

# Weave matching and dating of Van Gogh's paintings: an interdisciplinary approach

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THERE HAS BEEN a great upsurge in the study of nineteenth-century painting materials in recent decades but, in contrast to pigment research, the analysis of canvas types has been relatively modest.<sup>1</sup> That is not entirely unexpected. Until now the characterisation of canvas thread density has been based on a few hand counts made across the canvas in question, which so often depend upon the availability of an X-radiograph in the case of paintings that have been lined. This is a tedious business and, moreover, there has been no generally agreed method for acquiring, archiving or comparing thread count information on a broader scale. In addition, hand counting had the disadvantage of not being totally accurate, since the spot counts made might not be representative for the entire canvas.

It was the goal of the Thread Count Automation Project (TCAP), which started in 2007, to determine the thread density from X-radiographs of paintings on canvas with the help of computers. Although there are many roads leading to Rome, the mathematics of Fourier spectral analysis have been used for the automation.<sup>2</sup> Here, the intensity waveform visible in an X-radiograph indicating the light and dark transitions between thread centres and thread edges can be converted into a thread density (count) for each local evaluation square (typically 1 cm. square) across the entire surface of the canvas in question. Colour-coded maps of the computed thread densities revealed that the weaving process itself results in the thread density showing a tendency to remain relatively fixed for a bundle of threads traversing the canvas along the thread direction. Thus, maps of the local density of the horizontally oriented threads show horizontal stripes of different colours, and a striped pattern is visible in the density maps of vertical threads as well (Figs.26–28). This makes it possible to identify aligned pieces of canvas from the same original roll by their matching striped patterns, in the direction of both warp (here taken to be vertical, corresponding to the length of the roll) and weft (here taken to be horizontal, corresponding to the width of the roll). The consistency of the weaving process means that this weave match capability in the warp direction can identify pieces that were not necessarily adjacent on the original roll but simply shared threads that continued through the length of the fabric. On the other hand, the paintings that line up in the weft direction can only have been adjacent on the original roll.

The project started at the Van Gogh Museum, Amsterdam, with an analysis of Van Gogh's paintings in its collection,<sup>3</sup> and



26. *La berceuse*, by Vincent van Gogh. End of January 1889. Canvas, 92.7 by 73.8 cm. (Art Institute of Chicago); *Vase with twelve sunflowers*, by Vincent van Gogh. End of January 1889. Canvas, 92 by 72.5 cm. (Philadelphia Museum of Art); *La berceuse*, by Vincent van Gogh. End of March 1889. Canvas, 91 by 72 cm. (Kröller-Müller Museum, Otterlo); *La berceuse*, by Vincent van Gogh. Late December 1888–late January 1889. Canvas, 92.7 by 72.7 cm. (Boston Museum of Fine Arts); *Still life with potatoes*, by Vincent van Gogh. Mid-January 1889. Canvas, 39.5 by 47.5 cm. (Kröller-Müller Museum, Otterlo); and *Sunflowers*, by Vincent van Gogh. End of January 1889. Canvas, 95 by 73 cm. (Van Gogh Museum, Amsterdam). These paintings are shown in a weave match alignment.

although the study has been expanded to include canvases by other artists from different collections, it is the study of Van Gogh's *œuvre* that remains one of the main pillars underpinning the development and application of automated thread counting

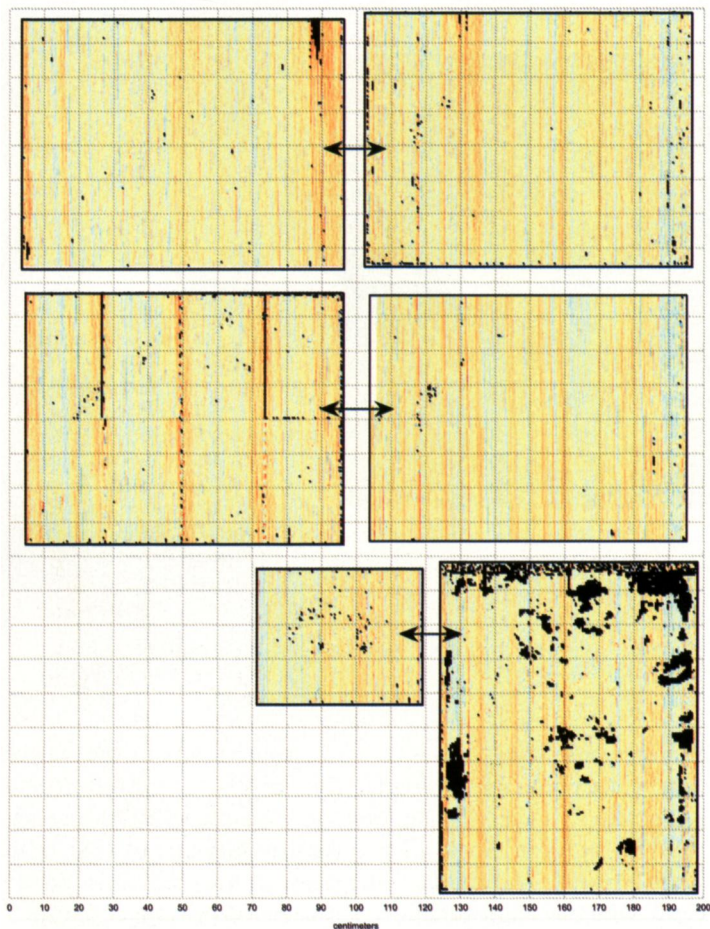
This article has been translated from the Dutch by Michael Hoyle. All F numbers citing works by Vincent van Gogh refer to J.-B. de la Faille: *The Works of Vincent van Gogh: His Paintings and Drawings*, Amsterdam 1970. D.H. Johnson and C. Richard Johnson Jr were supported in part by National Science Foundation Grant CCF-1048344 and CCF-1048352 'Counting Van Gogh and Vermeer'.

<sup>1</sup> See D. Bomford *et al.*: *Art in the making: Impressionism*, London 1990, pp.44–50; A. Callen: *The art of Impressionism. Painting technique & the making of modernity*, New Haven and London 2000, pp.31–47; and P. Labreuche: *Paris, capitale de la toile*

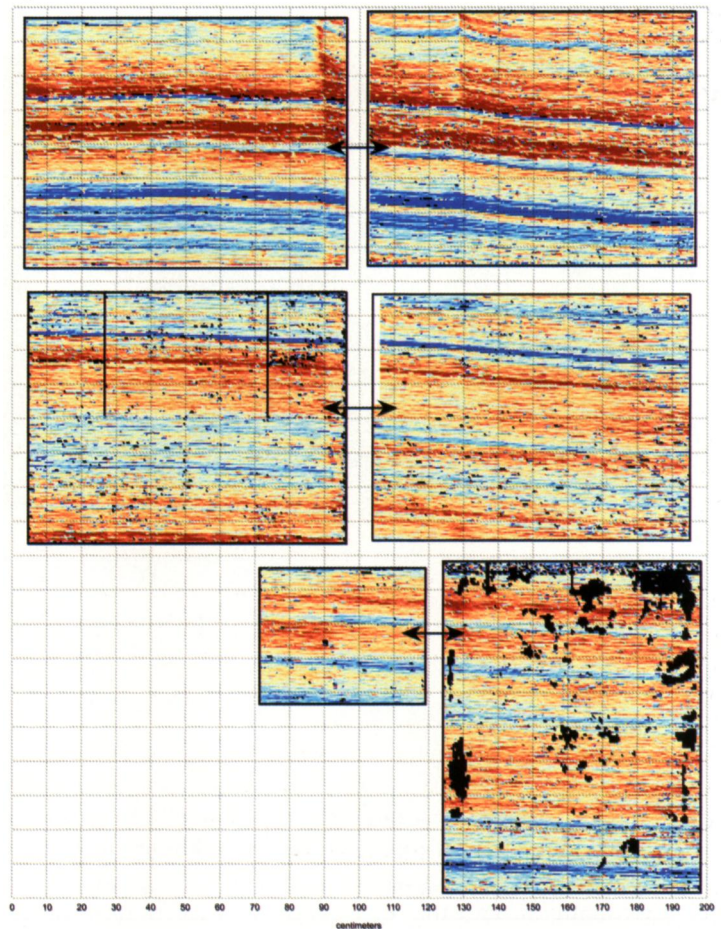
*à peindre, XVIIIe–XIXe siècle*, Paris 2011, pp.237–310; for studies relating to earlier art see the other chapters in this book.

<sup>2</sup> D.H. Johnson, C.R. Johnson Jr and E. Hendriks: 'Signal processing and analyzing works of art', *SPIE Optics and Photonics*, 7798–15, San Diego, August 2010.

