Four Drawings by Pieter Bruegel the Elder: Art-technical Research

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[FIG. 1] **Pieter Bruegel the Elder, *Justitia* (fig. 5), detail of the central figure.**

[FIG. 2] **Pieter Bruegel the Elder, *Stream with an Angler.* c. 1554.**
Pen and brown ink, 345 × 235 mm. Brussels, Bibliothèque royale de Belgique, Cabinet des Estampes / Koninklijke Bibliotheek van België, Prentenkabinet, inv. no. S.II 113145. Photo taken in raking light.

Pieter Bruegel the Elder was a virtuoso draughtsman of exceptional talent, who created enigmatic and complex compositions on paper throughout his career. In contrast to his paintings, his drawings have rarely been the focus of in-depth art-technical research.[1] Well studied and described in terms of style, his drawings have seldom been fully described in technical terms. Technical summaries in catalogues focusing on his graphic oeuvre are usually limited to descriptions of the laid paper with or without watermark and of the ink as *brown*, *grey-brown*, *brown-red* or *black*, referring more to the colour or tone of the ink than to its composition. A visual comparison shows the rich variety of colours and tones of his drawing media; even within one drawing, different shades of brown to black ink are visible. Pieter Bruegel was undoubtedly aware of this and selected the specific type and shade of paper and ink and the type of quill needed to realize his drawing: contour lines and quick, diverse and organic hatching required particular pens and inks (fig. 1).

More than any other artistic medium, drawings on paper are vulnerable. The well-known phenomena of ink fading through exposure to light and its autonomous chemical instability may have changed the original 16th-century visual characteristics of the ink's colour, thus hampering interpretation by scholars reliant on the eye to evaluate the drawings. Furthermore, successive mounting and restoration practices by previous owners through the centuries have changed the original characteristics. The analytical and imaging techniques recently applied to four Bruegel drawings, dated between 1554 and 1559, provide deeper insights into their materials and creation process. While visual appearance may change with time, the original appearance of the media selected by the artist can often still be deduced.

STREAM WITH AN ANGLER (1554), *LUXURIA* (1557), *PRUDENTIA* AND *JUSTITIA* (1559), FOUR DRAWINGS EXAMINED

In 2017–18, four drawings by Pieter Bruegel the Elder – three from the Print Room of the Royal Library in Brussels and one from the Royal Museum of Fine Arts of Belgium in Brussels – were studied in detail. These are a landscape, *Stream with an Angler*,[2] dated 1554, from the 'Lugt group', and three figurative allegories drawn as preparations for prints, *Luxuria*,[3] dated 1557, *Prudentia*[4] and *Justitia*,[5] both dated 1559 (figs 2–5). This essay explores and compares the technical characteristics of these four drawings on paper and illustrates the differences in media and tools. The study does not aim to define all the materials used in Bruegel's drawings, since, for example, none of the selected drawings has washes or chalks, and all are on white paper.[6] Nonetheless, this research, as part of the KU Leuven's work package in the Fingerprint Project, should provide a foundation for, and an impetus to, a broader art-technical study of the surviving sixty drawings by Pieter Bruegel the Elder, and is certainly a challenge for wider research in the near future.

[FIG. 3] **Pieter Bruegel the Elder, *Luxuria* (Lust). 1557.**
Pen and grey-brown ink, contours indented, 225 × 296 mm. Brussels, Bibliothèque royale de Belgique, Cabinet des Estampes / Koninklijke Bibliotheek van België, Prentenkabinet, inv. no. S.II 132816. Photo taken in raking light.

[FIG. 4] **Pieter Bruegel the Elder, *Prudentia* (Prudence). 1559.**
Pen and dark brown ink, contours indented, 224 × 300 mm. Brussels, Musées royaux des Beaux-Arts de Belgique / Koninklijke Musea voor Schone Kunsten van België, inv. no. 4060/490. Photo taken in raking light.

[FIG. 5] **Pieter Bruegel the Elder, *Justitia* (Justice). 1559.**
Pen and grey-brown ink, contours indented, 225 × 295 mm. Brussels, Bibliothèque royale de Belgique, Cabinet des Estampes / Koninklijke Bibliotheek van België, Prentenkabinet, inv. no. S.II 133707. Photo taken in raking light.

[FIG. 6] *Luxuria* (fig. 3), detail of quill strokes starting from left to right.

[FIG. 7] *Luxuria* (fig. 3), detail of hatching.

[FIG. 8] *Luxuria* (fig. 3), detail of contours.

The four drawings were examined and photographed in a standardized studio set-up: high-resolution photography with frontal and raking light, recto and verso, and with transmitted light;[7] ultraviolet light (UV); multispectral photography with filters;[8] photometric stereo with KU Leuven's Portable Light Dome (PLD white light and multispectral);[9] infrared reflectography (IRR).[10] For analytic research the drawings were transported to the Royal Institute for Cultural Heritage (KIK-IRPA) in Brussels for: macro-X ray fluorescence mapping (MA-XRF).

DRAWING TOOLS: A TABLE FULL OF QUILLS

All four drawings were made with feather pens. The quills used by draughtsmen such as Pieter Bruegel were most probably cut from the larger feathers of the right side wing of geese or swans or smaller birds such as doves, chickens or sparrows.[11] Bruegel was right-handed, because the ink on the left side of a quill stroke – where he started his line – is thicker than the right endpoint (fig. 6). On his (perhaps slightly sloping) working table, a set of different quills and a quill knife would have been ready and prepared for use. The quills were aged either naturally or artificially, meaning that the feathers were either a few years old or hardened. To allow the shaft of the feather to dry out, the quills had to be cured by putting them in hot ashes or sand for a certain time.[12] When fresh, the shaft would have been too weak to draw with and the natural fat would have interfered with the flow of the ink and the splitting of the nib. The method of hardening quills was described in several 16th-century calligraphic treatises.[13] Palatino suggests in 1540 in his *Libro nuovo d'imparare a scrivere* that the hardening of feathers by putting them in hot ashes was widespread.[14]

Bruegel, apparently trained as an illuminator and draughtsman, selected and prepared his quills and cut the nib to a specific thickness of point to allow him to create the line he wanted (0.05–1 mm thick). During the creation of a drawing, the nibs were resharpened with a quill knife, to produce the desired thickness for each line of ink. The nib had to be sharpened every few minutes, and the entire shaft of one quill could easily be used up on a particular detail. For one drawing he might have used more than two dozen quills.[15] When we observe the drawing vocabulary of Bruegel, we see he loved detailed hatching, curling and dotting points to fill the surface on the paper; minimal, sometimes dense lines, spots and criss-crossing fill the scene, defining highlights and creating shadows and tones (fig. 7). Thicker lines, created by increasing the pressure of the finger tips on the quill, sometimes accentuate the main figures in the drawing. As well as the quills, the selection of the ink played a major role (fig. 8).

BRUEGEL'S MEDIA: COMBINING INKS

The three figurative allegorical drawings studied (*Justitia, Prudentia* and *Luxuria*) are made with fine solid lines, with detailed dots and small details in the hatching, because they functioned as cartoons for engravings, while the vertical landscape of *Stream with an Angler* is drawn with atmospheric free pen strokes. Visually, the colours of the inks differ, as the allegorical drawings are drawn in grey-black or brownish ink, in contrast to the large tree near the river, executed in red-brown ink. During the research it became clear that the ink media used by Bruegel are different in the four drawings. This can be seen in the infrared reflectograms of the drawings, which do not reveal any underdrawing but only the ink of the lines of the finished drawing (figs 9 and 10).[16] Bruegel did not use any preparatory lines on the paper. It is highly likely that, for these allegorical drawings, separate sketches were made to prepare these complex compositions, but that these sheets with sketches failed to survive.

More information about the ink used for the drawings is gained with the combination of non-destructive chemical analyses (MA-XRF) and multispectral imaging (IR photography and multispectral micro-dome (MS MD)), which revealed the mixed composition of the inks: iron-gall ink combined with carbon ink. The varying components of iron-gall ink, made from gall nuts, iron sulphate, water and a binder, resulted in inks of diverse tones and hues, from light brown to black. Carbon ink, made from wood soot soaked in water, was blacker. This combination of the two is evident from the infrared images, where the lines revealed are exactly the same as those visualized through the MA-XRF analyses; the infrared images show the carbon, while the XRF technique (which cannot monitor carbon) detects the iron. Visually, adding carbon gave the ink a deep black lustre

[FIG. 9] ***Luxuria* (fig. 3), infrared photograph.**

[FIG. 10] ***Justitia* (fig. 5), infrared reflectogram.**

[FIG. 11] ***Justitia*** **(fig. 5), detail, infrared reflectogram. Mixed carbon/iron-gall ink is used for the person hanging in the centre of the picture and the three men beneath him, seen from the back.**

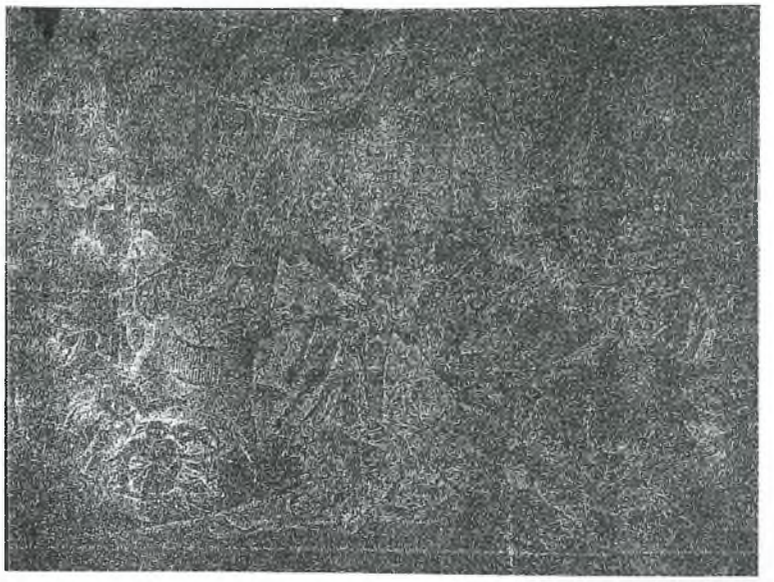
compared to the more brownish iron-gall ink (fig. 11). Combined inks are not so commonly used in drawings as the 'pure' iron-gall ink, but they were easy to make and not expensive.[17]

The two drawings from 1559, *Justitia* and *Prudentia* (preparatory drawings for the two engravings in the print series of the *Seven Virtues,* 1559–60, published by Hieronymus Cock), clearly have different characteristics. The ink medium of *Justitia* is completely visible in IR, the result of using an ink containing carbon, but in *Prudentia* only one small female figure in the centre appears in IR, thus demonstrating the overall use of an iron-gall ink except for this little figure drawn in a carbon-containing ink. The ink of *Luxuria*, 1557 (a preparatory drawing for the *Seven Capital Sins*), is similar to the one used in *Justitia.*

The use of combined iron-gall and carbon inks has a tradition going back to antiquity, as Pliny mentioned it as *atramentum.*[18] Italian artists such as Titian used combined inks and it is possible that they were known in the workshop of Giulio Clovio.[19] Recipes for combined inks are found in medieval illuminators' treatises, such as the important one compiled by Jean Le Begue in Paris in 1431.[20] The treatise written by Alexis of Piedmont/ Alexius Pedemontanus, *De Secretis libri VII*, in Lyon, *c.* 1558, also mentions the preparation of mixed inks.[21] Bruegel was certainly familiar with strong shades of mixed inks through his presumed training and experience as an illuminator, and would also have encountered the practice during his Italian journey.[22]

More information on Bruegel's drawing inks was revealed by the set of computerized images of elemental analyses of the iron-gall ink made by XRF mapping. It became clear that some areas are drawn in iron-gall inks of different chemical composition: in addition to the main component of iron, differing amounts of copper, lead or zinc are visualized in separate images. Slight differences in the composition of the metal components reveal the differences in the iron-gall inks the artist used in different phases of the drawing. In practice, this means Bruegel used another composition of ink. For example, the iron-gall ink of *Justitia* contains iron and zinc, with the exception of the vertical zone of *c.* 15 mm on the left of the drawing, which is worked out in an iron-gall ink without zinc. This might suggest a particular working session of some hours, when the artist used a different ink composition prepared in another inkwell. A second example is the dark cross-hatching to simulate windows and shaded interiors in *Luxuria,* created with an iron-gall ink containing a higher quantity of zinc. The detailed hatching on the left side of the tree trunk, and in the architecture and figures, is done with an iron-gall ink containing a larger component of lead (fig. 12). The naked figure on the right of the tree is drawn with two different compositions of iron-gall ink. The difference when zinc is present in the ink is also seen in the multispectral micro-dome false colour images (fig. 15). In *Prudentia*, some final details are filled with a dense hatching with an ink containing zinc. These hatchings in ink of a different composition are done most probably at the final stage of the drawing's creation, when Bruegel spent a

[12a]



[12b]

[FIG. 12] *Luxuria* (fig. 3). MA-XRF images showing (a) the distribution of iron and (b) the higher prevalence of lead in the iron-gall ink on the left side of the trunk.

