report.

The suggestion that the entire question of transport could be eliminated by transferring the database and reproducing it on-site is “inconceivable” for Roelofs, and actually inappropriate. “The experience of authenticity can never be reproduced.”

Colour

Joris Dik has also noticed that, despite advanced technology, important differences remain visible between originals and copies. One of these differences involves the transparency of the layers. Rembrandt produced a very lively red in the dress of The Jewish Bride by using semi-transparent layers, thus endowing the colour with a depth that cannot be found in the reproduction – at least not yet.

A few hundred metres away, the Van Gogh Museum already has 3D reproductions on sale. These ‘Relieve’ prints are produced through a process developed by Fujifilm, and they are apparently intended primarily for the Asian market. Five different works have been reproduced exactly – right down to the stickers on the back – and certified by curators of the museum. The selling price is unclear. It is advised that relievographs not be hung above a fireplace.