<sup>3</sup> The initial attempts to characterise the canvas used by Van Gogh, all of them hand counts, are described in K. Vanderlip de Carbonnel: 'A study of French painting canvases', *Journal of the American Institute for Conservation* 20 (1980), p.18; L. van Tilborgh and M. Vellekoop: *Vincent van Gogh. Paintings. Volume 1. Dutch*



27. Warp weave maps for the paintings shown in Fig. 26 in weave match alignment.



28. Weft weave maps for the paintings shown in Fig. 26 in weave match alignment.

research. It has become independent within the project, as it were. Since 2010, an endeavour has been made to acquire X-radiographs of all Van Gogh's oil paintings. Many public collections generously promised their co-operation, and private collectors also showed interest. More than 380 canvases have now been analysed, almost half of Van Gogh's *œuvre* on canvas, and in this article we assess the art-historical gains from the material assembled so far.

We had hoped that the data about the canvases would provide useful additional information to help date and sequence Van Gogh's paintings. Much is already known, but there are also outstanding problems, and the canvas research could make an important contribution not only to their resolution but also to the determination of more precise dates of execution. It is known from Van Gogh's letters that he preferred rolls of canvas to ready-made, pre-stretched canvases, and information about their weave structure might make it possible to reconstruct painting locations on those rolls. The idea was that having locations would automatically yield information about the sequence of the works from each roll.

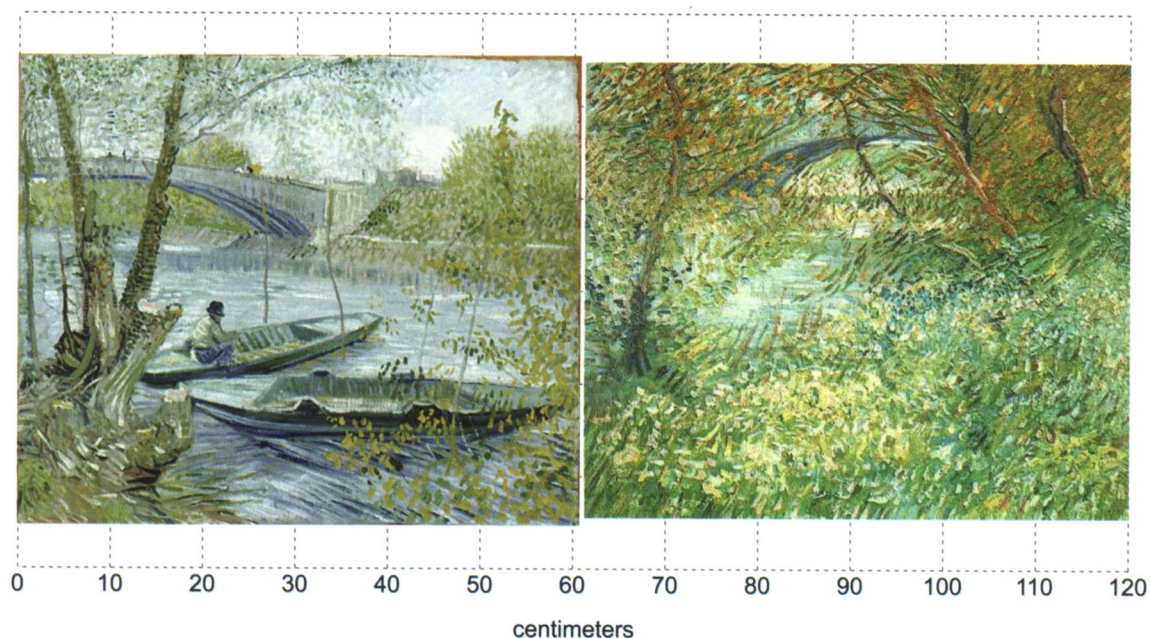
*period 1881–1885*, *Van Gogh Museum*, Amsterdam and Blaricum 1999, p. 22, nos. 3–40 and 42–44; K. Hoermann Lister, C. Peres and I. Fiedler: 'Tracing an interaction: supporting evidence, experimental grounds', in D. Druick and P. Kort Zegers: exh. cat. *Van Gogh and Gauguin. The studio of the south*, Chicago (Art Institute of Chicago) and Amsterdam (Van Gogh Museum) 2001, pp. 354–69; E. Hendriks and L. van Tilborgh: 'Van Gogh's "Garden of the asylum": genuine or fake', *THE BURLINGTON MAGAZINE* 143 (2001), pp. 150–52; and E. Hendriks and M. Geldof: 'Van Gogh's Antwerp and Paris picture supports (1885–1888): reconstructing

However, sceptics would say that artists are not bookkeepers or storeroom clerks, and that muddle might reign where we expect order. And how can it be worked out? Admittedly, that is a problem, but if there is one artist where this could be put to the test it is Van Gogh. Thanks to the correspondence we simply know more about the way he worked with his painting materials than about almost any other artist of his period, although that mainly applies to the years 1888–90.<sup>4</sup> Thus it is known when he ordered his rolls of canvas, when they were delivered to him and when they were used up. Together with what is already known about the dates of execution of the paintings we have unique comparative material for assessing the value of canvas research for the question of sequencing.

In addition, we know from his letters how carefully Van Gogh planned his working process. He usually thought in terms of campaigns involving similar subjects, and made an estimate beforehand of the amount of paint and metres of canvas he would need. 'I do so many calculations', he wrote in September 1888, 'and actually today I found that for the ten metres of canvas I had calculated the colours correctly, except for one, the

choices', *Art Matters: Netherlands Technical Studies in Art 2* (2005), pp. 39–75. Besides hand counts, some new findings from automated weave matching are given in E. Hendriks and L. van Tilborgh: *Vincent van Gogh. Paintings. Volume 2. Antwerp & Paris 1885–1888*. *Van Gogh Museum*, Amsterdam and Zwolle 2011, pp. 103–04 and 531–48.

<sup>4</sup> All the quotations from Van Gogh's correspondence in this article are from L. Jansen, H. Luijten and N. Bakker, eds.: *Vincent van Gogh. The Letters*, London and New York 2009, which is also available at [www.vangoghletters.org](http://www.vangoghletters.org).



29. (Right) *River scene with the Pont de Clichy*, by Vincent van Gogh. 1887. Canvas, 48.3 by 57.2 cm. (Dallas Museum of Art); and (left) *Fishing in spring, the Pont de Clichy (Asnières)*, by Vincent van Gogh. 1887. Canvas, 50.5 by 60 cm. (Art Institute of Chicago). Weft weave maps for the paintings shown in weave match alignment.

fundamental one of yellow. If all my colours run out at the same time, isn't that proof that I can sense the relative proportions like a sleep-walker?' (letter 683). In other words, he wanted to be the absolute master of his materials, and although he is often portrayed as an artist who worked intuitively, his approach has a lot in common with that of a craftsman. Unlike most of his colleagues he was accordingly frank in his admiration for such people: 'I think I still prefer to be a shoemaker than to be a musician', to take his own words of 1890 a little out of context (letter 854). This gives us the confidence to think that there was a certain practical logic to his use of canvas, and it is up to us to discover what it was.

However, we cannot come to any sensible conclusion on that point until we have compiled information on the canvases themselves. Is it possible to distinguish the paintings on loose canvas from the ready-made ones, and can we also recognise the different types within that category? Research into the production process of painters' canvas in the second half of the nineteenth century is still in its infancy, but the study of many paintings by one artist could help resolve several open questions. For example, we do not know for certain whether each new roll of canvas of a specific type from one and the same loom really did

have precisely the same weave structure, although the weave match between, for example, the canvases of Anthon van Rappard's *Woman winding yarn* of 1884 (Centraal Museum, Utrecht) and Van Gogh's *Small pear tree in blossom* of 1888 (Van Gogh Museum, Amsterdam) suggests that they did.<sup>5</sup> Nor do we know whether slight variations between rolls of canvas prepared with the same type of ground could be helpful in distinguishing different batches of production. We hope to return to both these points at a later date.<sup>6</sup>

We know that Van Gogh preferred rolls of canvas to the ready-made variety from the letters he wrote in the south of France. After arriving in Arles in February 1888 he bought both ready-made canvases and at least one roll from local suppliers, but in August he switched to rolls of canvas from Paris (see Appendix below), which he ordered through Theo from the firm of Tasset et L'Hôte, Paris, who also supplied his tubes of paint.<sup>7</sup> He experimented with different canvas types in his search for one that absorbed well but, dissatisfied with the local supplier and with the first consignment of a finer type of canvas from Tasset et L'Hôte, he decided in July 1888 to work only on their *toile ordinaire* which, with a few exceptions, he did to the end of his life.<sup>8</sup> We have a general idea as to how small Paris firms of this

<sup>5</sup> The match is in the warp and not the weft, and given the differences in the dates and locations (Nuenen and Arles respectively) we do not believe that the canvases came from the same roll. It is important to gather information about the places where the canvas was woven; much of it may have come from Belgium.