[FIG. 13] *Stream with an Angler* (fig. 2), details of photo taken in normal light. (a) A blunt quill was used for drawing the foliage, (b) a sharper quill for the reflection in the water.

[13a]

[13b]

few successive sessions completing his drawing. We can reach this conclusion only through the elemental analyses of the inks, since these differences are not detectable with the human eye.

Bruegel's drawing *Stream with an Angler*, depicting a majestic tree near a river with three little figures, was created overall in a warm, mid red-brown coloured ink with a free hand. Analysis revealed a carbon ink mixed with an iron-gall ink, containing, in addition to iron, an admixture of nickel (Ni) and manganese (Mn).[23] The artist most probably added some earth colours, such as ochres, signalled by manganese, to the iron-gall ink to enhance the colour of the ink (fig. 13). This technique of adding pigments to inks can also be observed in Bruegel's grisaille paintings and has been found in earlier grisaille illuminations by Jean de Tavernier, a master illuminator working for the Burgundian court in the 15th century.[24] The presence of nickel in the ink is unusual, however. Nickel is an element accompanying natural iron-based ore, and is rarely found in drawing inks, or artists' media in general, in the 16th century. In Michelangelo's drawing *A youth beckoning; and a right leg* (*c.* 1505) in the British Museum, small amounts of nickel were also detected in the drawing medium.[25] Bruegel might have selected this ink recipe, as already mentioned above, from his experience of Italian drawing practice.[26] Nonetheless, nickel remains uncommon in iron-gall inks in the 16th century; it appears more often in iron-gall inks for drawings from the 17th century onwards.[27] The warm brown ink with some reddish shade is found in numerous drawings by Bruegel, not only landscapes, but also allegorical drawings.

PAPER: STRUCTURE AND TRANSFER

The laid paper Pieter Bruegel used for drawing was made from linen rag pulp produced on a sieve of metal wires. This created a slightly irregular surface due to the relief imprint of the wire and the chain lines. As the structure of the paper was certainly not as smooth as modern paper, Bruegel needed a light hand on the quill and focused concentration to realize every desired line. Drawing on paper is a direct medium, with no room for mistakes. Undesired ink lines on rag paper can only be removed by scraping a thin layer off the paper. It seems Bruegel did not make mistakes or hesitate, as revealed by the imaging with transmitted light and the photometric stereo estimations of the paper's relief. Every line he placed in the composition was sharp and meaningful. One addition he made in *Luxuria* is the fuller feather tail of the rooster in the centre of the drawing.

Other topographical features, which can be observed on the three preparatory drawings for the engravings and which were described by Hans Mielke, are the indented or incised lines applied on the recto side in the fibre structure of the paper of *Luxuria*, *Justitia* and *Prudentia*. The transfer of the drawing to the surface of the copper plate, for engraving and then printing, is documented through these dry sharp lines; visible as shallow valleys or grooves, these were made in the paper by the engraver (Pieter van der Heyden) following the main contours of the figures with a fine metal stylus. This working process guaranteed a faithful copy for the printed edition. The details, such as dots and hatching, were not always indented. These lines were made visible

[FIG. 14] *Prudentia* (fig. 4), detail. Image with white light micro-dome (photometric stereo), showing the sharp indented lines.

Red-Green-Blue (RGB) IR-Red-Green IR-Green-Blue

[FIG. 15] *Luxuria* (fig. 3), detail. Multispectral micro-dome false colour images illustrate in more detail the different compositions of the two iron-gall inks used. The second type of ink contains zinc in addition to its main component, iron. In the RGB image, all the iron-gall ink lines appear black. In the IR-Red-Green and IR-Green-Blue images, the difference between the two inks becomes visible. The iron-zinc ink – used for hatching, shading, accentuating and modelling of the figure – appears reddish.

with photometric stereo, an imaging technique documenting the relief/topography of the surface of the paper using different lighting angles (fig. 14).[28] However, when the print of *Luxuria* was published in 1558 by Hieronymus Cock, a small change was made: due to the religious struggles of the time, the mitre of one figure in the drawing was replaced in the print by a head.

CONCLUSION

The standardized high-resolution photographic documentation and analyses of the four drawings kept in Brussels collections reveal Bruegel's great skill as a draughtsman. The characteristics of the ink indicate his knowledge of miniature painting and of Italian drawing techniques. The art-technical study shows that none of the studied pieces has an underdrawing, transfer lines or composition lines: the drawings were executed straight on to the paper. The use of iron-gall ink or combined iron-gall/carbon ink was clearly a deliberate choice by the artist, in order to gain certain effects in contours or in extremely detailed hatching. The differences in the elemental chemical components of the iron-gall ink (iron in combination with copper, lead or zinc) might result from the phases of work needed by Bruegel to finish the drawing: he might have worked on it for a few days or over a longer period. In contrast, the fluently drawn *Stream with an Angler* is in ink of uniform composition, containing carbon and iron with admixtures of manganese and nickel, suggesting that the drawing was made in one session. The colour of the inks may have faded through ageing, so that lighter ink may indicate a principally iron-gall ink, while darker ink may be the result of adding some dissolved carbon to the iron-gall component.

Further in-depth art-technical investigation into the drawn oeuvre of Bruegel, into both the landscapes and the 'Lugt group', as well as into the preparatory drawings for his printed oeuvre, will certainly reveal more details about his exceptional skill and virtuoso working methods.[29]

1 This research is part of the Fingerprint Project, an interdisciplinary collection and data management project, involving art history, art-technical research, digital imaging, image processing and conservation science. The aim is to monitor and evaluate, with advanced digital imaging, statistical processing and laboratory analyses, the phases of the genesis of a print, from the unique preparatory drawings to later states and editions. The four-year project (2016–20) is a collaboration between the Print Room of the Royal Library of Belgium and three KU Leuven teams: the Book Heritage Lab from Illuminare, Centre for the Study of Medieval Art, the Imaging Lab and ESAT. The Royal institute for Cultural Heritage is an external partner. The research project is funded by Belspo BRAIN-be (Belgian Research Action through Interdisciplinary Networks). For this project all the drawings and prints of Pieter Bruegel the Elder in the Print Room of the Royal Library in Belgium were digitized in 2017–18 by KU Leuven using a Phase One IQ180 camera, Schneider APO-DIGITAR 80/4.0 SES, exposure condition for Metamorfoze standard. For the project see: Lieve Watteeuw, Joris Van Grieken, Bruno Vandermeulen, Marc Proesmans, Maarten Bassens, 'The FINGERPRINT Project: From Drawing to Printed Line. The Art-Technical Genesis of Pieter Bruegel's Graphic Oeuvre', held at the conference 'Blocks, Plates, Stones: Matrices/Printing Surfaces in Research and Collections', 21 September 2017 at the Courtauld Institute of Art, London: https://fingerprintbruegel.wordpress.com/2018/04/12/poster-from-drawing-to-printed-line (last consulted 8 July 2019). For imaging with the KU Leuven Micro-Dome see: Watteeuw et al. 2016; Van der Perre et al. 2016.

2 Pieter Bruegel the Elder, *Stream with an Angler*. For details see: Mielke 1996, no. 19; Exh. Cat. Rotterdam – New York 2001, no. 18 (with previous literature); Sellink (2007) 2011, no. 19; Exh. Cat. Vienna 2018–2019, cat. no. 9.

3 Pieter Bruegel the Elder, *Luxuria* (Lust). For details see: Mielke 1996, no. 36; Exh. Cat. Rotterdam – New York 2001, no. 48 (with previous literature); Sellink (2007) 2011, no. 52.

4 Pieter Bruegel the Elder, *Prudentia* (Prudence). For details see: Mielke 1996, no. 47; Exh. Cat. Rotterdam – New York 2001, no. 68 (with previous literature); Sellink (2007) 2011, no. 84; Exh. Cat. Vienna 2018–2019, cat. no. 37. We thank Stefan Hauttekeete for his permission to examine the drawing of KMSK.

5 Pieter Bruegel the Elder, *Justitia* (Justice). For details see: Mielke 1996, no. 49; Exh. Cat. Rotterdam – New York 2001, no. 72 (with previous literature); Sellink (2007) 2011, no. 83; Exh. Cat. Vienna 2018–2019, cat. no. 36.

6 Michel 2017, p. 27, note 22.

7 Phase One IQ180, Fingerprint Project, KU Leuven.

8 Converted Nikon D610 with UV-VIS-IR Apo lens & MidOpt filters, Fingerprint Project, KU Leuven.

9 Allied Vision Prosilica GT 6600 with UV-VIS-IR Apo lens.

10 Osiris IRR camera, UGent. Image made by Max Martens.

11 On the history of quill making, historic treatises on calligraphy give some minor information. See: Pride 1812; Bishop 1956; Miner 1980; Brown – Lovett 1999.

12 The shaft of a feather is a tube or barrel. The hollow of the shaft consists of a cellular core (McKittrick et al. 2012).

13 For some 16th-century calligraphic handbooks mentioning the preparation of quills, see: Sigismondo Fanti, *Theorica et Pratica*, 1514; Ludovico Vincentino degli Arrighi, *La Operina*, 1522; Giovannantonio Tagliente, *Lo presente libro*, 1524; Giambattista Palatino, *Libro nuovo d'imparare a scrivere*, 1540; Juan de Yciar *Recopilacici subtilissima: intitulada orthographia practica*, 1548; Johann Neudörfer, *Fundament*, 1519; Caspar Neff, *Thesaurarium artis scriptoriae*, 1549; Juan Vives, *Linguae latinae exercitation*, 1540; Gerardus Mercator, *Literarum Latinarum, quasi Italicas cursoriasque vocant scribendarum ratio*, 1540.

14 Palatino, Giovanni Battista (*c.* 1515–*c.* 1575). *Libro nuovo d'imparare a scrivere tutte sorte lettere antiche, et moderne di tutte nationi, con nuove regole, misure, et essempi.* Rome: Baldassarre di Francesco Cartolari, 1540. This process is also known as 'dutching'; the quills were passed through hot ashes or sand to render them hard.

15 For understanding this process, we collaborated with a draughtsman, who observed Bruegel's drawing techniques and tested soft and hardened quills on old laid paper, experiencing how dominant the characteristics of the quills are in obtaining the desired effect. With thanks to the draughtsman Joris Snaet and the staff of the Maurits Sabbe Library, Faculty of Theology, KU Leuven, for providing the experiment on drawing with old laid paper and quills. These drawings were presented in the technical cabinets during the Bruegel exhibition in Vienna 2018–2019. Thanks to Nayla Marouf who studied the preparation of quills in the 16th century during her internship in the Book Heritage Lab in 2018.

16 In this essay only the infrared examinations of *Justitia* and *Luxuria* are published.

17 Combined inks could be used for writing and drawing as well as printing, see: Zerdouin Bat-Yehouda 1983, p. 206.

18 Colini et al. 2018, p. 49; Zerdoun Bat-Yehouda 1983, pp. 162–63.

19 Royalton-Kisch 2001, pp. 22–23. For Titian drawing, see: https://www.themorgan.org/blog/titians-heroes-forensic-analysis-detail-titian-drawing-under-normal-light (last consulted 21 June 2019).

20 Zerdoun Bat-Yehouda 1983, p. 206.

21 Zerdoun Bat-Yehouda 1983, pp. 293–94 and 310–11.

22 See the essay by Till-Holger Borchert in this volume.

23 KIK-IRPA, MA-XRF, M6 Jetstream, Bruker AXS Germany, Rh tube, 50kV, 600μA, spotsize 150μm, steps of 125μm, 10 ms/pixel. Also very small traces of potassium (K) were measured, inherent in iron-gall ink.