<sup>6</sup> There is a growing body of information about the different types of ground preparation found on Van Gogh's paintings, thanks to ongoing analytical studies conducted both at the Netherlands Cultural Heritage Agency (RCE) and the Centre de Recherche et de Restauration des Musées de France (C2RMF). Most recently, as part of her Ph.D. studies at the C2RMF, Johanna Salvant has applied advanced synchrotron techniques to search for varying proportions of lead isotopes in samples of lead-white based grounds, which may help to distinguish different batches of commercial production. Ground layer preparation research has already been published by Hoermann Lister, Peres and Fiedler, *op. cit.* (note 3), pp.358–59; Hendriks and Geldof, *op. cit.* (note 3); and Hendriks and Van Tilborgh, *op. cit.* (note 3), pp.104–17 and 534–48.

<sup>7</sup> There is a description of the firm in T. Reff: 'Degas chez Tasset', in M. Daniel, E. Parry and T. Reff, eds.: exh. cat. *Edgar Degas, photographer*, New York (Metropolitan Museum of Art) 1998, pp.75–81.

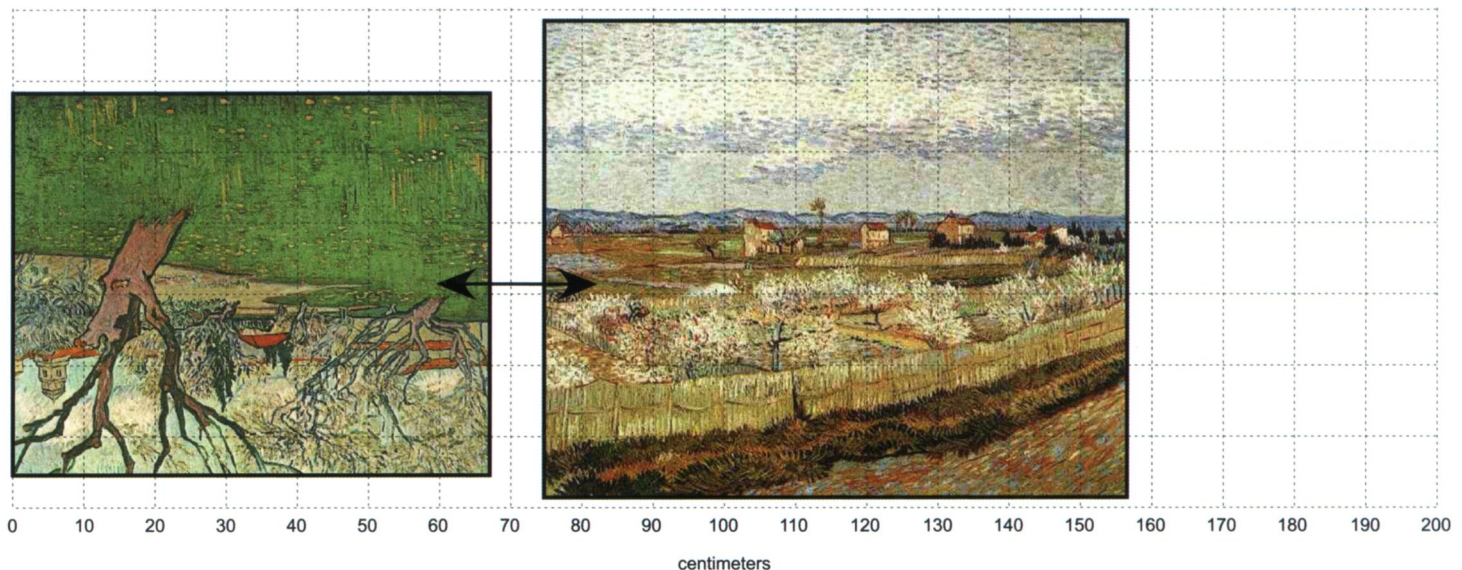
<sup>8</sup> See Bomford *et al.*, *op. cit.* (note 1), p.46; and Callen, *op. cit.* (note 1), pp.31–47, for a summary of the various types of canvas, ranging from the more common and inexpensive *toile ordinaire* to the finer and more expensive kinds called *fine* and *très fine*. The absorbent canvas from Tasset that arrived in Arles 1st May 1888 (see Appendix) 'would be just the thing for me', Van Gogh wrote, 'if the canvas itself was three times as coarse' (letter 610). In fact, he was experimenting with a variety of canvas types before he decided on the *toile ordinaire*, which in itself is not strongly absorbent.

<sup>9</sup> L. Carlyle and E. Hendriks: 'Visiting Claessens, artists' canvas manufacturers', *UKIC News in Conservation* 11 (2009), pp.4–5.

<sup>10</sup> They are mainly of the Impressionist and Post-Impressionist generations. It was only later in his career that Renoir, for instance, began working chiefly with large rolls of canvas which he cut to the sizes he needed with tailor's shears; see Bomford *et al.*, *op. cit.* (note 1), pp.46–47.

<sup>11</sup> Letter 478. Wed. J.L. Bayens & Zonen was an artists' supplies shop in Eindhoven.

<sup>12</sup> L. van Tilborgh: 'Van Gogh and his painting materials. An introduction', in Van Tilborgh and Vellekoop, *op. cit.* (note 3), pp.21–22, states that this probably applied to his entire Nuenen output, but for another view on the subject see R. Dorn: 'Zur



30. *Orchard in blossom, view of Arles*, by Vincent van Gogh. 1889. Canvas, 50 by 65 cm. (Van Gogh Museum, Amsterdam); and *Peach trees in blossom*, by Vincent van Gogh. 1889. Canvas, 65 by 81 cm. (Courtauld Gallery, London). Weft weave maps for the paintings shown in weave match alignment.

kind obtained their canvas. The unprimed support was woven by the textile industry in bolts c.100–200 metres long and roughly 2.1 metres wide.<sup>9</sup> These were then cut into ten to twenty rolls of 10 metres by large companies like Lefranc & Cie and Bourgeois, which applied a ground layer and then turned them into ready-made canvases. Some of the primed rolls were sold to small colourmen like Tasset et L'Hôte, who themselves produced ready-made canvases from them. However, canvas could be bought by the metre from both the large and the small firms, either primed or unprimed, but as far as we know most professional painters preferred ready-made canvases.<sup>10</sup>

Van Gogh's preference for rolls seems unusual, and may have been born of necessity. As an artist with no fixed abode he had limited space for storing stretchers, so buying canvas by the metre would have made more sense. It was a solution he had already hit upon in Holland, or at least there is a remark in his correspondence at the time that seems to suggest that he was working with large pieces or rolls of canvas: 'I'm coming over for a while on Sunday anyway', he wrote from Nuenen to his friend Anton Kerssemakers in Eindhoven in early 1885, 'and would like to take a metre of that canvas from Baijens with me, since my canvas is used up'.<sup>11</sup> This does not necessarily mean that that was

his normal practice, but the present research shows that we no longer need to rule it out.<sup>12</sup> Ninety-five of the Nuenen paintings have been examined, and fifty-nine of them have weave matches spread over eight groups, known as match cliques (each clique represents one kind of canvas). In seven of the groups (almost all of them, in other words) there are weft matches (fifteen in all), and that can only mean that Van Gogh was painting on canvas from rolls.<sup>13</sup>

This changed in Antwerp, when Van Gogh started to buy ready-made canvases and continued doing so when he was in Paris, as demonstrated by the wide variety of canvas types from that period.<sup>14</sup> However, we know that there are a few exceptions. In the late autumn of 1887 he divided up a large piece of twill measuring roughly 130 by 140 cm. for his last four Paris paintings,<sup>15</sup> and there is also a fine weft match between two pictures from Asnières (Fig.29), for which he bought loose, unprimed canvas.<sup>16</sup>

The situation changed again in 1888, when Van Gogh moved to Arles. At first he carried on working mainly on ready-primed canvases, but as time passed his preference was almost exclusively for rolls that were sent to him from Paris. We have now examined 187 paintings from the period 1888–90, and the large

Malerei Van Goghs, 1884–1886', *Georges-Bloch-Jahrbuch des Kunsthistorischen Instituts der Universität Zürich* 7 (2000), pp.170–71.