24 Watteeuw – van Bos 2014; see: Watteeuw – van Bos 2018.

25 *A youth beckoning; a right leg. c.* 1504–1505. Drawing in pen and brown ink and black chalk. London, British Museum, inv. no. P&D 1887.0502.117, recto. See: Verri et al. 2010, p. 68.

26 Royalton-Kisch 2001, p. 20.

27 In the 17th century often described as *Bisschops ink* after the Dutch artist Jan de Bisschop (1628–1671) who used a warm brown ink with a nickel component for his drawings. See: La Camera 2007.

28 White light micro-dome, KU Leuven.

29 One drawing in the circle of Bruegel: *The Street of Messina* (Mielke no. 15) was studied in 2018. See: Van Grieken et al. 2020 (forthcoming); see also Watteeuw 2019.

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Analyseverslag

Gemeente:	.....
Instelling of verzameling:	.....
Type van object:	.....
Titel van het object:	Hengelaar aan een stroom

Aanvrager:	Project Fingerprint
Contactpersoon aanvrager:	
Dossiernummer KIK:	2018.13804
Betrokken cel(len) van het KIK:	Labo, cel leder, papier & perkament
Verantwoordelijke van de cel(len):	Marina Van Bos
Contactpersoon KIK:	Marina.vanbos@kikirpa.be
Datum van het verslag:	.....
Verslag opgesteld door:	

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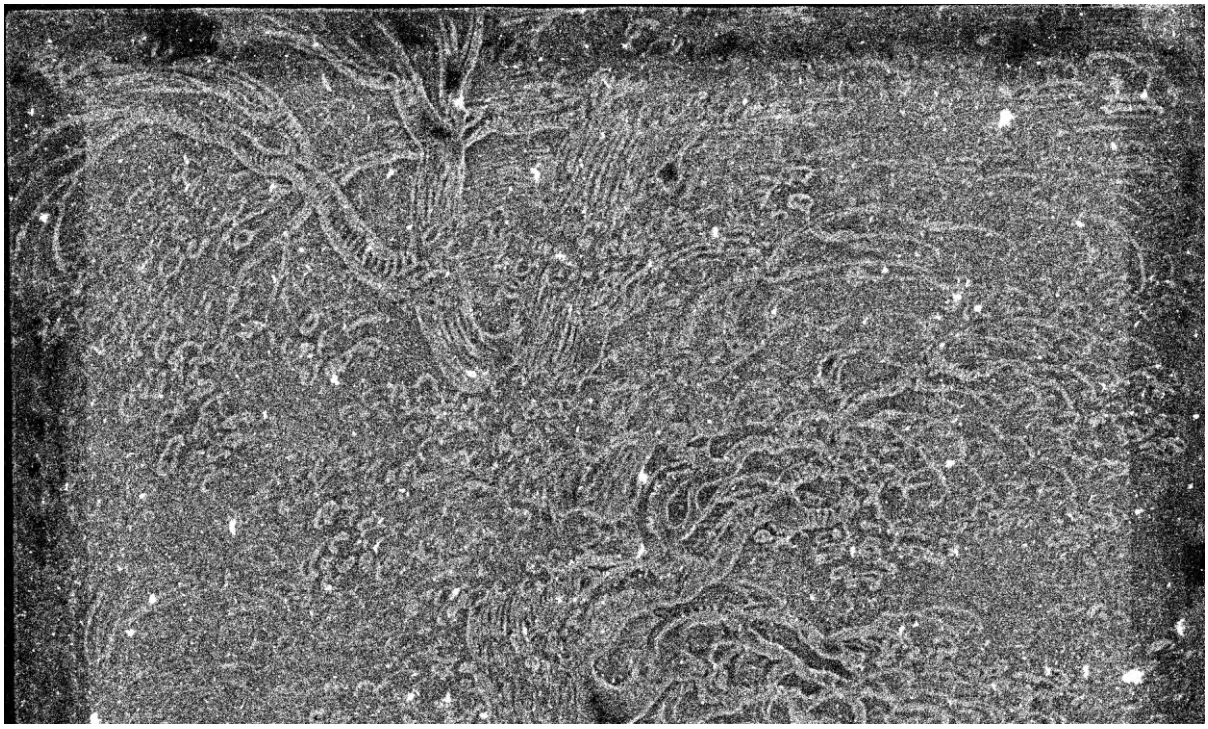
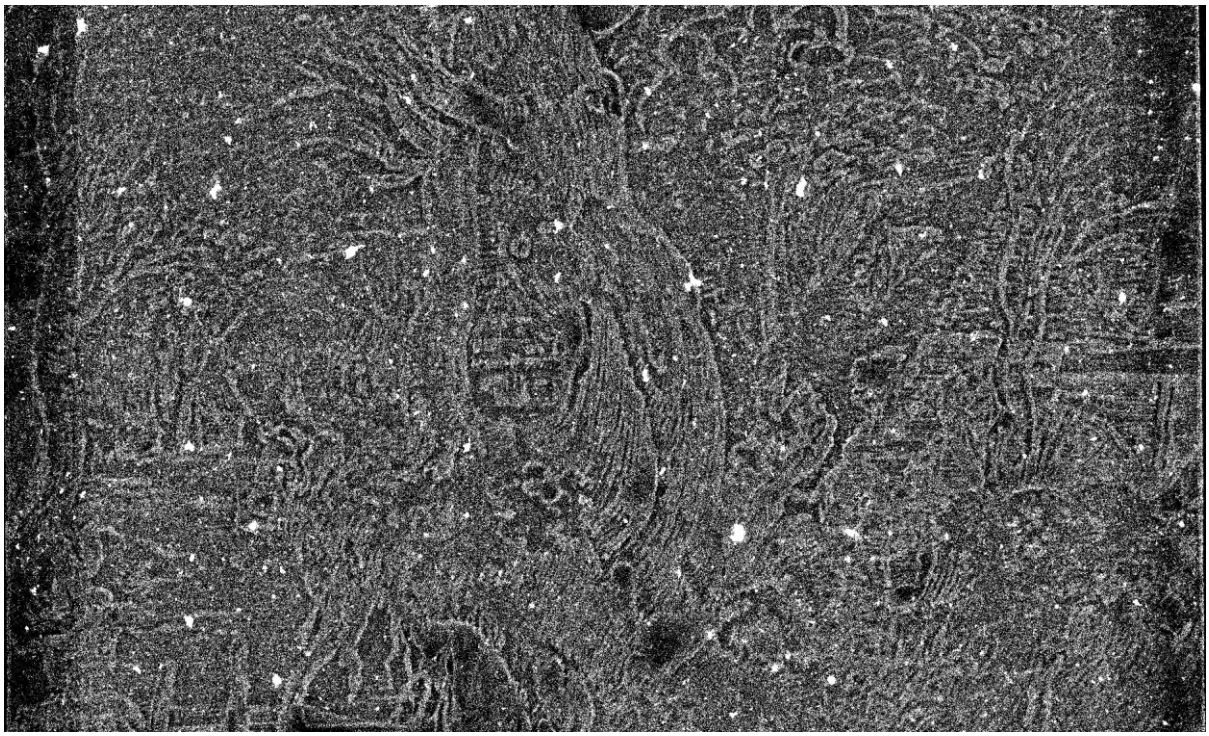
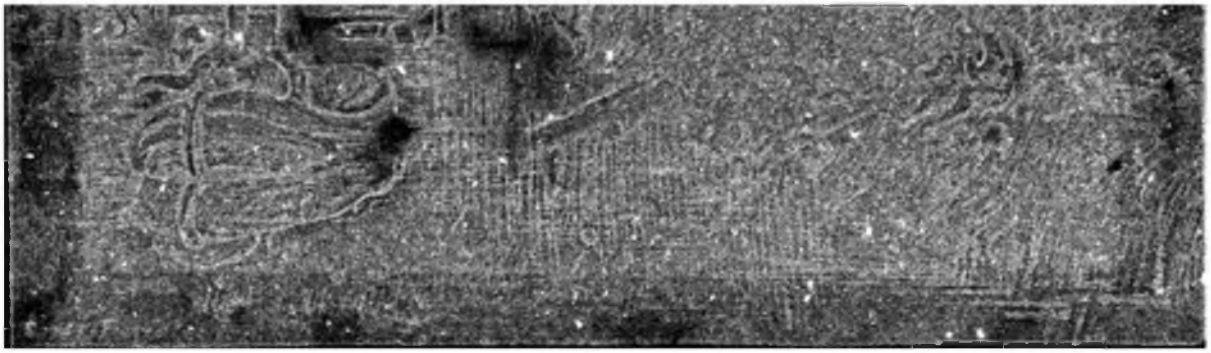
23.5 x 14.2 cm

23.5 x 6.73 cm

CALCIUM







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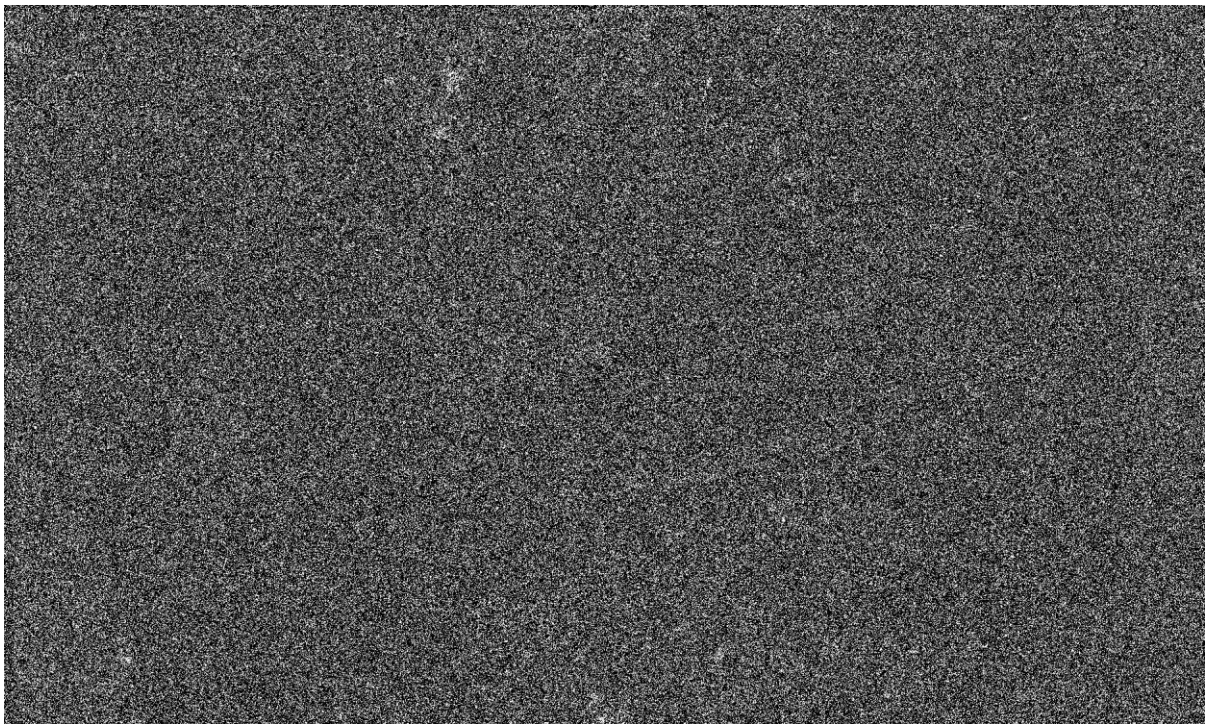