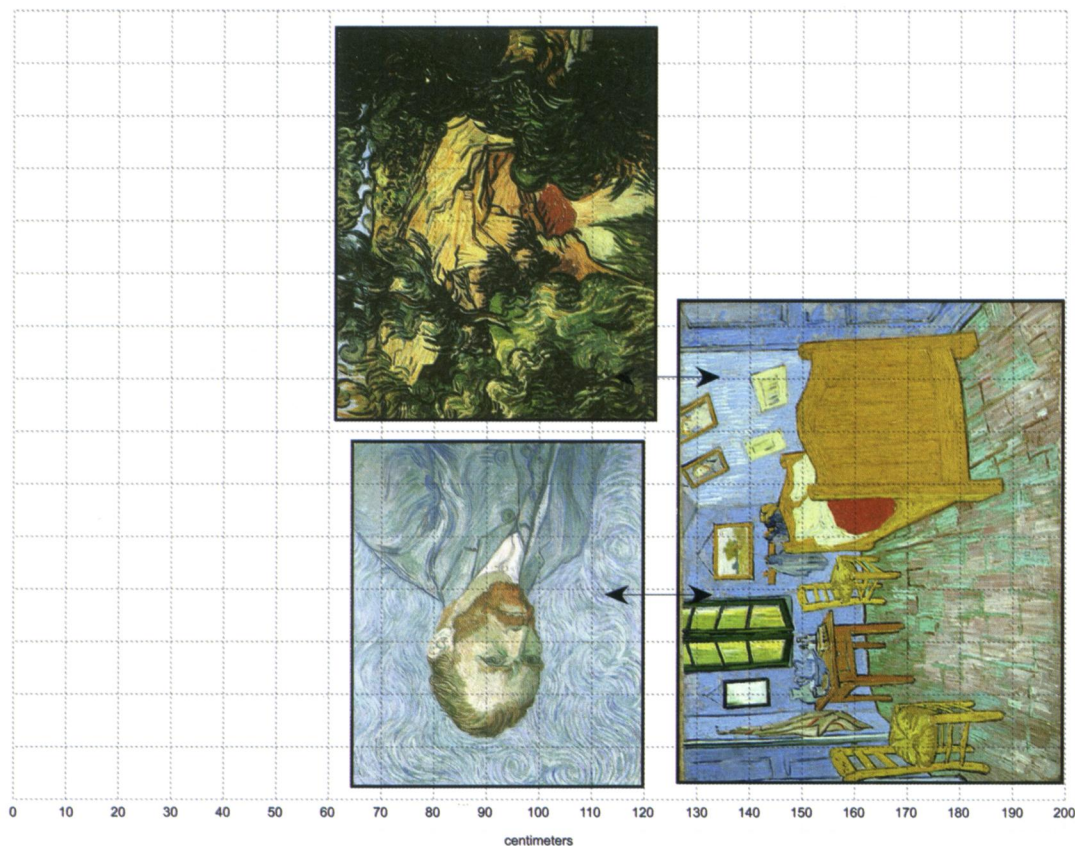
<sup>13</sup> There are no match cliques for thirty-six canvases, but at present it is difficult to say whether this means that they were ready-made. The data on eighty-four paintings from the Nuenen period are still lacking.

<sup>14</sup> We have examined ninety-five canvases from this period, of which fifty-eight have no weave match. The other thirty-seven can be divided into fifteen different match cliques; see also E. Hendriks: 'Van Gogh's working practice: a technical study', in Hendriks and Van Tilborgh, *op. cit.* (note 3), pp.92, 101–02 and 108.

<sup>15</sup> The works on twill are F 289, F 374, F 522 and F 549 (see *ibid.*, pp.509–17 and 518–23). In the autumn he also painted four pictures on cotton of exactly the same quality and with the same unusual ground layer. They may have been cut from the same piece, just not in overlap, which excludes the possibility of finding a weave match (F 344, F 373, F 377 and F 452; see *ibid.*, pp.452–56, 476–78 and 495–500).

<sup>16</sup> Only three of the four sides of the two paintings have primary cusping, so we know that those are the sides that were nailed to the stretcher. The weft match places the sides without cusping next to each other, and it can be deduced from both facts that it was there that the two canvases were originally joined together.

However odd it may sound, this means that Van Gogh only separated the two after having painted both scenes. Interestingly, this recalls an anecdote related by Emile Bernard: 'He [Vincent van Gogh] was soon spending his days in Asnières. He went there on foot from Paris with a huge canvas which he divided up into compartments. It was so big that passers-by took him to be a sign-carrier' ('*Bientôt il passe ses journées à Asnières: il y vient à pied de Paris, avec une toile énorme, qu'il divise en compartiments; une toile si grande que les passants le regardent comme un porteur d'enseignes*'); see E. Bernard: 'Vincent van Gogh', in *idem: Propos sur l'art*, Paris 1994, I, p.250. See also *idem*, ed.: *Lettres de Vincent van Gogh à Emile Bernard*, Paris 1911, p.11. It is hard to believe but possibly true, given the weave match between the two paintings mentioned here. Bernard, though, could never have witnessed it, for he was in Brittany when Van Gogh was working in Asnières. It also emerges from a remark in a letter by Lucien Pissarro (to Paul Gachet fils, dated 1st January 1928, Van Gogh Museum, Amsterdam) that even if Bernard's anecdote is true it was probably an exception. 'One day my father and I met him on rue Lepic. He was returning from Asnières with canvases [. . .]. He insisted on showing his studies to my father: to do so he lined them up against the wall in the street'; S. Stein: *Van Gogh. A retrospective*, New York 1986, p.88.



31. *Entrance to a quarry*, by Vincent van Gogh. 1889. Canvas, 60 by 74.5 cm. (Van Gogh Museum, Amsterdam); *Self-portrait*, by Vincent van Gogh. 1889. Canvas, 65 by 54 cm. (Musée d'Orsay, Paris); and *The bedroom*, by Vincent van Gogh. 1889. Canvas, 73.6 by 92.3 cm. (Art Institute of Chicago).

number of weave matches make the Tasset et L'Hôte *toile ordinaire* easy to distinguish from the ready-made canvases and those on rolls that he bought locally in Arles.<sup>17</sup> It is true that the differences in the average thread counts are minimal, but thanks to the computer they are easily recognised and are striking enough to be identified as a different sort, although discussion on this point is not yet completely closed.<sup>18</sup> The fact that the Tasset et L'Hôte *toile ordinaire* is not always exactly the same may be a little surprising, but it merely means that this type of canvas was woven on different looms.<sup>19</sup>

Arranging all the canvas types chronologically, and not just the *toile ordinaire*, provides confirmation of the above assumptions about Van Gogh's way of working. The *Self-portrait as bonze* (Fogg Art Museum, Cambridge MA) demonstrates that he did indeed allocate his metres of canvas well in advance. In order to convince the hesitant Gauguin of the appeal of working with him he suddenly decided on an exchange of portraits in mid-September 1888 and then painted himself as a Japanese monk.<sup>20</sup> Interestingly he did so not on the *toile ordinaire* he had been using up until then but on canvas obtained locally, from which one can conclude that he had already earmarked the remainder of his roll of canvas for other works and did not want to use the remaining metres for other subjects. He did the same when he had another sudden idea,

this time for his copy after *The raising of Lazarus* around 2nd May 1890 (Van Gogh Museum). He had received a reproduction of Rembrandt's etching from Theo a few days before and decided to make a free copy after it in paint and, although he had enough canvas left, he chose paper as the support.<sup>21</sup>

We also found confirmation for our idea that canvas research could be a useful tool for being more precise about the order in which works were made. It turns out that several that are known from the correspondence to have been made at roughly the same time are on canvases that were next to each other on the roll. That is the case, for example, with two works from the spring of 1889 about which Van Gogh reported to his friend Paul Signac: 'I've just brought back two studies of orchards'.<sup>22</sup> They have an excellent weft match (Fig. 30), and that is also the case with *The poet's garden* and *Path in the public garden*, which are mentioned in two successive letters.<sup>23</sup> The weft match between three paintings from Saint-Rémy is also in keeping with their date of execution. It is true that more than six weeks passed between *Entrance to a quarry* of mid-July 1889 and *Self-portrait* and *The bedroom* of early September (Fig. 31), but the former was the last painting Van Gogh made before his severe breakdown in the summer of 1889, and the other two were among the first that he worked on around 2nd September, after his recovery.<sup>24</sup>

<sup>17</sup> There are far fewer weave matches in the works he painted in Arles between February and July 1888 (eleven paintings spread over four match cliques) than in those executed there from August 1888 to April 1889, which include thirty-one paintings in three match cliques.