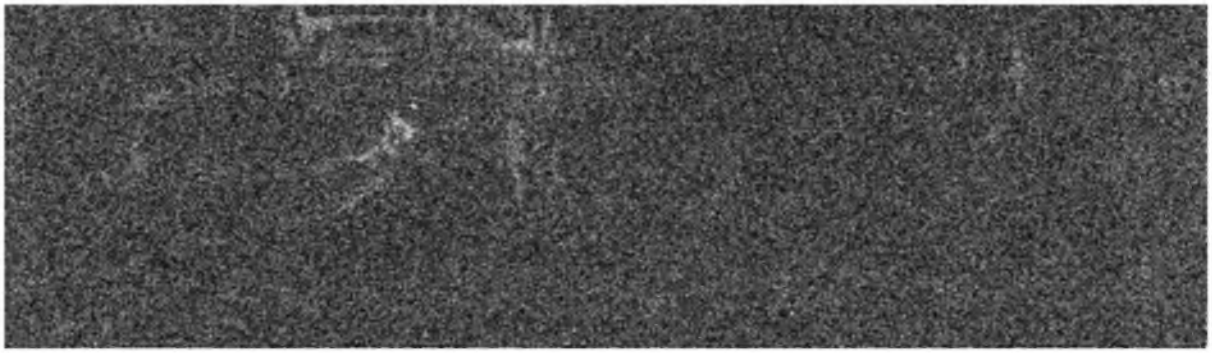

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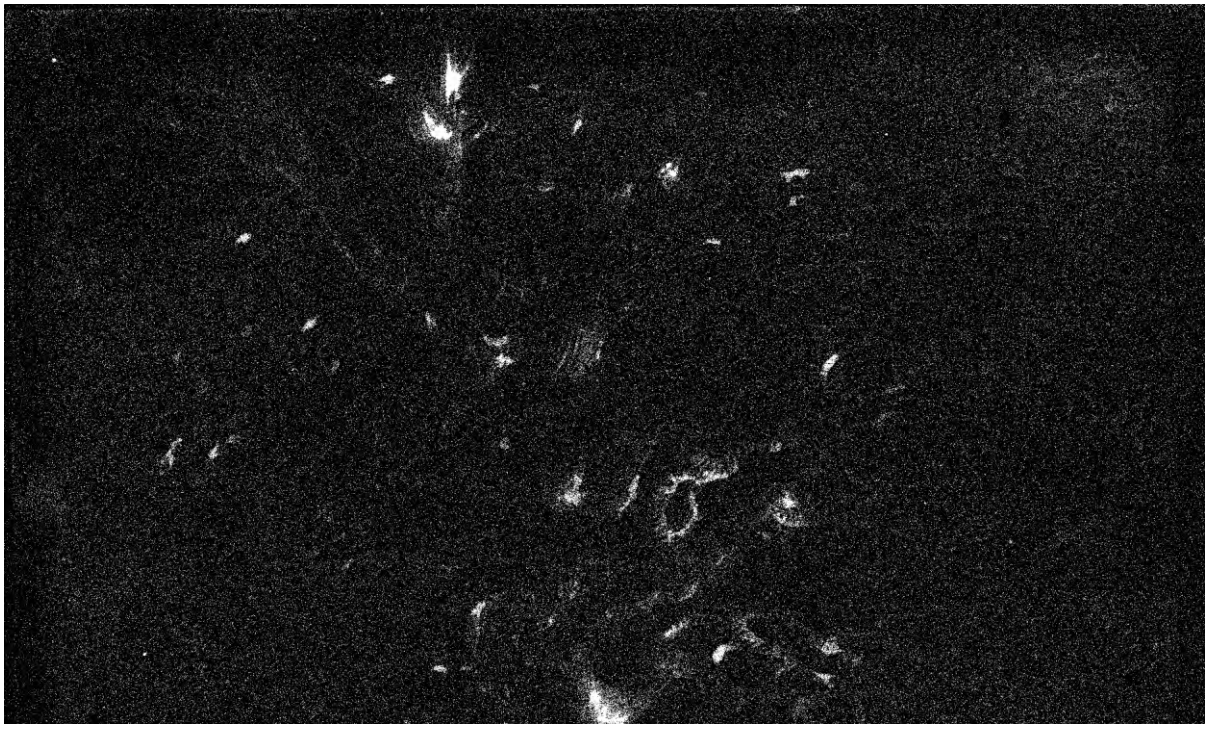

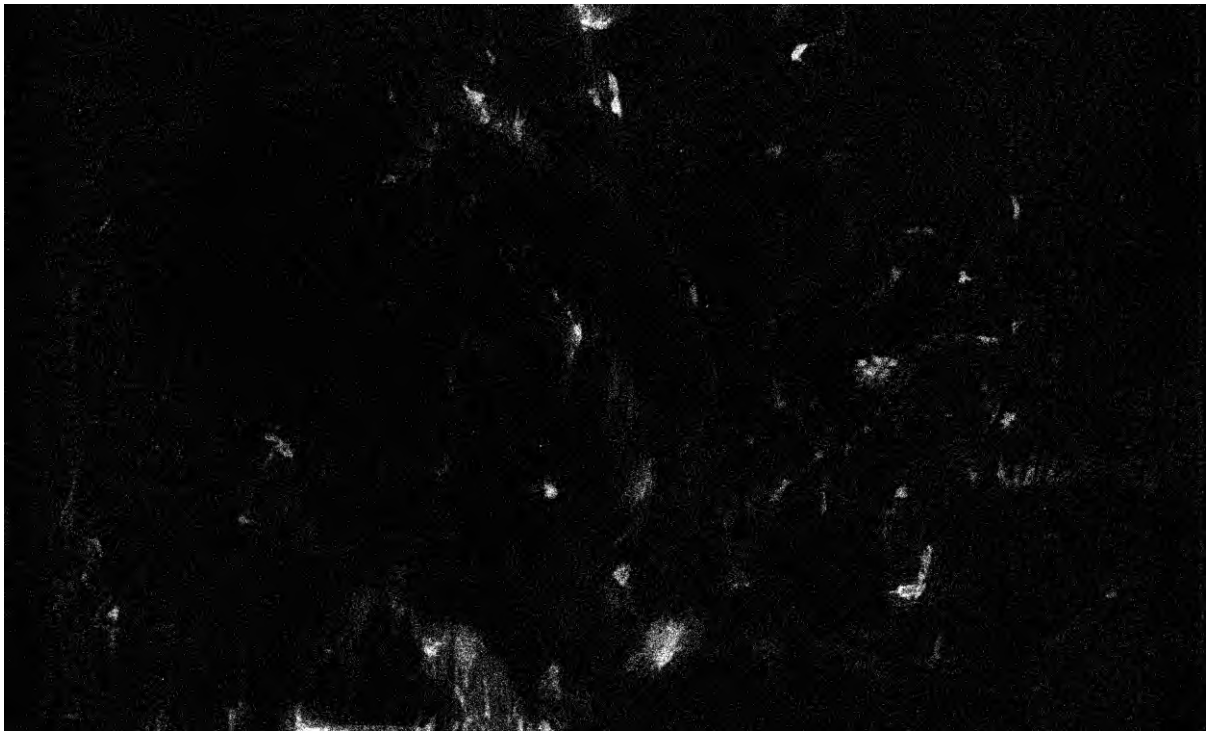

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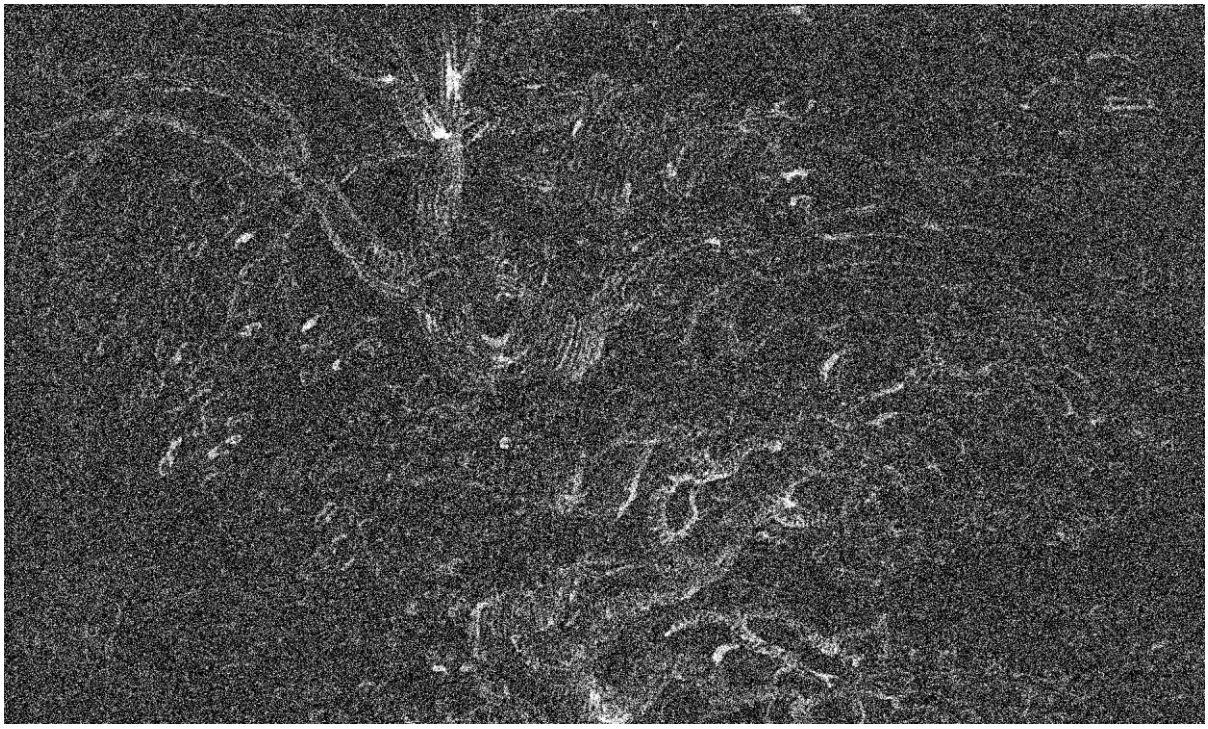

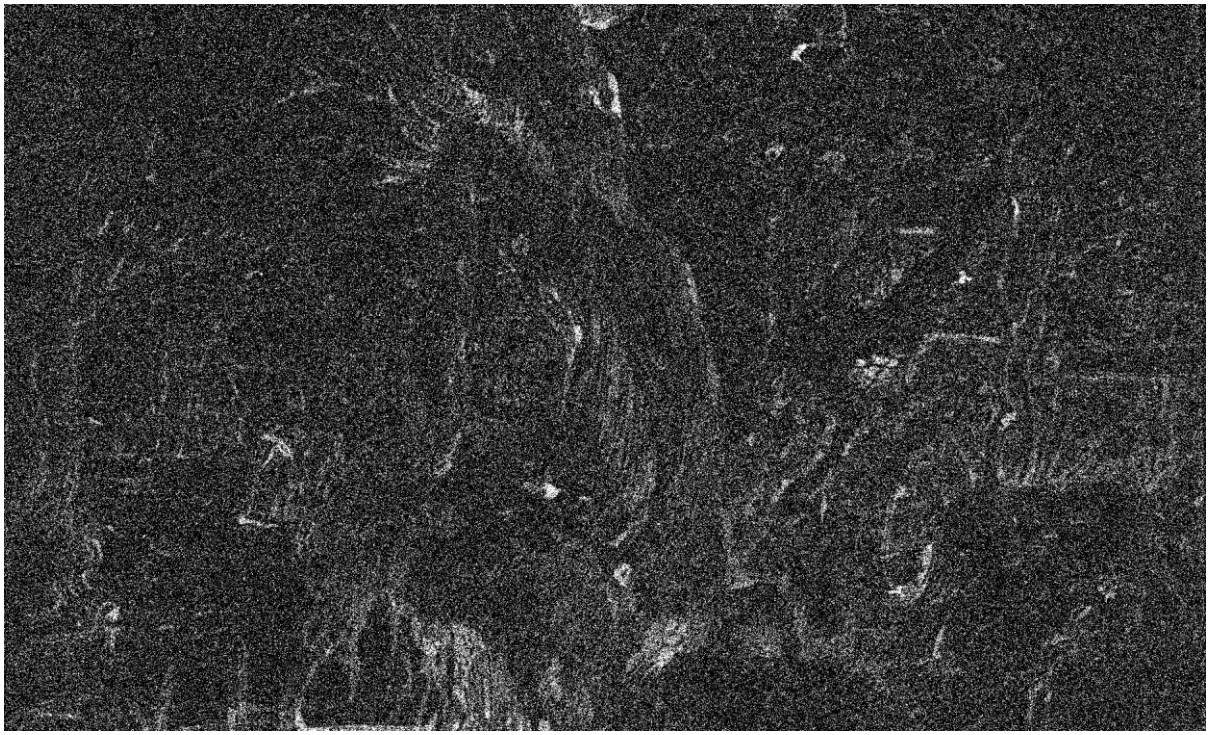

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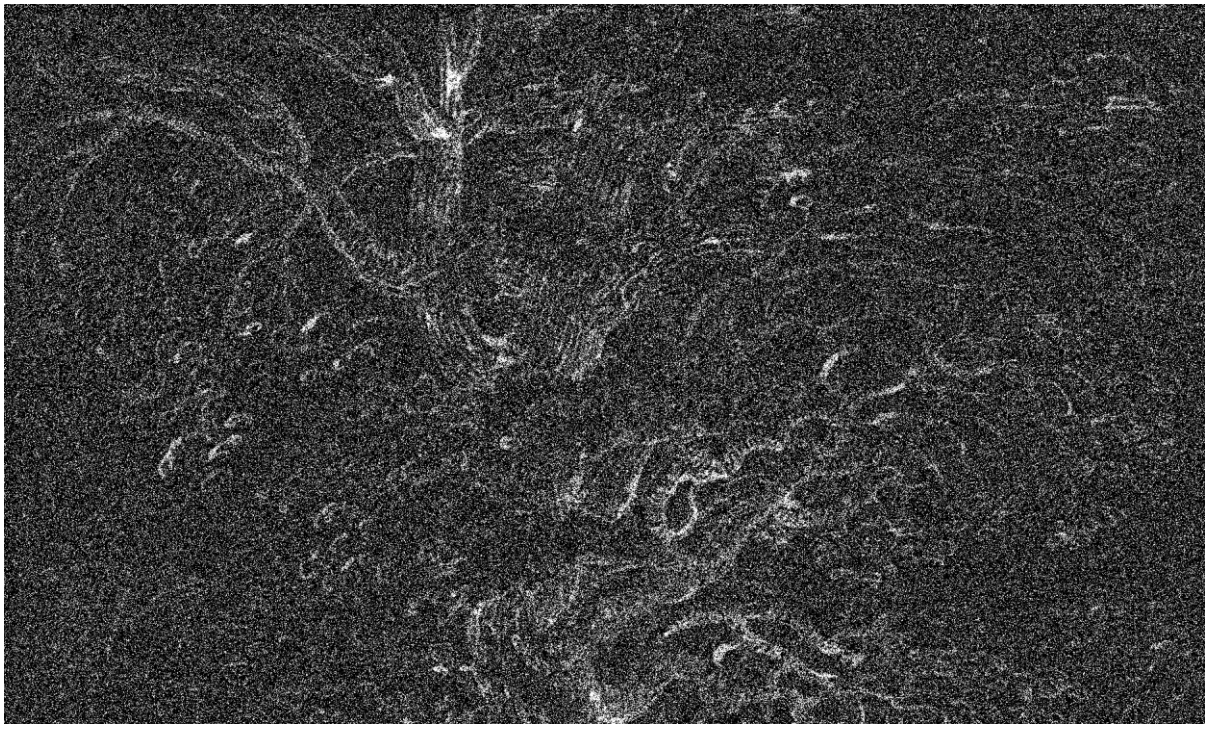

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Analyseverslag

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Verantwoordelijke van de cel(len): Marina Van Bos
Contactpersoon KIK: Marina.vanbos@kikirpa.be

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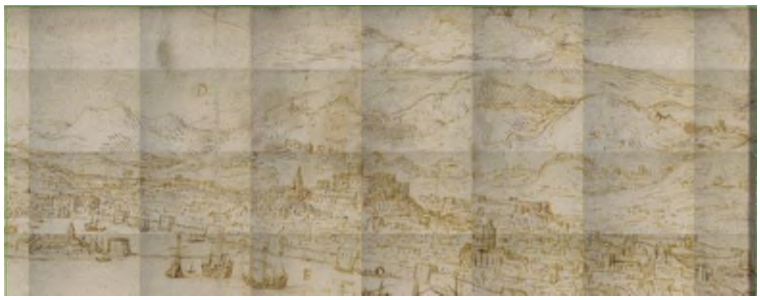

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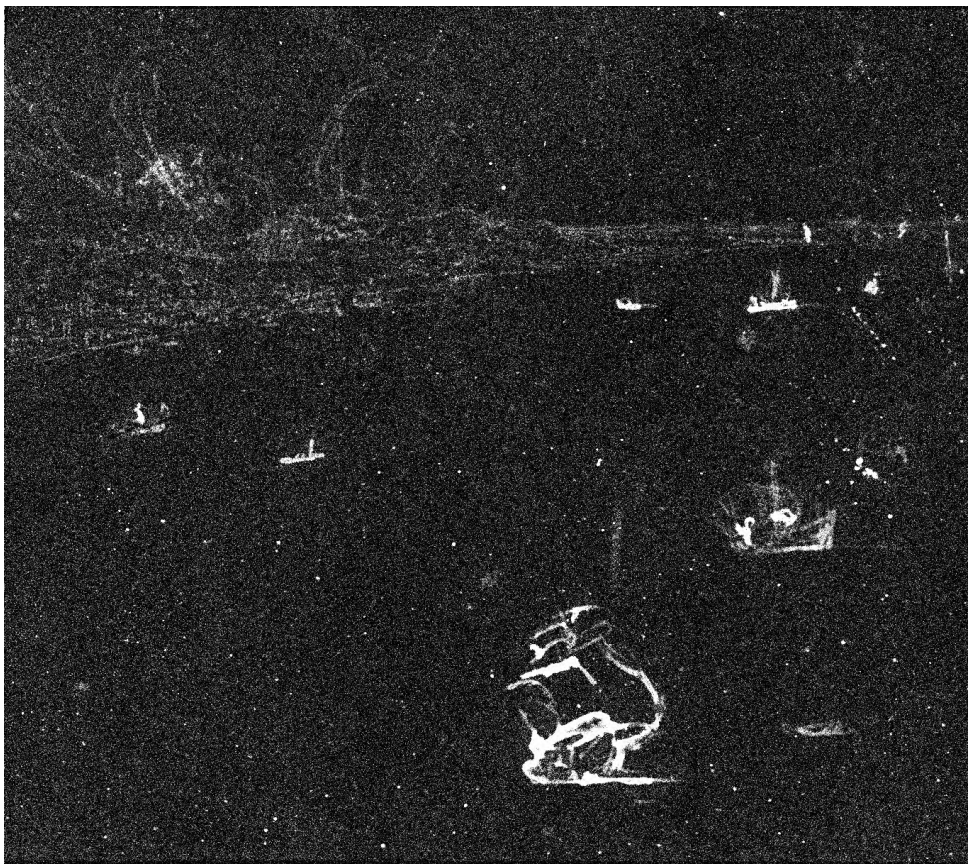

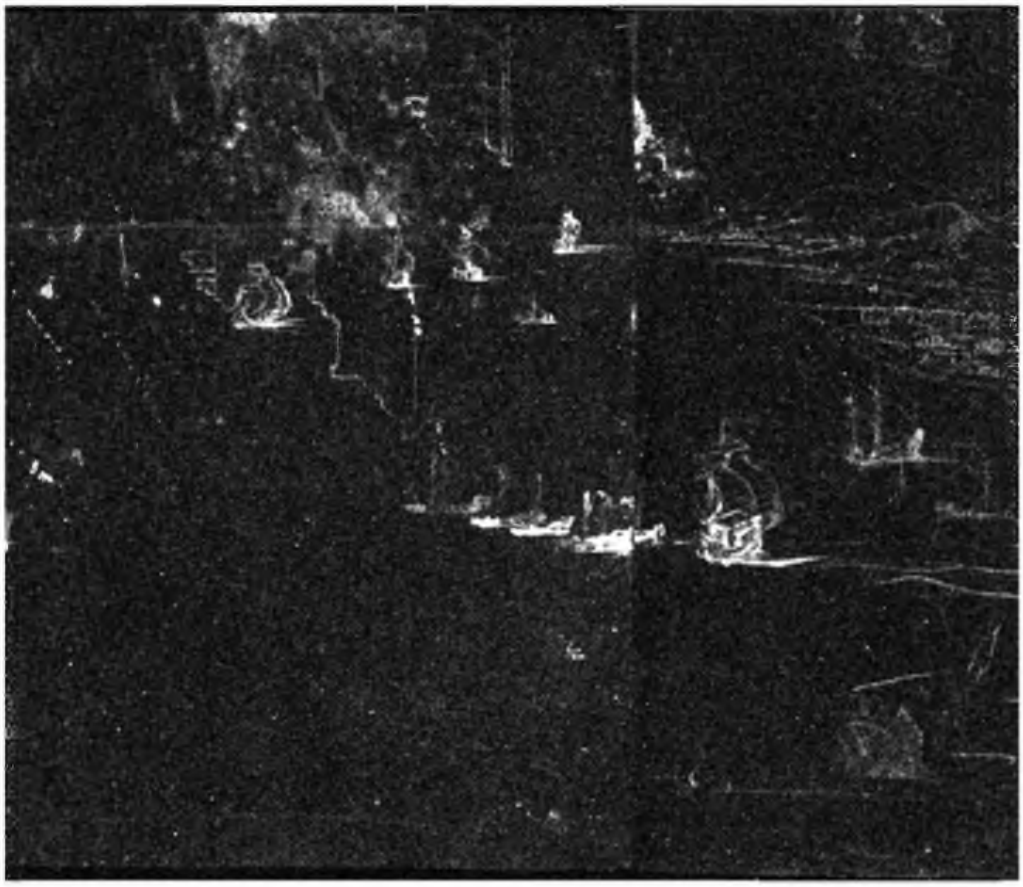

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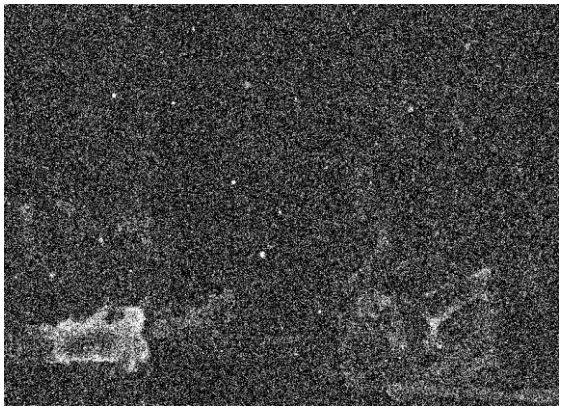

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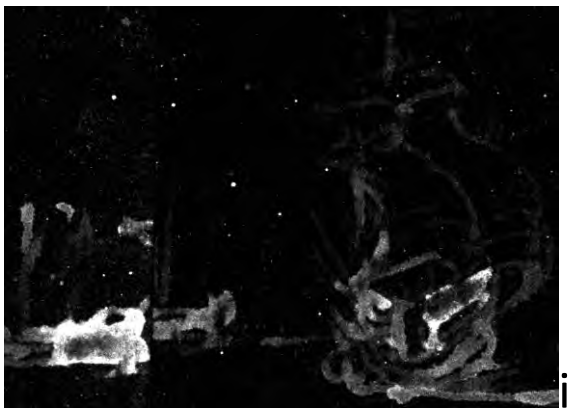