<sup>18</sup> The various types are distinguished by slightly different average thread counts (warp by weft) per square cm.: 11.5 by 18 (fifty-six paintings), 11.5 by 17 (twenty-seven) and 12 by 15.5 (twenty-three). At present there are eight canvases with an average thread count of 11.5 by 15.5 per square cm., which could indicate the use of a fourth type of *toile ordinaire* from Tasset et L'Hôte. However, in view of the small number of works involved and the fact that the dates of execution extend over the period August 1888 to July 1890, we are assuming for the time being that

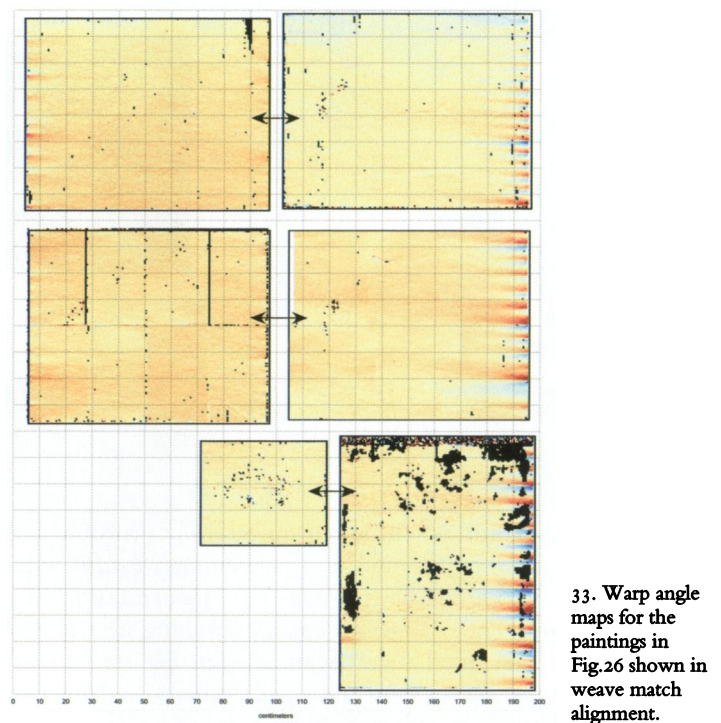
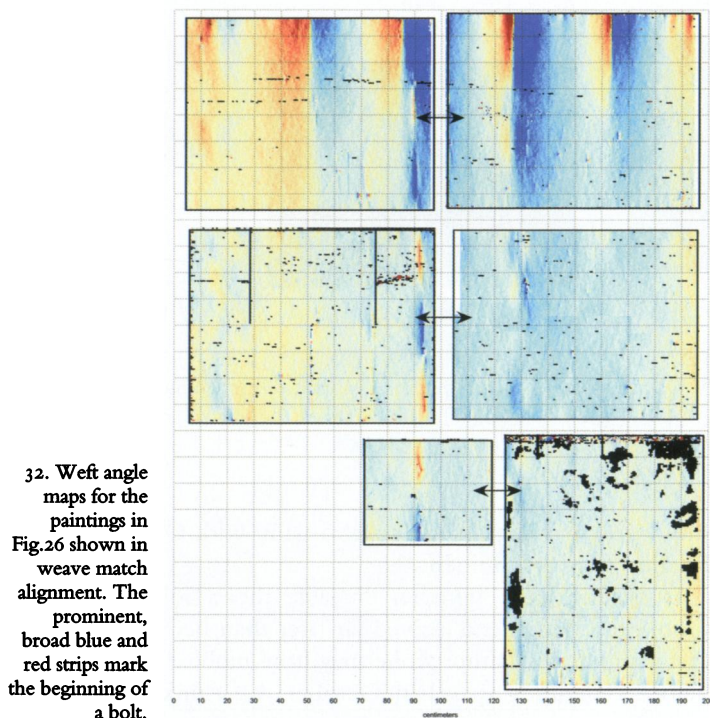
the canvases actually belong to the match clique with an average of 12 by 15.5 threads per square cm., although they have not been counted among the twenty-three pictures in that group.

<sup>19</sup> Or in the case of just a gradual deviation possibly a subsequent 100-metre bolt from the same loom. There are two clearly distinguishable match cliques with thread counts that barely differ from each other: 11.5 by 18 and 11.5 by 17 per square cm. (see note 18 above).

<sup>20</sup> F 476; see letters 678, 680, 681, 683, 685 and 692.

<sup>21</sup> See letter 866 for the painting and the arrival of the reproduction of Rembrandt's etching.

<sup>22</sup> Letter 756, with sketches of both works.



There is also a weft match between *La berceuse* (Art Institute of Chicago) and *Sunflowers* (Philadelphia Museum of Art), and that too is consonant with their assumed dates of execution (Fig. 26). Van Gogh painted the latter work as a wing of his triptych with *Mme Roulin by the cradle*, and it was assumed in the literature that of the five known versions of *La berceuse* the one in Chicago was the second one and was made at the same time as the Philadelphia *Sunflowers*.<sup>25</sup> The latter assumption now seems to be confirmed by the weft match between both paintings – seems, because as with all the other works with a weft match mentioned above, there is a catch. We are tacitly assuming that Van Gogh cut a new piece of canvas from the roll for each picture individually, but that is not necessarily so. For example, when planning an intensive campaign out of doors or on the arrival of a new consignment he could have cut up the roll, or part of it, for several paintings at the same time and put them on stretchers for later use.<sup>26</sup> In such cases the weft match would not necessarily provide information about the order of execution.

This logical way of cutting up the roll is suggested in a letter of late July 1888. Van Gogh had a number of empty stretchers in his studio, and that gave him the idea of ordering new canvas, although it was not strictly necessary. ‘What, if anything, would be urgent would rather be the canvas, seeing that I have a whole lot of stretching frames from which I’ve removed the studies, and on which in the meantime I must put other canvases’.<sup>27</sup> In this case, though, his main purpose was to put pressure on Theo to

send canvas as soon as possible, so he may simply have hit on this ruse as a way of prodding his brother into action, but there is one instance where we can definitely demonstrate that he cut up his roll of canvas in this way. This is the roll from which the canvases of *La berceuse* in Chicago and *Sunflowers* in Philadelphia were cut. Thanks to a peculiarity in the weave structure we know that not only were they adjacent on the roll but that they came from the beginning of it (Fig. 32).<sup>28</sup> This is important, for it is known from the letters that Van Gogh painted the still life at the end of January 1889, while examination of the weave structure has shown that not only did the roll contain the canvas used for a scene painted in December 1888, namely the Boston *Berceuse*, which he had begun before the incident of his ear,<sup>29</sup> but also others which he painted after January 1889, including the two works of trees in blossom from the spring of that year mentioned above (Fig. 30). That is odd, and can only be explained if he had put several canvases in his favourite size 30 on stretchers as soon as he started on the new roll, using one of them at the end of December 1888 for the Boston *Berceuse* and only moving on to the others in early January 1889, when he took up painting again after his enforced stay in the hospital in Arles.

Another difficulty when it comes to interpreting the canvas data lies in assessing the importance of weft matches of smaller canvases. Here, too, we cannot blindly assume that this automatically indicates the same date of execution of the two works. Van Gogh frequently used the standard sizes (10, 12, 15, 20 and

<sup>23</sup> F 468 and F 470 of September 1888; letters 681 and 682.

<sup>24</sup> Letters 797 and 799.

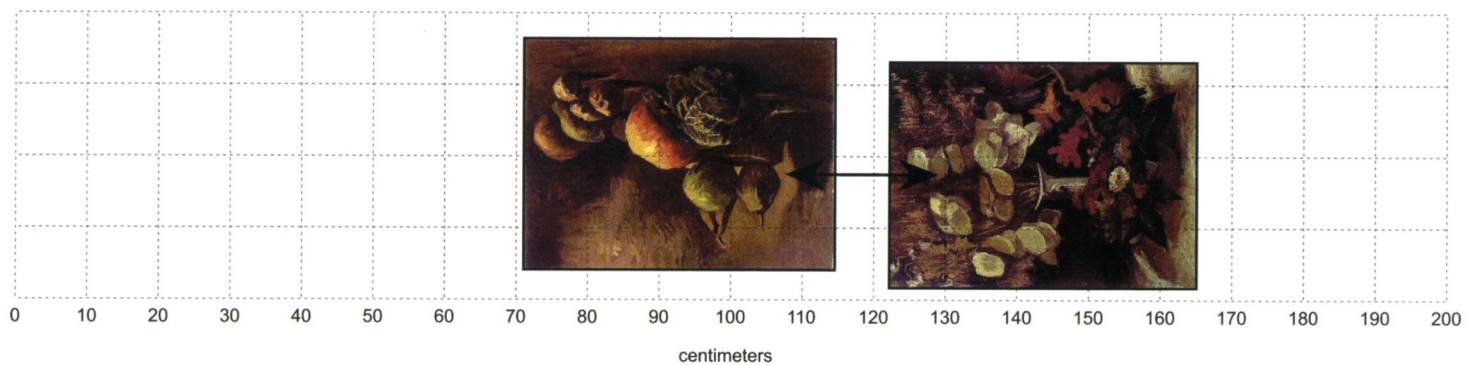
<sup>25</sup> Van Gogh painted that picture together with the *Sunflowers* (Van Gogh Museum) at the end of January 1889 as wings to a triptych with *La berceuse* in the middle, and because of the weft match we know now for certain that the painting in Chicago was the central work of the second triptych. The first one would thus have consisted of the two sunflower still lifes of August 1888 and the *Berceuse* in the Boston Museum of Fine Arts; see also J. Hulsker: ‘Van Gogh, Roulin and the two Arlésiennes: part I’, *THE BURLINGTON MAGAZINE* 134 (1992), pp. 570–75; and K. Hoermann Lister: ‘Tracing a transformation. Madame Roulin into *La Berceuse*’, *Van Gogh Museum Journal* (2001), pp. 63–83, esp. p. 72.

<sup>26</sup> When Van Gogh left Nuenen he was planning to take ‘at least 40 stretching frames’ with him to Antwerp, which was evidently the stock with which he intended to work; see letter 542.

<sup>27</sup> Letter 644. However, this does not seem to have been his usual practice and was probably part of his plan to hoard canvas (on which see below).