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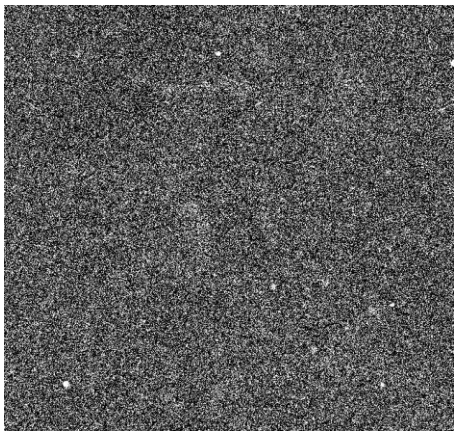
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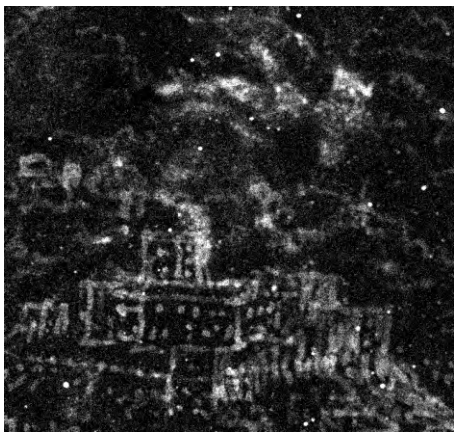
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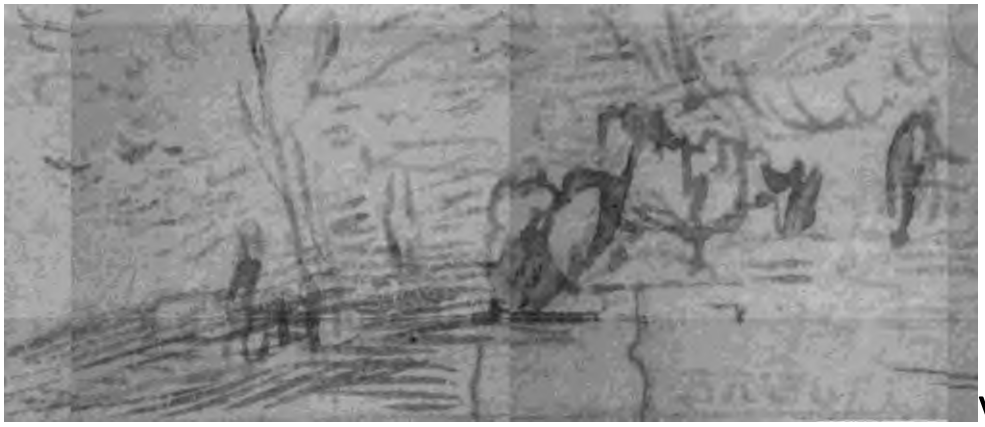
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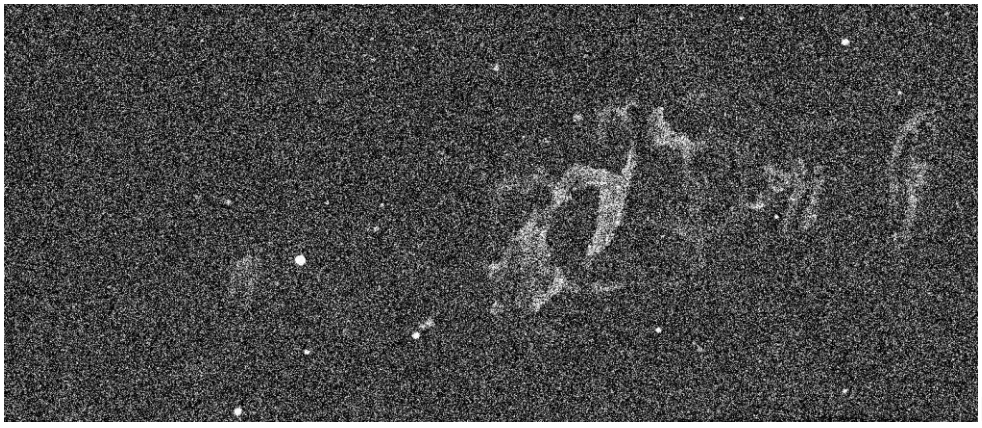
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Analyseverslag

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Verantwoordelijke van de cel(len): Marina Van Bos
Contactpersoon KIK: Marina.vanbos@kikirpa.be

Datum van het verslag: .....
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11.2 x 22.3 cm

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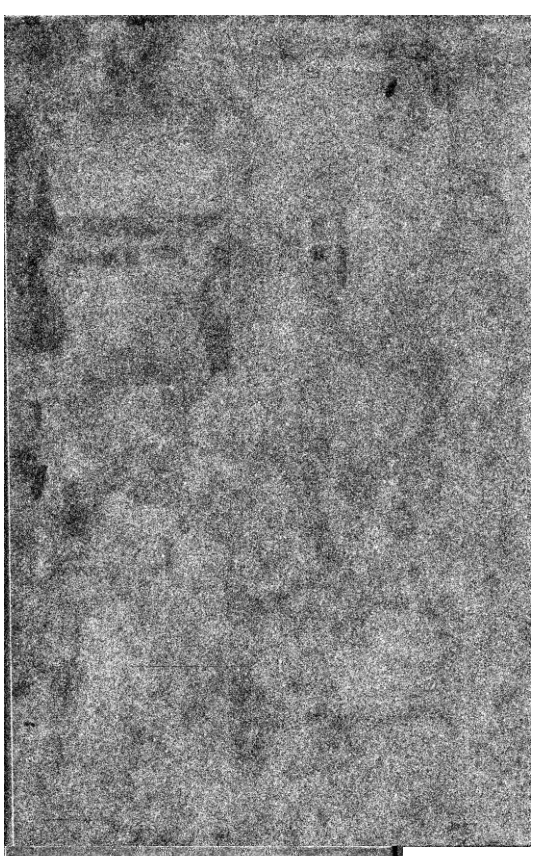

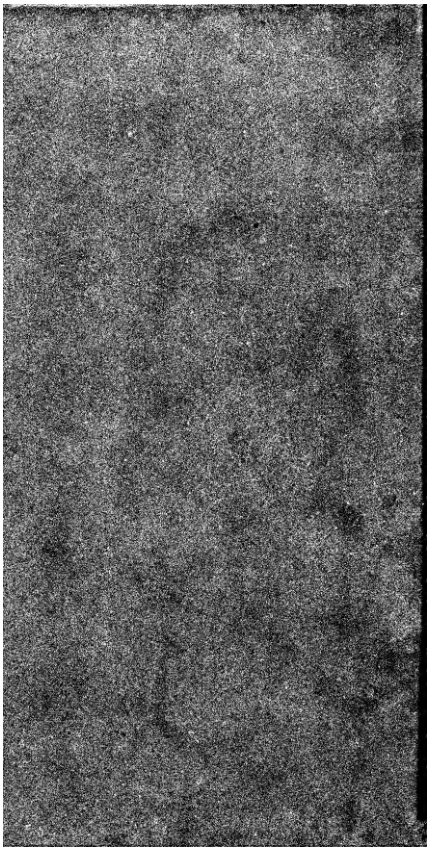

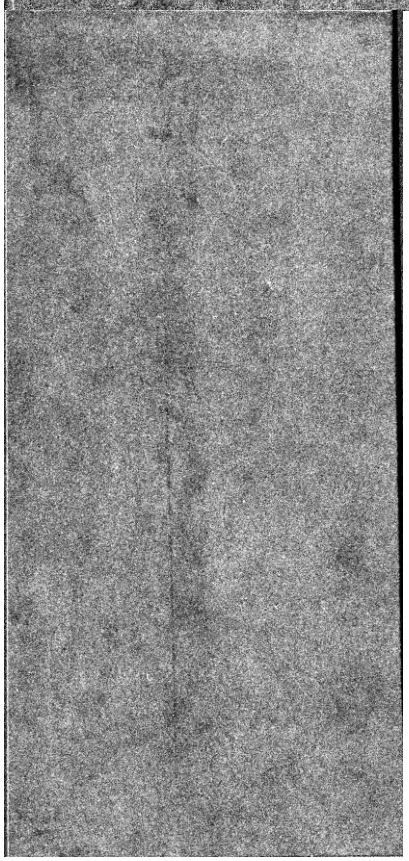

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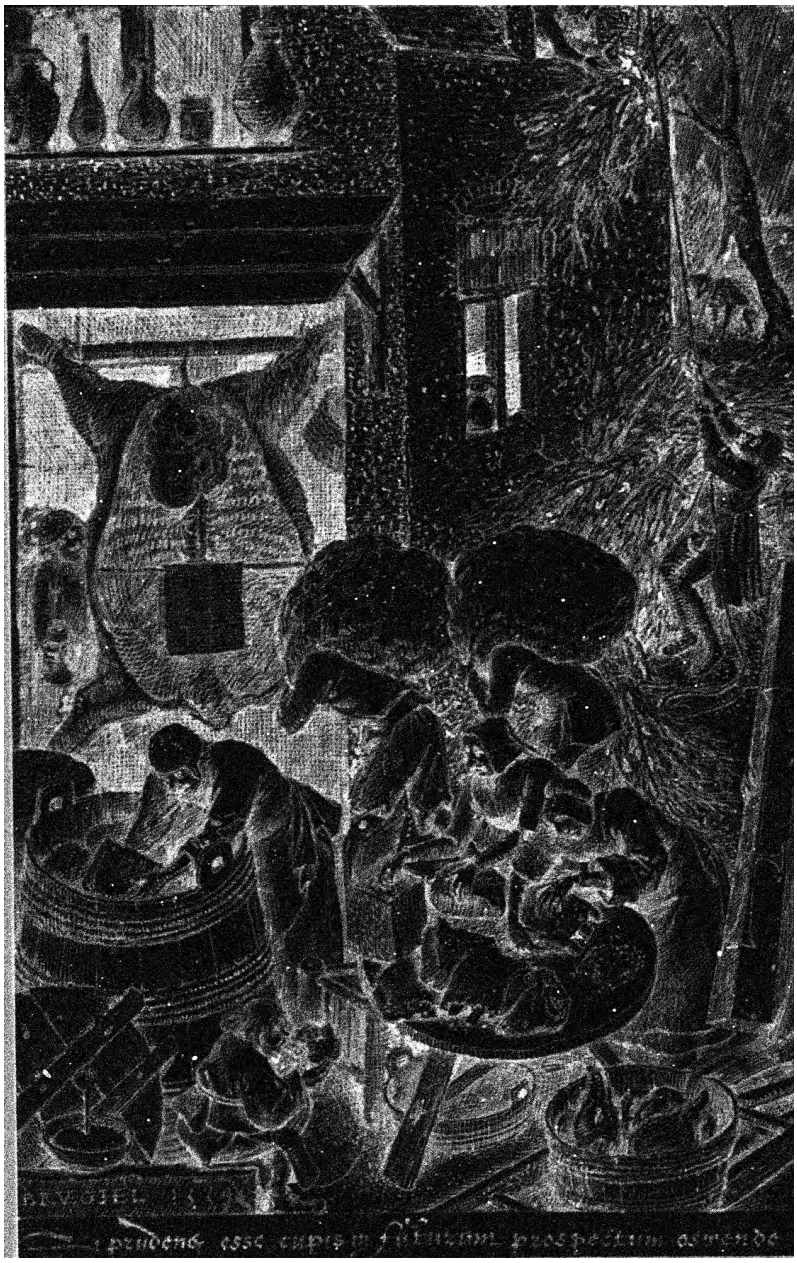

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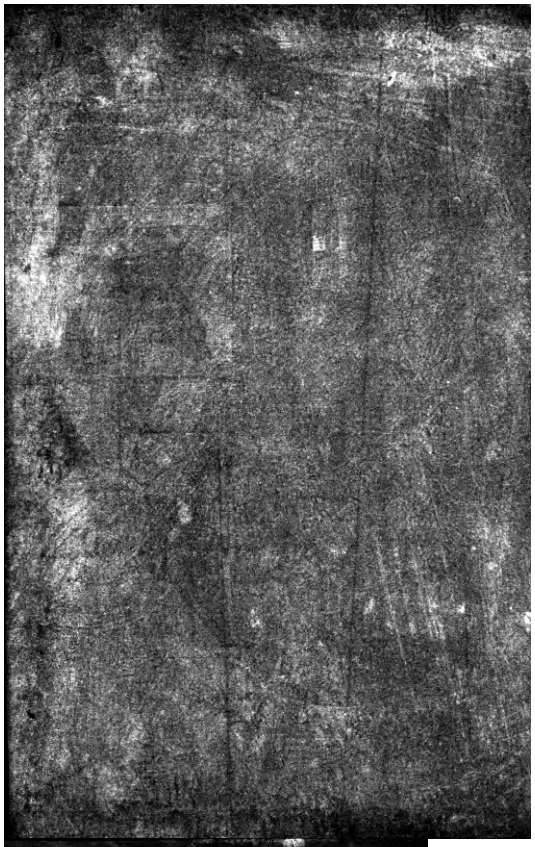