<sup>28</sup> There are strong wavy distortions evident in the weft angle map, which may be explained by uneven tension of the bobbin threads at the start of the weaving process (this tends to even out as weaving continues). We are indebted to Philippe Huyvaert, President of Claessen’s BV, Waregem, Belgium, for this information.

<sup>29</sup> See the concluding remarks of this article.



34. *Still life with vegetables and fruit*, by Vincent van Gogh. 1884. Canvas, 32.3 by 43.2 cm. (Van Gogh Museum, Amsterdam); and *Vase with honesty*, by Vincent van Gogh. 1884. Canvas, 42.7 by 31.7 cm. (Van Gogh Museum, Amsterdam).

especially size 30), and when he cut up a roll he probably had some canvas left over. If he did not have enough for his usual sizes he simply wrote that he had none left at all and ordered a new supply from Theo, although strictly speaking he still had leftovers.<sup>30</sup> He only used them when the smaller sizes suited him. For example, most of his ten small copies after Millet of September 1889, which measure roughly 40/45 by 25/33 cm., are painted on *toile ordinaire* from three earlier batches.<sup>31</sup>

It is equally problematic to make out whether Van Gogh used up the roll from an earlier batch before starting on a new one in the case of his large paintings. He could have done, but at present we only have evidence for the opposite. In the first half of 1890 he not only had a lot of canvas left over from a consignment that had arrived at the beginning of December 1889 but also a roll sent to him in January. Paintings from this period are on canvas from one of those two batches, and since the dates of some of those pictures are firmly established we know that Van Gogh made no effort to use up the earlier roll first.

Often, though, Van Gogh had run out of canvas, or almost so, when the new batch arrived, except for the period from July 1888 to April 1889, when he also had several rolls at his disposal.<sup>32</sup> It turns out that he had been hoarding them. 'I believe that at this moment', he wrote to Theo on 9th or 10th July, 'I'm doing the right thing by working chiefly on drawings, and seeing to it that I have colours and canvas in reserve for the time when Gauguin comes'.<sup>33</sup> He had just received canvas from Paris but was working on ready-made canvas bought in Arles. At the end of July he again ordered canvas from Theo, although he did add that it was 'not at all urgent'.<sup>34</sup> He received that batch on 31st July, and wrote: 'You did well to send the colours and canvases, my supplies being exhausted across the board'.<sup>35</sup> Oddly enough, he reported a week later that 'I have no more canvas or paint and have already had to buy here. And I have to get even more'.<sup>36</sup> Theo accordingly ordered more canvas from Tasset et L'Hôte, which arrived on 9th August.<sup>37</sup> Since Van Gogh had hardly been painting at all in the weeks before, this suggests that the rolls that arrived at the beginning and end of

July were put aside for the collaboration with Gauguin, which he thought was imminent.<sup>38</sup>

It is not clear whether he left those rolls completely untouched. His friend arrived far later than he had anticipated that summer and, although he may have nibbled at the supplies before Gauguin's arrival in October, we think that he only started using the rolls later, for research has shown that from the end of November 1888 to the middle of April 1889 he worked not only on canvas from a local supplier but also on three different kinds of *toile ordinaire*, and at a time when no new supplies were sent from Paris, which can only really be explained if he had rolls left over from earlier consignments. The last one came in October, when Gauguin had already arrived and the two friends had decided to paint on jute.

It should be borne in mind that when Van Gogh speaks of a consignment of a particular length of canvas it could equally well have consisted of two rolls. *The garden of the asylum* (Folkwang Museum, Essen), which he painted at the beginning of November 1889, is on a different kind of canvas from the other work examined from the same month and in the same large format.<sup>39</sup> That is very odd indeed, for it is known for certain that he ran out of canvas at the beginning of October and could only take up painting again when a consignment arrived at the end of the month – probably five metres.<sup>40</sup> We should perhaps be cautious here, but this can really only mean that the consignment was of two separate rolls. It seems that Tasset et L'Hôte only had a few metres of one roll left and added the beginning of another to make up the length ordered. This was probably a coincidence and thus exceptional, but it has to be borne in mind.

So are the sceptics right after all, that, there being no system to this, there is no reason to assume that canvas research can add anything useful to solving questions of dating and sequence? That is the wrong conclusion, although the above findings do teach us that the data about canvases have a relative rather than absolute value. Before discussing that, though, we have to know whether it is even actually possible to reconstruct rolls using X-radiograph data. If it is not, we lose an important building

<sup>30</sup> For a summary, see M. Chavannes and L. van Tilborgh: 'A missing Van Gogh unveiled', *THE BURLINGTON MAGAZINE* 149 (2007), pp. 549–50.

<sup>31</sup> F 634, F 670, F 692, F 697, and perhaps F 687 and F 700 as well. Paintings in the series that have not been analysed are F 688, F 696 and F 698; F 693 has no match.

<sup>32</sup> Too little is known about the Auvers period for any worthwhile observations to be made.

<sup>33</sup> Letter 638.

<sup>34</sup> Letter 644; Van Gogh wrote that the entire order was not all that urgent, with the canvas perhaps being more so than the paint.

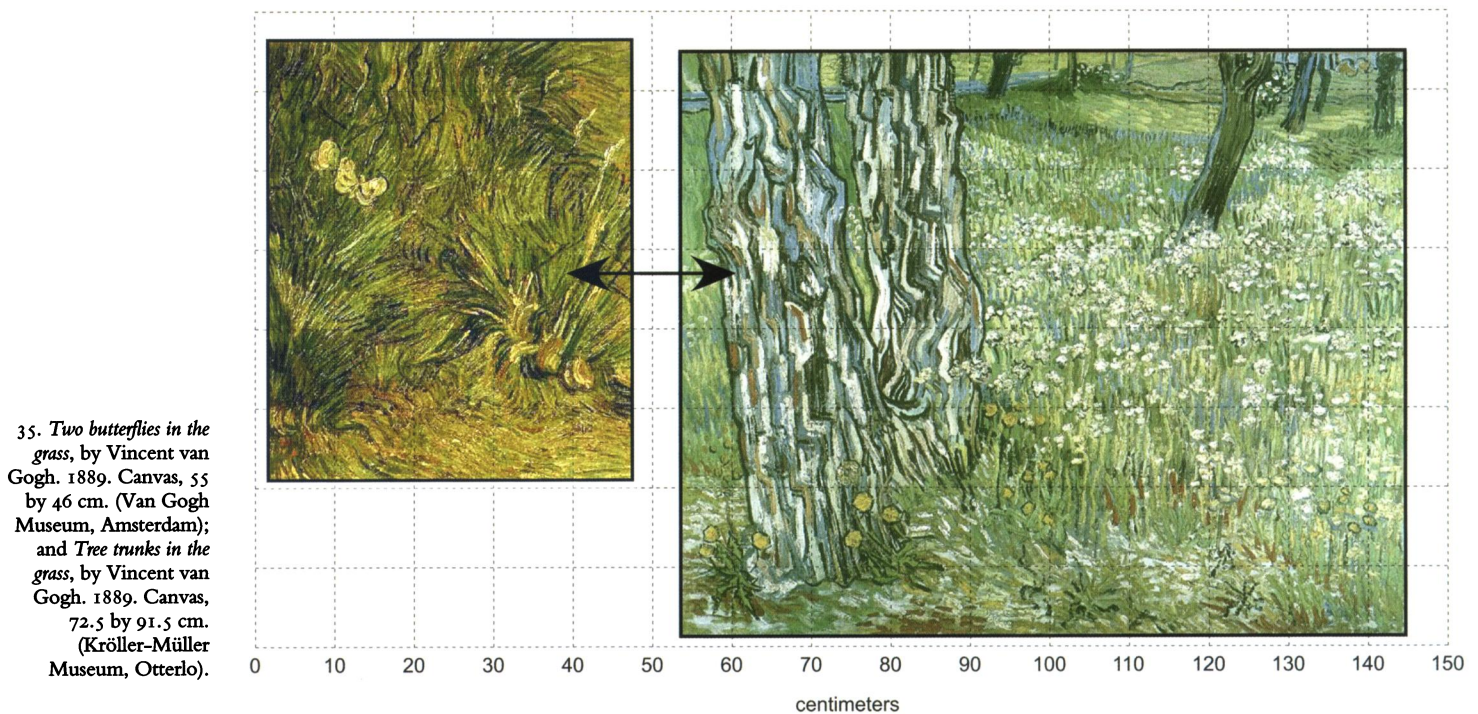
<sup>35</sup> Letter 652.

<sup>36</sup> Letter 657.

<sup>37</sup> Letter 658.

<sup>38</sup> Van Gogh had already announced the intended collaboration to Theo, but it can be deduced from what follows that he did not want his brother to know precisely how much his financial contribution to it would be, perhaps because he was afraid that Theo would back out.

<sup>39</sup> The dating of both works is now firm; see Hendriks and Van Tilborgh 2001, *op. cit.* (note 3), pp. 155–56.



35. *Two butterflies in the grass*, by Vincent van Gogh. 1889. Canvas, 55 by 46 cm. (Van Gogh Museum, Amsterdam); and *Tree trunks in the grass*, by Vincent van Gogh. 1889. Canvas, 72.5 by 91.5 cm. (Kröller-Müller Museum, Otterlo).

block, for then only the weft matches would be of use, and it is impossible to assess their significance precisely.

The good news is that it does seem to be possible, although at present we still have too little data to be able to present an elegant, fully-formed example. As we have said, paintings can be assigned to a particular batch on the evidence of the kind of canvas used combined with information we already have about roughly when its paintings were made, unless Van Gogh received rolls of the same kind in quick succession or used them almost simultaneously. They always have a weft match with another work (or several other works, in a few exceptional cases), and it turns out that the position of such a group of two or more works along the length of the roll of the identical kind of canvas can be determined with the aid of the cusping created when the ground layer was applied to the roll. Van Gogh pushed a long edge of the roll over spikes along the top side of a frame measuring ten metres long by a little over two metres high and then stretched it with the aid of laces at the bottom in a hook-and-cord system of lacing.<sup>41</sup> This was done with a certain amount of latitude, with the result that there is greater variation in the cusping on that side and, if present, that variation turns out to be a guide to the positions of the paintings on the roll and thus for reconstructing rolls of the same kind of canvas that were sent to Van Gogh in quick succession or were used at the same time.

One example is provided by the beginning of the roll that was used for the Chicago *Berceuse* and the Philadelphia *Sunflowers* (Fig.26). If one examines the cusping of the paintings on canvas with the same weave structure one can reconstruct roughly the first three metres of the roll (Fig.33). Van Gogh used this canvas

not only for these two pictures but also for the two versions of *La berceuse* in the Kröller-Müller Museum, Otterlo, and the one in Boston which share a weft match, and the *Sunflowers* in the Van Gogh Museum.<sup>42</sup> It can be deduced from this reconstruction that Van Gogh cut up part of his roll for five size 30 paintings. His decision to cut the canvas for the Amsterdam *Sunflowers* not horizontally from the roll but vertically also tells us that he divided up the section of canvas beside it for smaller sizes, because otherwise that decision would have been uneconomic. This is confirmed by the weft match between *Sunflowers* and *Still life with potatoes* (Fig.26).

Reconstruction is more difficult with rolls that were only attached with nails during the application of the ground layer.<sup>43</sup> There is then very little variation in the cusping, and unfortunately that is the case with one of the three kinds of *toile ordinaire*.<sup>44</sup> Fortunately it is not the most common, and another point in our favour is that a consignment of this type came from the beginning of a bolt, which establishes the position of at least one painting.<sup>45</sup> It is as yet difficult to say whether the rest of this roll and the rolls of this canvas type from other batches can be reconstructed.

But what new insights into dating and sequence can we expect if the rolls are reconstructed? The current conclusion is that, unfortunately, we do not yet know. It can only be assessed from each roll individually – there is no general rule. Each roll, as we saw earlier, has its own problems. It may be a question of leftovers used later, or of Van Gogh working on canvas from more than one roll at the same time, and maybe first stretching several canvases before painting them, or doing so halfway through a

<sup>40</sup> On this, see Chavannes and Van Tilborgh, *op. cit.* (note 30), pp.549–50.

<sup>41</sup> Carlyle and Hendriks, *op. cit.* (note 9).

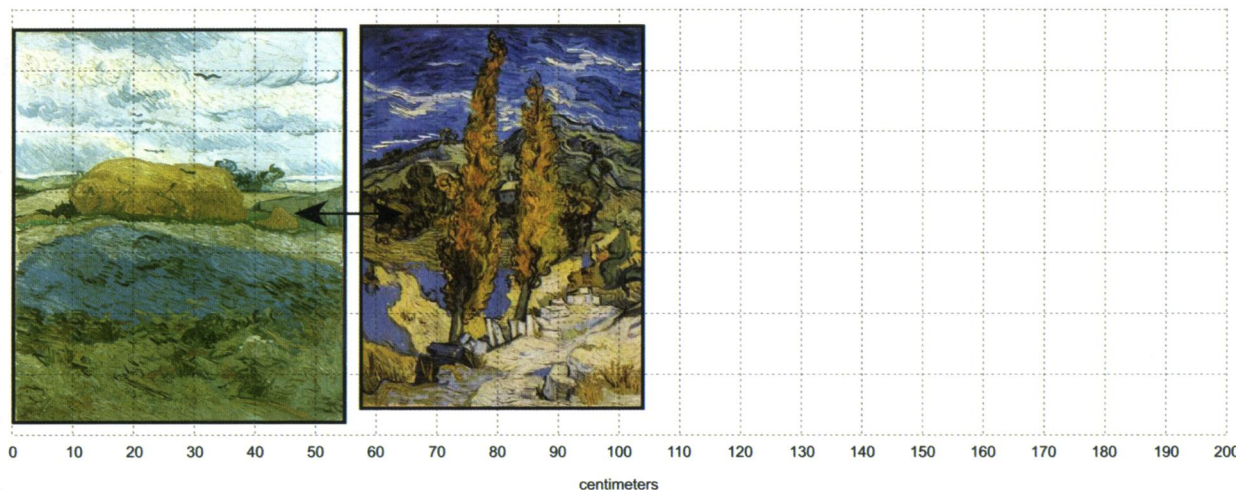
<sup>42</sup> The other two versions of *La berceuse* (Metropolitan Museum of Art, New York, and Stedelijk Museum, Amsterdam) are on canvases from rolls of the two other types of *toile ordinaire*.

<sup>43</sup> This may be indicative of a difference between vertical priming, for which the stretching frame of 2 by 10 m. was stood upright and the spike and lacing system used, and horizontal priming, for which the frame lay flat and the canvas was nailed down

on all sides. For the latter method see Bomford *et al.*, *op. cit.* (note 1), p.49.

<sup>44</sup> This is the type with an average thread count match of 12 by 15.5 per square cm.

<sup>45</sup> This emerges from the weft angle map of the *The garden of the asylum at Saint-Rémy* of May 1889 in the Kröller-Müller Museum in Otterlo. There are also batches of the other two canvas types which include the beginning of a bolt, both of which have already been mentioned: *La berceuse* in Chicago and the Philadelphia *Sunflowers* (11.5 by 17 per square cm.) and *The bedroom* and *Self-portrait in Chicago* and Paris respectively (11.5 by 18 per square cm.).



36. *Wheat stacks under a cloudy sky*, by Vincent van Gogh. 1889. Canvas, 63.3 by 53 cm. (Kröller-Müller Museum, Otterlo); and *Poplars at Saint-Rémy*, by Vincent van Gogh. 1889. Canvas, 61.6 by 45.7 cm. (Cleveland Museum of Art).

roll. We cannot know any of this in advance, and the challenge is to discover what he decided to do with each roll. Only then can we see if we can arrive at a more precise sequence with the aid of what we already know about dates from other sources. We believe that the sheer volume of data will enable us to form a more accurate picture of Van Gogh's way of working.

Ironically, we suspect that this procedure will probably be easier with the earlier Nuenen paintings than with those from the summer of 1888. Van Gogh had less money in his Dutch period, and the data currently in the database seem to indicate that in those days he was far more inclined to finish a roll before starting on a new one. The grouping of the kinds of canvas shows that by and large they were used for works that were executed at about the same time.<sup>46</sup> Unlike the French *œuvre*, we know that quite a few paintings have been lost, which means that the reconstruction of rolls will always be incomplete.