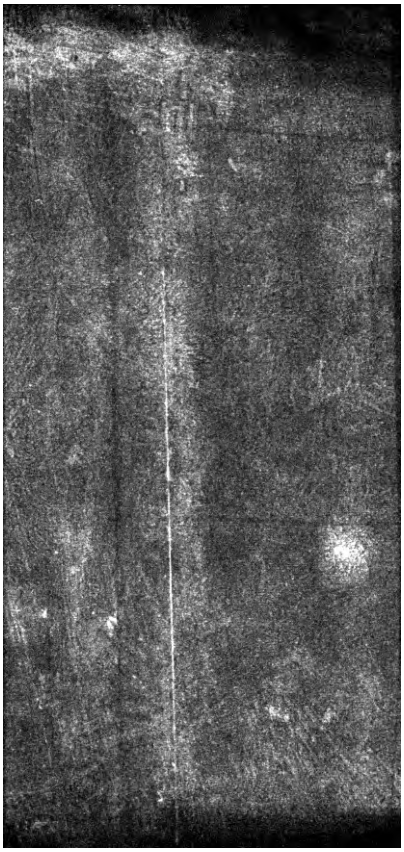

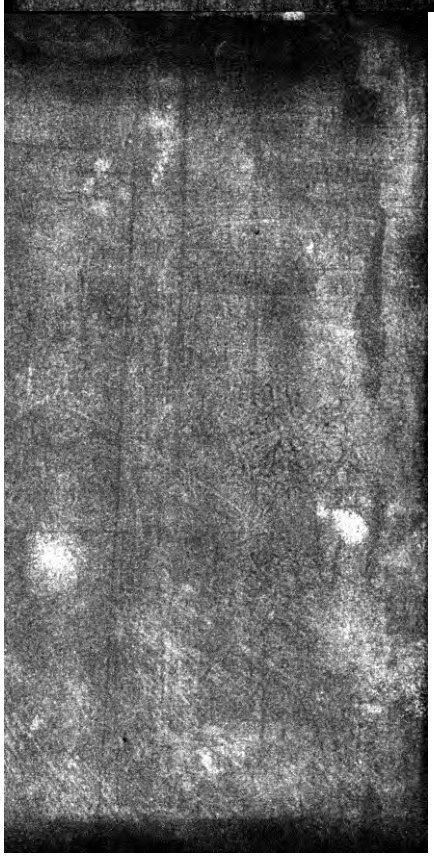

THE BRUEGEL SUCCESS STORY

Papers Presented at Symposium XXI for the Study of Underdrawing and Technology in Painting, Brussels, 12–14 September 2018

Edited by

Christina Currie,

in collaboration with

Dominique Allart, Bart Fransen, Cyriel Stroo

and Dominique Vanwijnsberghe

PEETERS

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2021

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27

View of the Strait of Messina, by Circle of Pieter Bruegel the Elder: Drawing Techniques and Materials Examined

Lieve Watteeuw, Marina Van Bos, Joris Van Grieken, Maarten Bassens, Bruno Vandermeulen and Hendrik Hameeuw

Abstract: The *View of the Strait of Messina* (Brussels, Royal Library of Belgium, KBR, Print Room), attributed to the circle of Pieter Bruegel the Elder, was studied in detail in 2018 in the context of the Fingerprint Project. The drawing was examined with analytical and imaging techniques, combined with visual, microscopic and conservation assessment. Non-destructive macro X-ray fluorescence mapping analyses (MA-XRF) and multispectral imaging revealed the use of at least two different inks to create the drawing: iron gall and carbon ink. The iron gall ink shows various degradation characteristics, such as fading, darkening and brittleness, which change the appearance of the drawing. On the verso of the drawing – composed of two sheets of paper – figures and ornaments are sketched in charcoal and red chalk.

—o—

Introduction

In 2011 the Royal Library of Belgium (KBR) acquired from a Brussels antique dealer a drawing with a view of the Strait of Messina in the style of Pieter Bruegel the Elder (figs 27.1 and 27.2).[1] Its previous history is still unknown. At the time of acquisition the sheet had been discussed only briefly in Hans Mielke's 1996 catalogue raisonné of Bruegel's drawings.[2] His opinion – formed on the basis of a photograph – was that the drawing was a copy, probably after a lost drawing by Bruegel made *in situ*.[3] It was also Mielke who linked this sheet to a print published in 1618 in the last volume of Georg Braun's and Nicolas Hogenberg's *Civitates Orbis Terrarum* (fig. 27.3).[4] Apart from striking similarities in the overall composition and in several topographical details, an inscription on this print claims that it was made after an original drawing by Bruegel once in the possession of Joris Hoefnagel.[5] In his 2011 article on the drawing, Joris Van Grieken largely confirmed Mielke's observations: 'the quality of the draughtsmanship is not sufficient to support an attribution to Bruegel himself, but the links with his style and oeuvre suggest that it is a direct copy either after a drawing by Bruegel made from life or after an autograph drawing created in the studio'.[6]

This contribution adds new analytical and imaging information to Van Grieken's findings, published in 2011 in *In Monte Artium*, an essay that is available online.[7] In 2018 the drawing was examined more closely in the context of the Fingerprint Project.[8] This study discusses the new results of this art-technical research and puts them in the context of traditional drawing practice.

Short Description of the Messina Drawing

The oblong drawing shows a broad panoramic view of the Strait of Messina. On the right bank of the

Fig. 27.3 Recto of engraved view of the Strait of Messina, published 1618, in Georg Braun and Nicolas Hogenberg, *Civitates Orbis Terrarum*, 1572–1618, part IV, fol. 58 (inv. KBR S.I 1666 [NHD48])

Strait we see the city of Messina with Mount Etna in the background. The right shoreline runs from the city walls to the foreground where a chapel, a bank of trees and vaguely drawn figures and pack animals are represented. The waters of the Strait of Messina occupy most of the central part of the drawing. The sea is dotted with numerous smaller and larger ships, both sailing vessels and galleys. On the left shore the city of Reggio di Calabria can be seen in the distance with steep wooded hills beyond it. Various topographical features are indicated by capital letters, as is also the case in the printed version of 1618, where each letter refers to an identifying caption. Above the mountains of Calabria at the left of the drawing we see the letter 'A', while the port of Reggio is marked with 'B'. The Strait of Messina in the middle is indicated by 'C', the mountain range on the Sicilian side with 'D', the harbour of Messina with 'E' and, finally, Mount Etna bears the letter 'F'. In the lower right corner of the sheet is the signature 'BRVEGEL'.

Assessment of the Condition of the Paper Support

The condition of the drawing was assessed using visual and microscopic observation. The paper support for the *View of the Strait of Messina* measures 153 × 523 mm and consists of two trimmed sheets of reused paper mounted together.[9] The good-quality, laid paper is of medium thickness and has a fibrous surface, showing lighter and darker fibres. The chain lines are clearly visible in the vertical direction and no watermark is present. The two leaves show minor stains and smudges from drops of liquid, as well as some rust stains and small perforations caused by iron gall ink corrosion. Three vertical folds are visible in each sheet, probably because the paper was folded when purchased from the paper dealer. Moreover, if the drawing travelled, it must have been folded into a smaller oblong format for transport (figs 27.4a–b).[10]

The paper shows signs of wear: apart from the numerous stains that cover its surface, there are

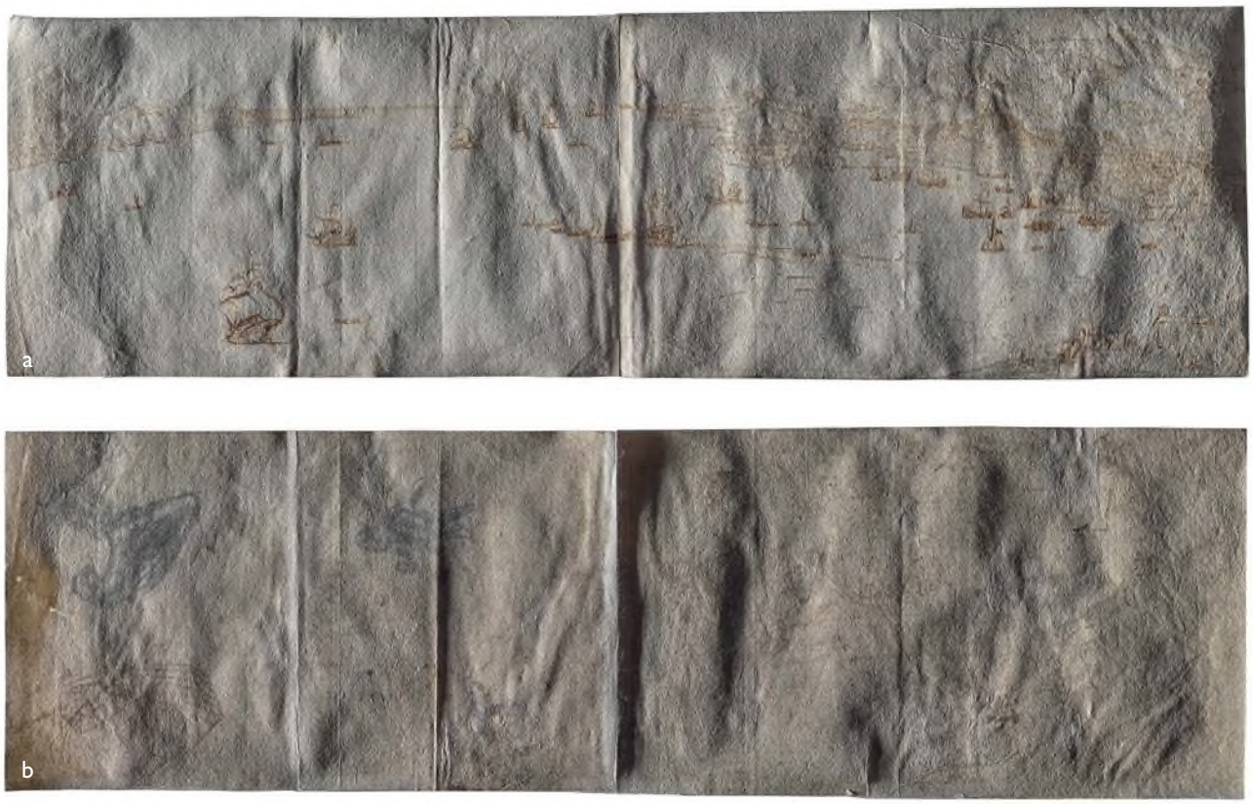

Fig. 27.4 Recto (a) and verso (b) of *View of the Strait of Messina* (fig. 27.1) , both with raking light from the right. Seven vertical folding lines, valley and peak direction

several weak spots and traces of old folds. Along the smudged edges are several tiny tears, some of which have been repaired at the back in the last decades. The two pieces of paper are joined with a strip of Japanese paper of recent date.[11] During an early mounting, the sheet was trimmed on all four sides and the hinge joining the two sheets was re-glued, causing a gap of a few millimetres. There has been a small loss to the composition. Mounting the two sides on the hinge has been done rather clumsily. The right part is mounted around 0.5 mm higher than the left part, causing a slight shift in the composition, which is especially visible in the ship in the middle. Fragile areas are visible within the laid paper, caused by the removal of former hinges (visible with transmitted light). In 2011 the KBR added hinges (Japanese paper) for the actual mounting, but no treatment has been done since.

Analysis and Imaging of the Drawing Media

Experimental Protocol and Equipment

The focus of the laboratory research was to discover more about the creative process of this copy after a Bruegel drawing. Mielke rightly pointed to elements that resemble Bruegel's way of drawing, such as the typical dotted way in which the trees in the foreground are represented. Similar to Bruegel's and contemporaries' practice is the use of two colours of ink, found in some of Bruegel's early drawings that were made during, or directly following, his trip to Italy, as pointed out by Sellink 2018b and Michel 2018.[12] Watteeuw et al. 2019 recently demonstrated the intentional use of multiple and combined inks in four Bruegel drawings, kept in two Brussels collections: *Angler near the river* (1554), *Luxuria* (1557), *Justitia* (1559), KBR, Print Room; *Prudentia* (1559), Royal Museums of Fine Arts of Belgium.[13]

Technical photography (Phase One IQ180), standard multispectral photography (Converted NIKON D610) complementary with filters (MidOpt, across 13 spectral bands), was done by the imaging team of the Fingerprint Project of KU Leuven at KBR. After this first documentation, the drawing was transported to the laboratory at KIK-IRPA for X-ray fluorescence mapping (MA-XRF). MA-XRF maps were registered using the M6 Jetstream (Bruker AXS, Berlin, Germany) with a Rh X-ray tube operated at 50 kV and 600 µA current. The drawing was scanned using an X-ray beam size of 150 µm, in steps of 125 µm, and a dwell time per step of 10 ms. Details were scanned using an X-ray beam size of 50 µm, in steps of 40 µm, and a dwell time per step of 15 ms. The spectra were collected, deconvoluted and examined with the Bruker M6 Jetstream software. Chemical elements were identified in the scan by examining the sum spectrum and maximum pixel spectra. The data of the imaging and analyses were brought together to obtain a comprehensive view of the material characteristics of the drawing.

Ink Identification in the Messina Drawing

Combination of Imaging and Analytical Visualization

As is clearly visible, the drawing of the Strait of Messina is executed in two different types of ink. MA-XRF revealed that most of the drawing is done in iron gall ink, evidenced by the presence of iron in the MA-XRF map (fig. 27.7).[14] The ink of the small boats on the right – applied with a thick pen – contains a substantial amount of manganese as well.[15] This iron gall ink is chemically unstable and is degraded, darkened or faded to a lighter shade. At concentrated points of ink, the paper is degraded by ink corrosion, creating small perforations in the laid paper in the areas where the lines criss-crossed and the ink layer was dense (for example, in the central sailing boats).

Short thin black lines (hatching and shading) were added to the drawing for shaping contours, adding detail to boats and for creating the effect of the mountain slopes. These lines were drawn with a very fine quill and were executed in carbon ink.[16] This black carbon ink becomes more visible both on the IRR and multispectral photographs with IR bandpass filters (fig. 27.8b).

Discussion

The combination of two or even more inks is not unusual in sixteenth-century drawings. Stylistically we can determine that the iron gall ink drawing lines in the Messina panorama and the small touches or lines executed in carbon ink are complementary and applied at the same drawing moment since they match each other (fig. 27.8).[17] The carbon lines are clearly reinforcing the brownish iron gall lines. But the iron gall ink faded over time and

Fig. 27.5 Verso of *View of the Strait of Messina* (fig. 27.1). Sketches in different types of ink (faded), charcoal and red earth. Some iron gall ink corrosion stains from the recto side and a modern vertical strip of Japanese paper in the centre

Fig. 27.6 Left section (a) and right section (b) of the verso of the paper (*View of the Strait of Messina*, fig. 27.1), with slight overlap of verso, UV fluorescence image. Sketch with a ship and two standing figures and two architectural profiles (a); several armed and male and female naked figures and a skeleton; sketch with male and female figures; study of a bust and a leg and studies of male heads (b)

Fig. 27.7 Recto of *View of the Strait of Messina* (fig. 27.1). MA-XRF image. Fe-Kα distribution map, visualizing the iron component in the iron gall ink

took on different hues, so that the view has become so faded that it is hard to distinguish them clearly, as is especially evident in the lines made for the mountains at the horizon. The black carbon lines scattered over the drawing stayed stable so that the contrast between the two media has increased. This changes the current perception and reading of the drawing.

Later additions are present. As mentioned earlier, the drawing has several capital letters written above the horizon line, labelling the topographical features. These capital letters, written in iron gall ink, gave only a very weak sign in the MA-XRF. Also the 'BRVEGEL' signature in the right corner gave a very weak signal due to its faded iron gall ink. The fact that both the letters and the signature have a far weaker ink signal than the measured signal for the drawing lines suggests that they were applied at a different stage. They are most likely later additions, supplied by a different hand. The letters, although not an exact repetition, indicate a direct relationship with the engraving by Braun and Hogenberg – most obviously that the drawing served as the model for the print.

Earlier Sketches on the Drawing's Verso

The verso side of the *View of the Strait of Messina* is fascinating, as it was used for loose sketches in different media and with different drawing tools, before the large panorama of Messina was drawn on the recto side. Some of the drawings are almost invisible to the naked eye as the ink is thin and much faded, but the IRR and multispectral imaging show clearly at least eleven different trials or sketches, executed in different directions on the paper and in different media (figs 27.5 and 27.6).

Their style is completely different from the drawing of the *View of the Strait of Messina* on the other side. Most prominent is a large sketch on the right sheet of paper of an interior with several armed or naked male and female figures with a skeleton. This could possibly be interpreted as a *Totentanz* or an allegorical scene on the theme of *vanitas*. We have not yet been able to identify this scene. It might be a copy of a wall painting or a print.

Several other sketches of smaller figures on the sheets of paper were done earlier: two sets of standing male and female figures, two male heads (partially cut), and two half-length figures reaching out to each other with their hands. A sailing boat is worked out in detail in the left corner, but partially cut. Two small sketches of architectural profiles – in a brown medium – are less visible (and might be copies from an architectural treatise?). Two undefined rough sketches in charcoal are of a completely different type of doodle and dominate the verso side. A small half-profile in red earth on the top of the left sheet is almost invisible. After these sketches were made, the two sheets were cut and some sketches at the edges became incomplete. But this was the format the artist needed for drawing the *View of the Strait of Messina*.[18]

Fig. 27.8 Detail of a sailing ship in *View of the Strait of Messina* (fig. 27.1). . Combination of imaging and analytical visualization. Standard colour RGB (a); multispectral image with 940nm bandpass filter, showing the carbon-based ink lines (b); Fe-Kα distribution map, showing the iron gall-based ink lines (c)

Conclusions

After technical examination, we can conclude that nothing contradicts Mielke and Van Grieken attributing a late sixteenth or early seventeenth-century date, based on stylistic characteristics of the *View of the Strait of Messina* by a follower/copyist of Pieter Bruegel. The drawing has been executed on reused paper, as the draughtsman probably had no other paper available at the moment he needed it. The drawing of Messina seems to be made in haste. The draughtsman might have had only very temporary access to the material/model he was copying after. It is executed in a combination of lines and shapes using overall iron gall ink of two different compositions, with touches, lines and hatching in carbon ink, which was not an unusual drawing practice in the sixteenth century.

We can only guess how the original Bruegel material the copyist had in front of him might have looked. In Van Grieken's 2011 article, it was suggested that the original probably had the same 'finished' form and might have been a direct study after life by Bruegel's hand. After this research we are more hesitant about drawing this same conclusion. We would even call into question the idea that the copyist of the Messina vista had a single finished drawing before his eyes. Instead he might have reconstructed the view based on several partial sketches by Bruegel and helped by knowledge of the site or of other topographical material. The draughtsman could have been Joris Hoefnagel, but no final attribution can be made.

On the quest to improve laboratory methodology in drawing research, the use of the combination of detailed spectral imaging and analytical data through MA-XRF to examine a drawing was experimental, and helped pinpoint the different inks and drawing mediums used by the draughtsman of the view and by the later hand of the added lettering and signature. The evaluation of condition showed that the fading of the iron gall ink is considerable and has substantially changed the visual perception of the drawing.

The eleven sketches in a variety of media on the verso side remain a mystery. They predate the copy of the Messina panorama. Further research on the sketches on the reverse has to be done, but nothing indicates that the artists of the recto and verso are linked to each other. The authors hope that, prompted by the images reproduced here, scholars of drawing may shed light on their identification and meaning.

Notes

1 Brussels, Royal Library of Belgium, KBR, Print Room, *View of the Strait of Messina*, pen on paper, 153 × 523 mm, inv. KBR F-2011-138. See Mielke 1996, p. 40; Van Grieken 2011. See also Leuven/Paris 2013, p. 376; Sellink 2013, specifically p. 294 and note 21; Bassens and Van Grieken 2019, pp. 102–5.

2 Mielke 1996, p. 40.

3 In Mielke 1996, p. 40 (no. 15), Hans Mielke hesitatingly adds a question mark after the word '*Kopie*'. In his introductory essay (p. 12) he seems to be more convinced: 'Dass die auf Bruegel hinweisende Aufschrift im Städtebuch [Braun and Hogenberg 1572–1618] vertrauenswürdig war, bewies der glückliche Fund einer Kopie (Kat. 15).' And further: 'Somit sind Bruegels topographischen Aufnahmen aus Italien […] nur als Reflexe auf uns gekommen: die Gesamtansicht der Meerenge, die das Städtebuch gedruckt hat, als mässige Kopie von unbekannter Hand.'

4 See Braun and Hogenberg 1572–1618, part IV, fol. 58.

5 Inscription: *Repertum inter studia aytographa / Petri Bruegelij Pictoris nostri / seculi eximij Ab ipsomet deline: / atum Communicavit Georgius / Houfnaglius. Anno 1607.* (Found among the studies of Pieter Bruegel, most eminent painter of our age. Reproduced after the same. Communicated by Joris Hoefnagel. Anno 1607.)

6 Van Grieken 2011, quoting Mielke (Mielke 1996, p. 40; quotation translated from German to English).

7 <brepolsonline.net/doi/10.1484/J.IMA.1.102414?mobileUi=0>.

8 Watteeuw et al. 2017. The Fingerprint Project is an interdisciplinary collection and data management project, involving art history, art technical research, digital imaging, image processing and conservation science. The aim is to monitor and evaluate with advanced digital imaging, statistical processing and laboratory analyses, the phases of the genesis of a print, from the unique preparatory drawings to later states and editions. The four-year project (2016–20) is a collaboration between the Print Room of the Royal Library of Belgium and three KU Leuven teams: the Imaging Lab, ESAT and the Book Heritage Lab, and Illuminare – Centre for the Study of Medieval Art. The Royal Institute for Cultural Heritage (KIK-IRPA) is an external partner. The research project is funded by Belspo BRAIN-be (Belgian Research Action through Interdisciplinary Networks). For this project all the drawings and prints of Pieter Bruegel the Elder in the Print Room of the Royal Library in Belgium were digitized in 2017–18 by KU Leuven using a Phase One IQ180 camera, Schneider APO-DIGITAR 80/4.0 SES, exposure condition for Metamorfoze standard.

9 The two sheets of paper measure respectively 152 × 259 mm (left) and 153 × 254 mm (right).

10 Image on the recto and verso sides with raking light. Phase One IQ180, Schneider APO-DIGITAR 80/4.0 SES.

11 The Japanese paper strip was added before the acquisition by the KBR in 2011. A new mounting in a passepartout was done in the conservation studio of the Print Room at the KBR.

12 For the use of drawing media and drawing techniques by Pieter Bruegel the Elder, see Mielke 1996; Royalton-Kisch 2001; Sellink 2018b; Michel 2018, p. 18.

13 See Watteeuw et al. 2019.

14 The varying components of iron gall ink, made from gallnuts, iron sulfate, water and a binder, resulted in inks of diverse tones and hues, from light brown to black. For historical recipes for inks and combined inks, see Zerdoun Bat-Yehouda 1983, p. 206. See also Watteeuw and Van Bos 2014; Watteeuw and Van Bos 2018.

15 MA-XRF, M6 Jetstream (KIK-IRPA, Brussels, 2018) shows a clear Fe-Kα distribution map. For the identification of iron gall ink with traces of manganese, see also Watteeuw and Van Bos 2018.

16 Carbon ink (soot soaked in water or other liquid) is not detectable with MA-XRF, but is made visible with the multispectral image with 940nm bandpass filter. See fig. 27.8b.

17 For image (a) is made with the Phase One IQ180 camera; image (b) is made with a Converted NIKON D610, CoastalOpt 60mm 1:4 UV-VIS-IR Apo Macro + MidOpt BN940 filter; image (c) is a visualization of the iron components with MA-XRF.

18 The drawing lines on the verso side are weak. No MA-XRF analyses have been carried out from the verso side and no signal was obtained through the paper layers while scanning the recto side, so that no information about the elements of the media are (yet) available. The very faded brown drawing lines are most probably made in iron gall ink, becoming visible in UV fluorescence. Two rough sketches on the left sheet of paper are executed in charcoal.

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Bruegel's drawing for *The Dirty Bride* (*c.* 1566) A FINGERPRINT project case study

[fig. 1] Pieter Bruegel the Elder, *The Dirty Bride* or *The Wedding of Mopsus and Nisa*, *c.* 1566. Drawing in pen and black-brown ink on a white-prepared, partially carved block of applewood, 264 × 416 × 29 mm. New York, The Metropolitan Museum of Art, Harris Brisbane Dick Fund, 1932, inv. no. 32.63.

Introduction

In terms of his graphic oeuvre, Pieter Bruegel is best known as a designer of copper engravings. He was very fond of this technique, in which he produced brilliant, detailed designs commissioned by the publisher Hieronymus Cock (*Aux Quatre Vents*) after returning to Antwerp from Italy in 1554. By contrast, the body of work comprising Bruegel's woodcuts is very limited: the only survivors are *The Wild Man*, also known as *The Masquerade of Orson and Valentine*, from 1566 (see also cat. no. 21),[1] and the unfinished, cut woodblock for *The Dirty Bride* or *The Wedding of Mopsus and Nisa* (fig. 1; see also cat. no. 22).[2] The pen drawing on the block was likely intended as a counterpart of *The Wild Man*, done in the same year (fig. 2). The dimensions of the print of *The Wild Man* and the block for *The Dirty Bride* are virtually identical.[3] A previously unknown publisher commissioned the set of woodcuts. Bruegel also used both scenes in his painting *The Battle Between Carnival and Lent* (1559).[4]

The cutting of the woodblock with the drawing of Mopsus and Nisa was almost certainly begun in an Antwerp woodcutter's workshop following the design that Bruegel drew directly onto the block. There are several possible reasons why the woodcut medium rather than that of a burin engraving was chosen for these popular themes.