Despite these caveats, it is possible to report some new discoveries. For example, *Still life with vegetables and fruit* (Van Gogh Museum) has always been dated to the autumn of 1885, but that, it turns out, is incorrect. It has a weave match with *Vase with honesty* (Fig.34) which, according to current opinion was painted in the autumn of 1884 or that winter.<sup>47</sup> There are chrysanthemums in the foreground of the flower piece,<sup>48</sup> so it was painted in the autumn, which also fixes the date of the other picture, assuming that in Nuenen Van Gogh differed from his practice in France by finishing his rolls of canvas before ordering new ones. The manner of the fruit still life is not nearly as supple as pictures painted in the autumn of 1885 and consequently fits in much better with the other still lifes from his first year in Nuenen, which are also far more 'in' than 'beyond' the paint, to use an expression common among painters at the time.<sup>49</sup>

We also seem to have solved the problem of *Still life with potatoes* in the Kröller-Müller Museum, which was initially dated to Van Gogh's Paris period (Fig.26).<sup>50</sup> Scherjon and De Gruyter were the first to suggest that early Arles was more likely, and that view became widely accepted.<sup>51</sup> Recently, a new date of early 1889 was proposed, and the canvas research has now shown this to be correct.<sup>52</sup> As mentioned above, *Still life with potatoes* has a weave match with Van Gogh's third version of the sunflowers with a yellow background, which dates from the end of January 1889. That said, we still do not know the precise date of *Still life with potatoes* since he was planning to make 'one or two still lifes to get back into the way of painting' at the beginning of January. We are assuming that this resulted in that work together with *Plate with red herrings* (private collection) and *Still life with a plate of onions* (Kröller-Müller Museum), which are closely related in style and composition.<sup>53</sup> Van Gogh was probably speaking of these three works when he mentioned 'three studies' in a letter of mid-January 1889.<sup>54</sup>

*Two butterflies in the grass* (Van Gogh Museum) is another painting which, like *Still life with potatoes*, has been tossed back and forth. In 1928 De la Faille proposed Arles but corrected himself in 1939 by moving it to 1889, the first year of Van Gogh's stay in Saint-Rémy.<sup>55</sup> Alan Bowness, however, came to a different conclusion in 1968, dating it to May 1890, a suggestion accepted by the editors of the De la Faille *œuvre* catalogue of 1970.<sup>56</sup> Hulsker then moved it back to Arles, reverting to De la Faille's dating in 1928, and placing it at the end of Van Gogh's time there: April 1889.<sup>57</sup> The authors of the Van Gogh Museum's first collection catalogue followed Hulsker.<sup>58</sup>

The canvas research presented here has put an end to this long discussion. It turns out that Bowness was right. The paint-

<sup>46</sup> This category includes quite a few works which Van Gogh later painted over in both Brabant and Paris, so the simultaneity is not always immediately apparent.

<sup>47</sup> See Van Tilborgh and Vellekoop, *op. cit.* (note 3), pp.72–77.

<sup>48</sup> Kindly communicated by Hans C.M. den Nijs of Experimental Plant Systematics IBED, University of Amsterdam.

<sup>49</sup> Letter 439. In Van Tilborgh and Vellekoop, *op. cit.* (note 3), pp.72–77, it is not only the fruit still life that is dated to the closing months of Van Gogh's time in Nuenen but also the colouristically related scene of the flying fox. Doubts have now been cast on that dating, which has reverted to the autumn of 1884, on which see L. van Tilborgh: 'Establishing the chronology', in Hendriks and Van Tilborgh 2011, *op. cit.* (note 3), p.40, note 18.

<sup>50</sup> J.-B. de la Faille: *L'œuvre de Vincent van Gogh. Catalogue Raisonné*, Paris and

Brussels 1928, I, p.108.

<sup>51</sup> W. Scherjon and J. de Gruyter: *Vincent van Gogh's great period. Arles, St. Rémy and Auvers sur Oise (complete catalogue)*, Amsterdam 1937, p.192, no.182.

<sup>52</sup> Van Tilborgh, *op. cit.* (note 49), p.571, note 3.

<sup>53</sup> Letter 732.

<sup>54</sup> Letter 736. In note 5 to that letter these three studies are associated with *Still life with a plate of onions* and his two self-portraits (F 527 and F 529), but that seems a little odd in the case of the latter two in view of the neutral word 'study', although they were certainly painted in the same weeks. The canvas of *Still life with a plate of onions* is from the same roll. There is no known X-radiograph of *Plate with red herrings*.

<sup>55</sup> De la Faille, *op. cit.* (note 50), I, p.112; and *idem*: *Vincent van Gogh, Paris 1939*, p.486.

<sup>56</sup> A. Bowness: *exh. cat. Vincent van Gogh. Paintings and Drawings*, London (Hayward



37. X-radiograph of *Still life with poppies, cornflowers, camomile and carnations*, by Vincent van Gogh. 1886. Canvas, 80 by 67 cm. (Triton Foundation).



38. *Enclosed field with peasant*, by Vincent van Gogh. 1889. Canvas, 73.5 by 92 cm. (Indianapolis Museum of Art).

ing displays a weft match with *Tree trunks in the grass* (Fig. 35), the date of which is beyond a doubt. Van Gogh included a sketch of that painting in his letter to Theo of 4th May 1890 and thus painted the white butterflies in the grass around the same time.<sup>59</sup> Together with the stylistically related *Clumps of grass* (Pola Museum of Art, Kanagawa) it was an exploration of the decorative patterns to be seen in the garden of the asylum. Van Gogh wanted to familiarise himself with them in preparation for his *Field of grass with butterflies* (National Gallery, London), which, like *Tree trunks in the grass*, was an attempt to make a tapestry of paint in the manner of Monticelli.<sup>60</sup>

Another date that moved to and fro was that of *Wheat stack under a cloudy sky* (Kröller-Müller Museum). In 1928 De la Faille believed that it had been painted in Arles,<sup>61</sup> while in 1956 Hammacher and Gans suggested Saint-Rémy, but fourteen years later other authors favoured Arles or Auvers.<sup>62</sup> Although De la Faille had stuck to his guns, the editors of his *œuvre* catalogue made a small correction to June 1889.<sup>63</sup> Hulsker, always contrary, then proposed Auvers, even going so far as to suggest that it was one of Van Gogh's very last works.<sup>64</sup> The Otterlo museum's collection catalogue of 1980 then relocated it to Saint-Rémy, but subsequent authors once again followed Hulsker by placing it in Auvers.<sup>65</sup>

The canvas research has also put an end to this to-ing and fro-ing. The painting has a weave match with *Poplars at Saint-Rémy* (Cleveland Museum of Art; Fig. 36), which is known from

letters to have been executed before the beginning of October 1889.<sup>66</sup> Van Gogh's painting of the wheat stack on a rainy day can only have been made around the same time.<sup>67</sup> It shows the field within the asylum walls, and the stack of wheat is the same as the one in the middleground of *Enclosed field with peasant* (Fig. 38). At centre right in that work, against the backdrop of Les Alpilles, is the low wall that is seen in severely foreshortened form in the Otterlo work. Van Gogh had gone further into the field for that picture and had turned to the left, which removed the ridge of hills from his field of vision and gave him a view of the landscape that was far less rugged. That is why the picture was not unequivocally associated with Saint-Rémy.

There is no better way to conclude this interim report than by making an appeal. Any museum or collector wishing to participate in this project should contact [onderzoek@vangogh-museum.nl](mailto:onderzoek@vangogh-museum.nl). It may be possible to date paintings more precisely, which will be very welcome while we wait for a new and much-needed *œuvre* catalogue. It is essential that an X-radiograph be made of the pictures, but that has the added benefit that it may well yield other results: Van Gogh often re-used his canvases. For example, beneath the *Still life with pears* of autumn 1885 is the head of a peasant woman (Van Baaren Collection, Centraal Museum, Utrecht), and it is known that *Still life with poppies, cornflowers, camomile and carnations* (Triton Foundation) from the early summer of 1886 is on top of a figure study that was probably made in Cormon's studio (Fig. 37).<sup>68</sup> In short, making X-radiographs is essential: if we wish to learn as much as possible about Van Gogh's complex *œuvre*, we have to make use of every available aid.

Gallery) 1968–69, p.121; and J.-B. de la Faille: *The works of Vincent van Gogh. His paintings and drawings*, Amsterdam 1970, p.284.

<sup>57</sup> J. Hulsker: *The new complete Van Gogh. Paintings, drawings, sketches*, Amsterdam and Philadelphia 1996, p.387 (the first edition was published in 1977).

<sup>58</sup> E. van Uiter and M. Hoyle, eds.: *The Rijksmuseum Vincent van Gogh*, Amsterdam 1987, p.343, no.1.220.

<sup>59</sup> Letter 866.

<sup>60</sup> *Clumps of grass*, of which we do not have an X-radiograph, is usually dated to the spring of 1889, but given the stylistic similarities to *Two butterflies in the grass* there can be no doubt that both were made at the same time.

<sup>61</sup> De la Faille, *op. cit.* (note 50), I, p.160.

<sup>62</sup> A.M. Hammacher and L. Gans: *A detailed catalogue with full documentation of 272*

*works by Vincent van Gogh belonging to the collection of the State Museum Kröller-Müller*, Otterlo 1959, p.97. See also, *ibid.*, (3rd ed.), ed. E. Joosten, Otterlo 1970, p.108.

<sup>63</sup> De la Faille, *op. cit.* (note 56), p.237.

<sup>64</sup> Hulsker, *op. cit.* (note 57), p.482.

<sup>65</sup> Hammacher and Gans, *op. cit.* (note 62), (4th ed.), ed. P. Hefting, Otterlo 1980, p.117; and J. ten Berge et al.: *The Paintings of Vincent van Gogh in the Collection of the Kröller-Müller Museum*, Otterlo 2003, pp.377–79.

<sup>66</sup> Letter 808.

<sup>67</sup> Van Gogh had no canvas left at the beginning of October; see note 40 above.

<sup>68</sup> There is only one surviving painted study of it (F 215, from a different model). Van Gogh is known to have overpainted two figure studies from Cormon's studio; see Hendriks and Van Tilborgh 2011, *op. cit.* (note 3), pp.186, 269 and 271.

